

# Application Trends in Pulmonary and Critical Care Medicine Fellowships

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## BACKGROUND

This study, using publicly available data from the NRMP (National Resident Matching Program), was designed to describe changes in the last decade in internal medicine (IM) subspecialty fellowship match patterns, with a focus on pulmonary and critical care medicine (PCCM).

In 1995, representatives of the American College of Chest Physicians, American Thoracic Society, Society of Critical Care Medicine, and the Association of Pulmonary and Critical Care Medicine Program Directors formed COMPACCS (Committee on Manpower for Pulmonary and Critical Care Societies) to evaluate the workforce and training needs in PCCM (1). In 2000, this committee published a report forecasting a shortage of PCCM physicians because of rising demand from an aging population (1). This projected shortage prompted COMPACCS to recommend critical care societies take steps to improve the efficiency of and increase the number of

critical care providers (2). This has resulted in the implementation of tele-intensive care unit care, using advanced practice providers, and providing intensive care training to hospitalists (3).

Increasing the number of trainees who pursue PCCM would have the most direct impact on the shortage. However, shortly after this report, IM residents reported reservations about the specialty (4). In a 2005 survey, whereas 41% of residents seriously considered PCCM as a specialty, only 3.4% ultimately applied to a PCCM fellowship program (4). Residents cited time demands and stress as major dissuading features. There was concern that growth in the specialty would lag because of interest. However, a recent study showed considerably higher growth in PCCM applications and fellowship positions since that time when compared with the pulmonary medicine fellowship (5).

## METHODS

We used publicly available data from the NRMP to examine the application and

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match data for all IM subspecialties using Microsoft Excel. Subspecialties with more than 200 applications in the 2021 matriculation cycle were included. Annual match data for each specialty (number of applications and positions offered) from 2010 to the present were collected from the publicly available NRMP archive (6).

We used this data to calculate the “specialty competitiveness ratio” (SCR) to define the number of applicants per match position offered within the specialty. The SCR is calculated as shown below.

$$SCR = \frac{\text{Number of unique applicants to the specialty}}{\text{Number of available training positions in that specialty}}$$

An SCR greater than one indicates more applicants than match positions, meaning this specialty is more competitive. An

SCR of less than one indicates more match positions than applicants.

The average annual growth rate of fellowship positions and applications was calculated for each specialty. One-sample *t* test was performed on mean annual growth for all specialties using an  $\alpha$  of 0.05 and a null hypothesis of zero growth.

## RESULTS

In 2021, the largest fellowships were cardiology (1,045 match positions), PCCM (657), hematology/oncology (638), gastroenterology (590), and nephrology (474). The specialties with the greatest number of applicants were cardiology (1,575 applicants), PCCM (1,023), hematology/oncology (909), gastroenterology (895), and palliative care (415).

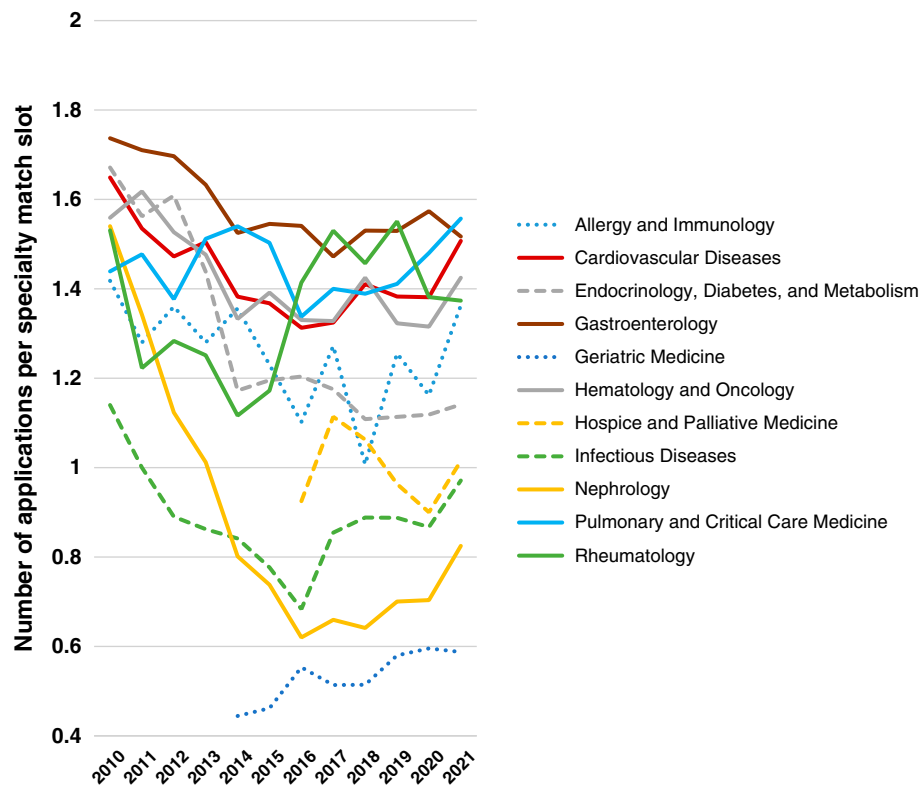


Figure 1. Specialty competitiveness ratio for internal medicine subspecialties since 2010.

In 2021, PCCM had the highest SCR (1.56) of the IM subspecialties for the first time since 2014 (Figure 1).

Gastroenterology and cardiology fellowships ranked second and third, respectively, with SCRs of 1.52 and 1.51. Infectious diseases, nephrology, and geriatrics are the only specialties with an SCR below 1.

Figure 2 outlines the annual growth in applications and fellowship positions for each specialty since 2010. Two specialties with less than 10 years of data, geriatric medicine and palliative care, were excluded from this figure. PCCM applications increased by 5.37% annually, the most of any specialty. The second greatest annual increase in applications was in gastroenterology with 3.35%. PCCM has been the third-fastest growing specialty in match positions since 2010, with average annual growth of 4.40%, behind gastroenterology (4.63%) and endocrinology (4.59%) (Figure 2). Since 2010, PCCM has been the only specialty with greater percent growth in applications

than match positions. Cardiology, endocrinology, gastroenterology, hematology/oncology, PCCM, and rheumatology all had statistically significant annual growth in fellowship positions, whereas PCCM and gastroenterology were the only two specialties with statistically significant annual growth of applications.

**DISCUSSION**

This evaluation of NRMP match data indicates that in the 2020 match cycle, PCCM was the most popular specialty, as measured by the SCR. The 60.2% growth in PCCM fellowship positions over the last decade ranked third among IM subspecialties, and PCCM is the only IM subspecialty that has had more growth in applicants than in match positions.

This rising popularity correlates with workforce analysis from the Department of Health and Human Services, which estimated the 2013 supply of pulmonologists in the United States to be 12,380, notably greater than the predicted supply of pulmonologists by Angus and

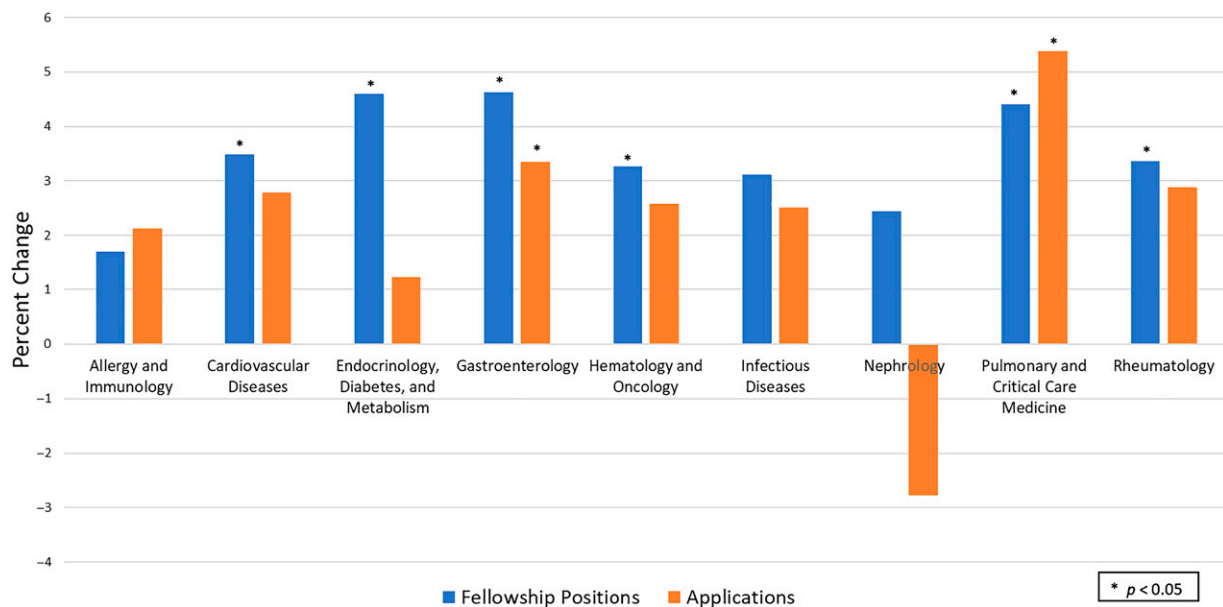


Figure 2. Average annual percent growth of fellowship positions and applications since 2010.

colleagues of approximately 7,000 (1, 7). Despite this finding, they still estimated a shortage of 1,400 pulmonary physicians by 2025.

There is little published to explain the rise in popularity of PCCM. A recent survey of PCCM fellows reported high rates of depression (41%) and burnout (32%) that appear to be at odds with the rising SCR (8). The increased popularity is likely multifactorial, including the following. First, PCCM provides a diverse spectrum of disease and intellectual stimulation; both are features that residents rank as important when choosing career paths (9). PCCM has the third highest salary among IM subspecialties (10). Other specialties with high SCR scores also have high salaries, which would suggest some financial motivation to explain the rise in popularity (10). The pandemic has shone a spotlight on critical care physicians, and

there is some thought that this may drive more applicants to PCCM. Given the discordance between published literature on PCCM interest and fellowship application data, a more thorough analysis of factors influencing IM resident decisions about fellowship choice is warranted.

Over the last decade, PCCM has grown in both fellowship positions and applications, and it was the only specialty with a greater percent increase in applications than fellowship positions. This resulted in PCCM ranking number one in popularity by the SCR for the first time since 2014. This rise in popularity has helped alleviate the PCCM physician shortage predicted in 1995.

**Author disclosures are available with the text of this article at [www.atsjournals.org](http://www.atsjournals.org).**

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## REFERENCES

1. Angus DC, Kelley MA, Schmitz RJ, White A, Popovich J Jr; Committee on Manpower for Pulmonary and Critical Care Societies (COMPACCS). Caring for the critically ill patient. Current and projected workforce requirements for care of the critically ill and patients with pulmonary disease: can we meet the requirements of an aging population? *JAMA* 2000;284:2762–2770.
2. Ewart GW, Marcus L, Gaba MM, Bradner RH, Medina JL, Chandler EB. The critical care medicine crisis: a call for federal action: a white paper from the critical care professional societies. *Chest* 2004;125:1518–1521.
3. Buchman TG, Coopersmith CM, Meissen HW, Grabenkort WR, Bakshi V, Hiddleson CA, *et al*. Innovative interdisciplinary strategies to address the intensivist shortage. *Crit Care Med* 2017;45:298–304.
4. Lorin S, Heffner J, Carson S. Attitudes and perceptions of internal medicine residents regarding pulmonary and critical care subspecialty training. *Chest* 2005;127:630–636.
5. Richards JB, Spiegel MC, Wilcox SR. Characteristics of pulmonary critical care medicine and pulmonary medicine applicants and fellowships. *ATS Scholar* 2020;1:67–77.
6. Match data and report archives. National Resident Matching Group [accessed 2021 Oct 15]. Available from: <https://www.nrmp.org/report-archives/>.
7. National and regional projections of supply and demand for internal medicine subspecialty practitioners. 2013–2025. Rockville, MD: Department of Health and Human Services; 2016.

8. Sharp M, Burkart KM, Adelman MH, Ashton RW, Daugherty Biddison L, Bosslet GT, *et al.*; Consensus Expert Panel (CEP) Members. A national survey of burnout and depression among fellows training in pulmonary and critical care medicine: a special report by the Association of Pulmonary and Critical Care Medicine program directors. *Chest* 2021;159:733–742.
9. Horn L, Tzanetos K, Thorpe K, Straus SE. Factors associated with the subspecialty choices of internal medicine residents in Canada. *BMC Med Educ* 2008;8:37.
10. Wang T, Douglas PS, Reza N. Gender gaps in salary and representation in academic internal medicine specialties in the US. *JAMA Intern Med* 2021;181:1255–1257.