



Impact of Ambulatory Blocks on Pulmonary Critical Care Fellow Outpatient Training Experience

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ABSTRACT

Background: The Accreditation Council for Graduate Medical Education requires Pulmonary and Critical Care Medicine (PCCM) fellows spend a minimum of 7% of their time in the outpatient setting over 3 years of training. In a multi-institutional survey, only 47% of PCCM fellows rated their ambulatory training as adequate. Internal medicine residencies previously adopted the “x + y” scheduling model, which separates inpatient (“x”) and outpatient (“y”) rotations to provide focused ambulatory experiences, to address similar concerns.

Objective: To observe the effects of dedicated ambulatory blocks at a single academic PCCM fellowship on fellow exposure to outpatient pulmonary medicine, and on fellow and faculty perceptions of education.

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Methods: In the 2021–2022 academic year, PCCM fellows of all class years in a single academic fellowship program in the northeast United States rotated through four 2-week ambulatory blocks that included longitudinal clinics, themed subspecialty clinics, and a dedicated educational half-day for small group learning. Before the intervention, fellow ambulatory clinics were scheduled longitudinally one-half day per week during inpatient and research blocks. Both fellows and faculty were surveyed before and after the intervention; fellows were also interviewed via focus groups at the conclusion of the intervention. The degree of subspecialty clinic exposure was compared before and after intervention.

Results: There was an increase in the quantity and variety of pulmonary subspecialty clinics per fellow when compared with preintervention years ($P < 0.01$). After intervention, we observed increased fellow satisfaction with ambulatory education, perceived preparedness for independent practice, and satisfaction with subspecialty clinic exposure ($P < 0.05$). Faculty satisfaction with fellow ambulatory pulmonary education also increased ($P < 0.05$). Thematic analysis from focus groups highlighted focused topical learning, exposure to the breadth of pulmonary medicine, career development, interaction with engaged faculty experts, and enhanced interprofessional competence.

Conclusion: The ambulatory block structure provides a potential model to expand PCCM fellow outpatient pulmonary training through increased exposure to ambulatory pulmonology and dedicated ambulatory teaching. Important features of the ambulatory block structure include separation of outpatient clinics from competing responsibilities, expansion of fellow pulmonary exposure, opportunities for deliberate practice, and faculty engagement in fellow education.

Keywords:

graduate medical education; fellowships and scholarships; pulmonary medicine; ambulatory care; focus groups

The Accreditation Council for Graduate Medical Education (ACGME) requires fellows in Pulmonary and Critical Care Medicine (PCCM) spend a minimum of 7% of their time in outpatient clinics over 3 years of training, with the expectation that trainees be prepared for the complexities of ambulatory practice upon graduation (1). The imbalance between ambulatory and inpatient experiences in PCCM may in part explain why, in a multi-institutional survey, only 47% of PCCM fellows rated their ambulatory training as adequate to prepare them for

independent practice, with 53% agreeing that they would benefit from additional time in the ambulatory patient care setting (2).

The few existing studies addressing ambulatory education in PCCM fellowships have focused on didactic education, with few or no associated structural changes to enhance clinical exposure. One investigated the effect of a 24-month, case-based didactic curriculum spanning topics in outpatient pulmonary medicine, which was associated with increased fellow satisfaction with

ambulatory education. However, the study did not include experiential learning techniques (2). Another study examined the effect of intentionally pairing their curriculum with experiential learning opportunities for PCCM trainees in lung transplant. Fellow perceptions of knowledge and in-training exam scores improved; however, topic scope was limited, and experiential learning spanned both inpatient and outpatient arenas (3).

Internal medicine (IM) residencies previously faced a similar concern of limited ambulatory exposure; however, the ACGME now mandates that “rotations must be structured to minimize conflicting inpatient and outpatient responsibilities” (4). The “x + y” model adopted by many IM training programs separates inpatient (“x”) and outpatient (“y”) rotations, and provides focused time for ambulatory training and outpatient education (5, 6). Transition to this model improved trainee perceptions of their ambulatory training, continuity of care, and chronic disease outcomes while enhancing residents’ sense of ownership and confidence in clinical practice (6–10).

We incorporated ambulatory blocks into PCCM fellow schedules in a modified x + y structure, with the aim of increasing fellow exposure to outpatient pulmonary medicine and enhancing trainee perception of ambulatory education. A mixed-methods analysis was performed to evaluate the impact of ambulatory blocks on training in our fellowship program.

Portions of these data were presented in poster format in October 2022 at the American College of Chest Physicians annual conference (11), in a presentation at the May 2023 American Thoracic Society/Association of Pulmonary and Critical Care Medicine Program

Directors/Pediatric Pulmonary Training Directors Association Clinician Education Forum, and in an abstract in the 2023 American Thoracic Society Innovations in Fellowship Education booklet (12).

METHODS

Study Participants and Setting

This study included all PCCM fellows at Yale School of Medicine ($n = 19$, 2020–2021; $n = 18$, 2021–2022), an ACGME-accredited program with 18 months each of clinical and research time. Fellows have longitudinal pulmonary clinics at two sites: one affiliated with a 1,500-bed tertiary care academic hospital and the other associated with a Veterans Affairs hospital. Before the intervention, fellow longitudinal clinics were scheduled as half-days during inpatient rotations or research time in accordance with ACGME program requirements (1). During this time, second- and third-year fellows were required to rotate through a minimum of 16 pulmonary subspecialty clinics over 2 years, although the number and variety of clinics varied among fellows.

This study was deemed exempt by the Yale Institutional Review Board. Informed consent was obtained from participants before surveys and semistructured interviews.

Ambulatory Block Structure

In the 2021–2022 academic year, PCCM fellows were divided into four cohorts, each consisting of fellows of varying post-graduate years, with the intent that the groups would rotate through ambulatory blocks together. Each fellow completed a total of 8 weeks of ambulatory blocks (four 2-week blocks) over the academic year. A sample 2-week ambulatory block schedule

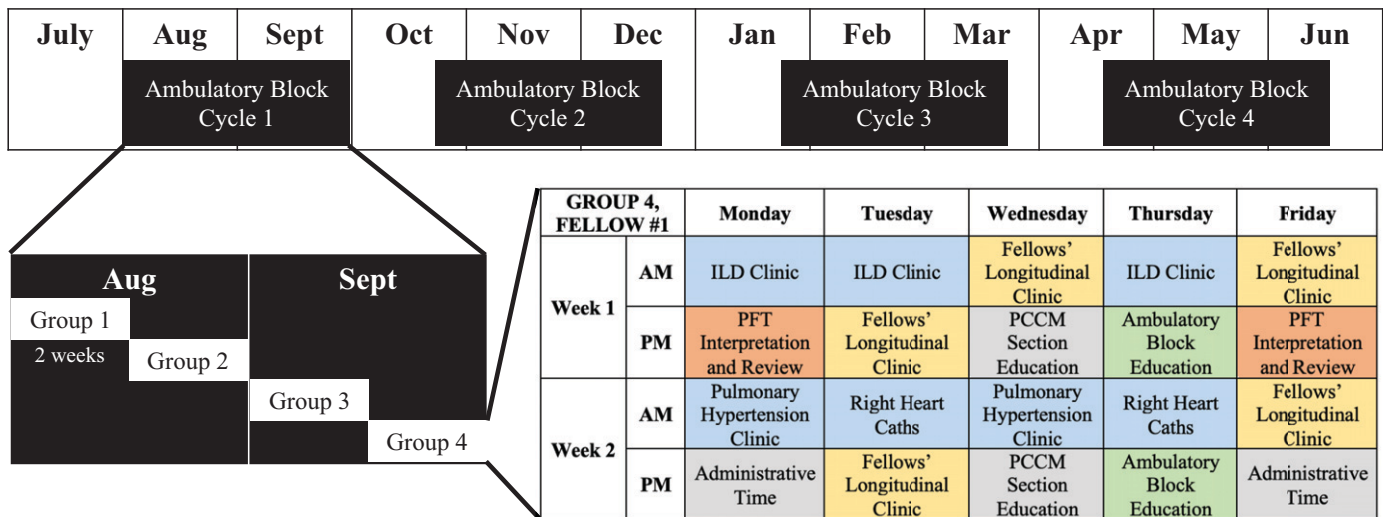


Figure 1. Ambulatory block structure and example of a 2-week fellow schedule. Fellows were divided into four mixed-year groups, with each fellow rotating through four 2-week blocks in the academic year. When not on ambulatory blocks, fellows returned to otherwise scheduled clinical rotations or research time. Fellows were assigned themes within each ambulatory block, which defined the subspecialty clinic(s) through which they would rotate; for example, Week 1 focuses on ILD and Week 2 on pulmonary vascular disease. Additional subspecialty themes included asthma/airway disease, chronic obstructive pulmonary disease, cystic fibrosis, post-coronavirus disease (COVID-19), thoracic oncology, tuberculosis, and sleep medicine. Week 1 also demonstrates time for pulmonary function test (PFT) interpretation and review in the role of PFT fellow of the week. Administrative half-days were intended for follow-up of clinic tasks, including finishing notes, talking to consultants, reviewing imaging with radiology, and inbox management. ILD = interstitial lung disease; PCCM = pulmonary and critical care medicine. Reprinted by permission from Reference (12).

for a single fellow is provided in Figure 1. Within each ambulatory block, weeks were organized into themes, which determined what mix of pulmonary subspecialty clinic(s) they would experience. Longitudinal clinics were both incorporated into ambulatory blocks and scheduled throughout the year per ACGME requirements (1). Ambulatory blocks also included half-days for administrative work, section-wide education, and small group ambulatory block educational sessions. Educational topics were selected based on the American Board of Internal Medicine pulmonary boards blueprint (see Table E1 in the data supplement). Sessions were taught by clinical faculty based on provided teaching scripts, although specific teaching approaches were left to the discretion of the instructors. As part of this restructure, the program created the role of pulmonary function test (PFT) fellow of the week, which alternated between

fellows within each block; fellows in this role were responsible for PFT interpretation with a faculty mentor. Both PCCM fellows and faculty were oriented to the new structure, as well as the aims of the ambulatory block model. Faculty provided learning objectives specific to their subspecialty clinic before implementation. Ambulatory blocks added 2 weeks of scheduled clinical service time per year for second- and third-year fellows compared with years prior, which replaced research time. Impact on clinical service time was minimized by incorporating previously stand-alone rotations, such as sleep medicine, pulmonary rehabilitation, and pulmonary physiology.

Evaluation Methods

Subspecialty clinic exposure in ambulatory blocks, including total half-days of clinic and number of subspecialty clinics experienced per fellow, was compared with three

academic years before the intervention (2017–2018, 2018–2019, and 2019–2020). The 2020–2021 academic year was excluded, as ambulatory clinics were temporarily suspended because of the coronavirus disease (COVID-19) pandemic. First-year fellows were excluded from the preintervention data set, as clinical rotation structure did not accommodate subspecialty clinic attendance.

Online surveys of fellows and faculty were performed before intervention (May 2021), and again 9–10 months after implementation of ambulatory blocks (March–April 2022). Survey questions are incorporated in figures below and Table E6 (demographic data in Tables E4 and E5). Survey questions were generated by study leaders and reviewed by IM faculty outside of the study who have experience in medical education; several rounds of iterative feedback and revisions on survey questions were completed until consensus was achieved. Surveys were anonymous (Qualtrics), and results are reported in aggregate.

We conducted 1-hour focus groups of each ambulatory cohort 11–12 months after the implementation of ambulatory blocks (May–June 2022). Focus groups were conducted in person during ambulatory block education time to maximize participation. Participation was voluntary. Semistructured interviews were conducted using an interview guide (Table E2) that was developed to further explore survey responses, in alignment with an explanatory mixed-methods approach (13). Focus groups were voice recorded, professionally transcribed, and deidentified before release to the study group (Landmark Associates Inc.). Content analysis was performed in NVivo software using a grounded theory-based approach, a systematic method of qualitative analysis

that allows researchers to identify and define themes during the data collection process (14). All study authors independently reviewed interview transcripts to identify subthemes and form an initial code book consisting of themes, subthemes, definitions, and illustrative examples. Through an iterative process of coding, building consensus, and recoding, these codes, definitions, and applications were refined until final consensus on coding schema was achieved. Each transcript was independently coded using this final coding schema by at least two study investigators to ensure consistent application of codes.

Reflexivity

The research team consisted of a current PCCM fellow (K.A.M.), two PCCM faculty (J.D.P. and S.H.), and an IM faculty with expertise in qualitative research (K.A.G.). To minimize bias during focus group interviews, focus group questions were open ended and reviewed by K.A.G., who was not involved in the PCCM program. In addition, semistructured interviews were conducted by non-PCCM trainees who were not involved in implementation of ambulatory blocks. Fellows were invited to participate in member checking: all participants were e-mailed a draft of the results and invited to provide feedback. Ten participants responded, which resulted in no changes to our findings. Fellowship program leadership was not involved in data collection or analysis. Our analysis adhered to the Consolidated Criteria for Reporting Qualitative Research guidelines (Table E3) (15).

Statistics

Comparison of subspecialty clinic exposure was performed via one-way analysis of variance. For survey questions using a 5-point Likert scale, agreement was

defined as a response of “agree” or “strongly agree.” Comparative analysis of Likert scale survey questions appearing on both the pre- and postintervention surveys was performed using χ^2 or Fisher’s exact test, depending on sample size and response distribution. *P* values ≤ 0.05 were considered statistically significant. Statistical analysis was performed on Prism 9 software.

RESULTS

Feasibility and Subspecialty Exposure

Ambulatory blocks were implemented into all PCCM fellow schedules ($n = 18$) in the 2021–2022 academic year, with fellows rotating through four 2-week blocks. After the implementation of ambulatory blocks, fellows attended an average of 2.8 times more clinics and were exposed to 3.2 times the number of different pulmonary subspecialties than in preintervention years (Figure 2; $P < 0.01$).

Survey Results

The preintervention survey was completed by 15 of 19 fellows (78.9%) and 36 of 59 faculty (61.0%). The postintervention survey was completed by 14 of 18 fellows (77.8%) and 29 of 57 faculty (50.9%). Demographic data are included in Tables E4 and E5.

There was a significant increase in fellow satisfaction with all assessed domains of ambulatory training compared with preintervention (Figure 3; $P < 0.05$). Faculty also demonstrated increased satisfaction with fellow ambulatory education, access to subspecialty clinics, and diversity of subspecialty exposure ($P < 0.05$); however, there were no significant differences in other variables. In the postintervention survey, 100% of fellows (14 of 14) and 78.2% (18 of 23) of faculty agreed that the ambulatory block experience contributed positively to

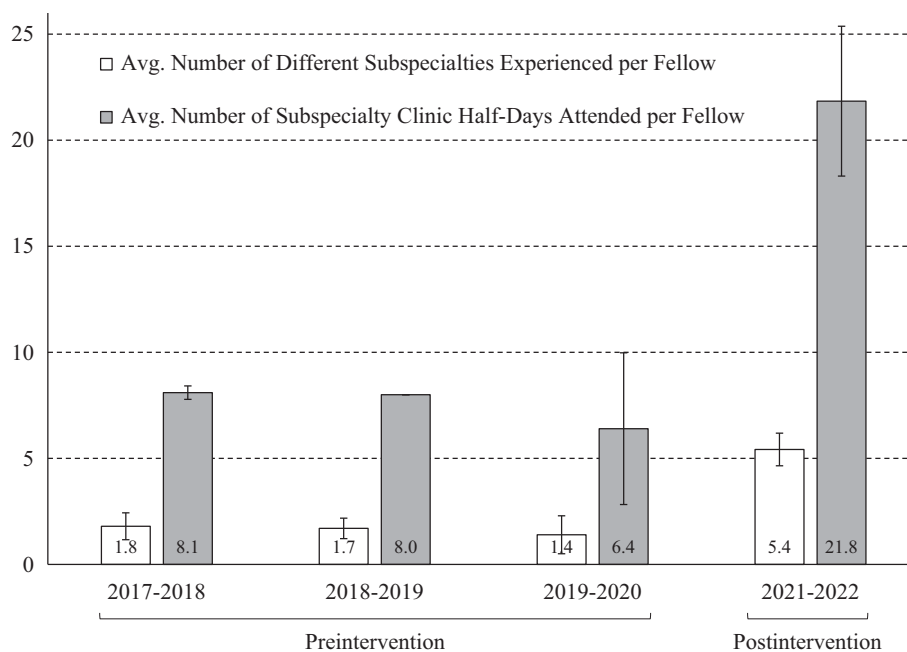


Figure 2. Amount and variety of fellow subspecialty clinic exposure before and after the implementation of ambulatory blocks. Average labeled at base of each bar; error bars represent standard deviation. The 2020–2021 academic year was excluded because of impacts of the coronavirus disease (COVID-19) pandemic.

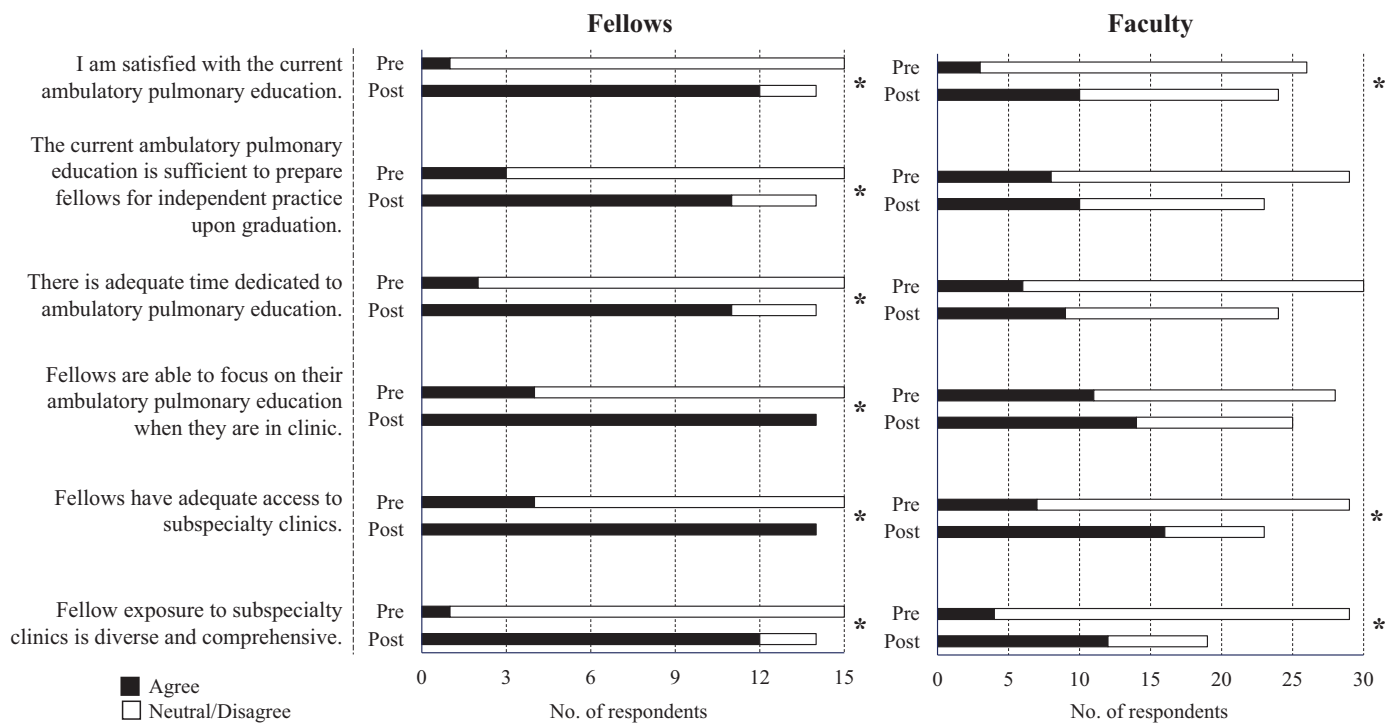


Figure 3. Fellow and faculty survey responses before and after implementation of ambulatory blocks. Survey questions used a 5-point Likert scale, with agreement defined as a response of “agree” or “strongly agree.” Comparative analysis was performed using χ^2 or Fisher’s exact test, depending on sample size and response distribution. * $P < 0.05$.

outpatient pulmonary education, and 85.7% (12 of 14) of fellows agreed that the ambulatory block clinic structure is an ideal ambulatory training model. Additional postintervention fellow and faculty survey data are included in Table E6.

There was no significant difference in fellow rating of continuity of care in either of their longitudinal clinics between the pre- and postintervention surveys (academic hospital clinic, $P = 0.36$; Veterans Affairs clinic, $P = 0.68$).

Fellow Focus Groups

All PCCM fellows ($n = 18$) participated in one of four focus group discussions, consisting of three to five participants. The average length of discussion in the four focus groups was approximately 44 minutes. Analysis yielded five major themes describing fellow perceptions of

the ambulatory block structure (Figure 4). Fellows also provided areas for growth, which were organized into a sixth theme. All themes and subthemes, with representative quotes, are summarized in Table 1.

Theme 1: Focused topical learning.

Fellows noted several ways in which the ambulatory block structure allowed for focused topical learning, defined as learning centered around a specific disease or cluster of similar disease entities belonging to the subspecialty theme to which individuals were assigned. Dedicated 2-week ambulatory blocks helped protect ambulatory education from competing responsibilities, such as inpatient service and research. Fellows believed they were able to participate and be present in the clinic without feeling a need to rush to the clinic from other obligations. Fellows also noted they had more time to

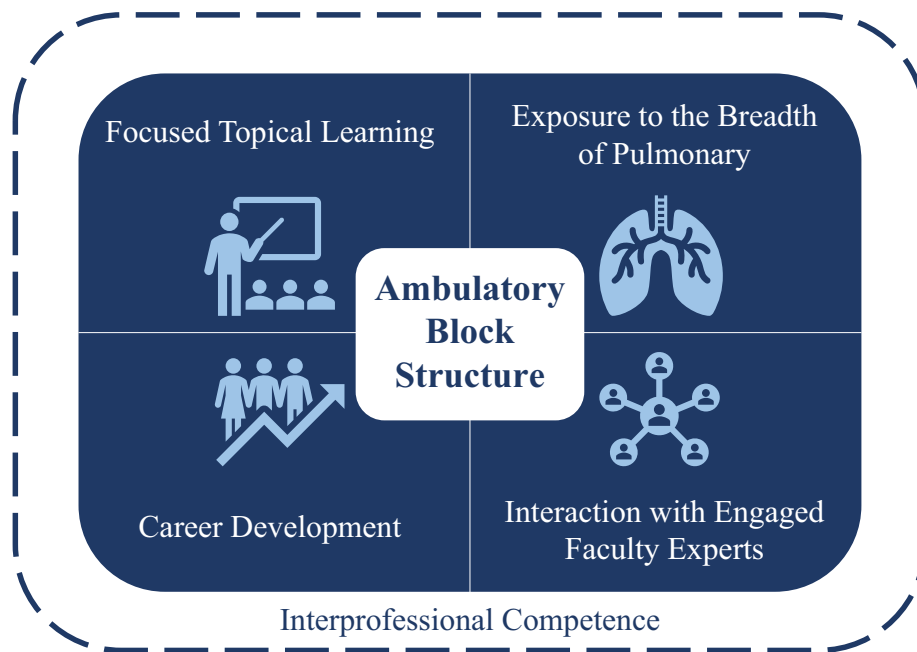


Figure 4. Conceptual model of the benefits of the ambulatory block structure. This conceptual model incorporates the five major themes elucidated from thematic analysis of fellow focus groups conducted after the implementation of ambulatory blocks. Reprinted by permission from Reference (12).

prepare for and learn from outpatient clinics. These deeper dives into patient charts improved fellow perception of preparedness for appointments. Lastly, integrating dedicated time for small group, interactive, mixed-year educational sessions improved fellows' sense of focus and engagement in their education. The small group atmosphere was believed to enhance learning by fostering accountability to prepare for teaching sessions and participate in discussions, and improving learner comfort to ask questions.

Fellows also noted that rotating in the same subspecialty clinic multiple times within a 2-week period, as a result of themed ambulatory blocks, allowed for reinforcement of learned material, helping to fortify new knowledge. Fellows also noted opportunities for deliberate practice of new skills unique to ambulatory medicine, and described opportunities to learn initiation and titration of medications with which they were not very familiar. They

appreciated the ability to practice these skills with direct supervision and feedback from subspecialty attendings. Fellows also expressed that deliberate, repeated practice with PFT interpretation allowed them to both cement foundational skills and explore nuances of the data exemplified in more complex test results.

Theme 2: Exposure to the breadth of pulmonary medicine. Fellows perceived the ambulatory block model standardized exposure to each of the pulmonary subspecialties. This structure facilitated exposure to a broader cast of clinical educators and content experts, and decreased the perceived “randomness” of subspecialty experiences. These structured times in subspecialty clinics were considered important opportunities for both career development and learning. In addition to improved access to subspecialty attendings, structured rotations through each of the pulmonary subspecialties exposed fellows to more

Table 1. Themes, subthemes, and representative quotes from thematic analysis of focus groups describing fellow impressions of the ambulatory block structure

Themes and Subthemes	Representative Quotes
Theme 1: Focused topical learning	
Separation of outpatient from competing responsibilities	<p>"I think that being able ... to really concentrate and dedicate time to [the] ambulatory experience and ambulatory education where you're not being pulled in multiple directions is ... really important."</p> <p>"There's no way you can be fully present at either, your ... ICU or your clinic if you are trying to run across town and see patients at an outpatient setting ... The schedule change allowed me to actually be present and participate in clinic, get something out of it."</p>
Dedicated time for preparing for and learning from outpatient encounters	<p>"I found that I can spend more time preparing for my patients and really doing the deep chart dive that I think is sometimes very helpful ... I think it helps with their care and my ability to care for them."</p> <p>"It actually allowed me, to, time to look up patients ahead of time and really get into the habit, so I thought the structure was much improved from kind of the sporadic clinics we had before."</p>
Creation of opportunities for small group learning	<p>"I think, in particular, the small group session has been really helpful because I think it's really easy to get lost or distracted in larger group settings ... I think that was really helpful to learn, like a much more conducive learning environment in a small group."</p>
Timely reinforcement of learned material	<p>"It allows you to kind of like have this theme of ... similar clinics at the same time ... We're seeing, for example ... four to six subspecialty clinics in these 2 weeks, kind of like whatever you learned that first week or in the first clinic ... kind of like reinforce that a couple of times. It helps you to do that, like cementing the knowledge."</p>
Deliberate practice of new skills unique to ambulatory medicine	<p>"I've been doing ILD clinic. And we don't see a ton of ILD in our fellows' clinic 'cause they get siphoned off to the subspecialist, so in the last 2 weeks I've seen more patients for whom [mycophenolate] is being prescribed than in my entire fellowship. And at the end of these 2 weeks I feel like I could prescribe [mycophenolate] ... Two weeks of consistent time I actually am finally comfortable because I've seen it, it's reiterated, and I'm doing it with a specialist."</p> <p>"PFT fellow for a week ... gives you a consistent chunk of time to not only think about, but also review, those studies with an attending and so you're actually in real time learning from your mistakes and then implementing those learning points immediately thereafter. And so it leads to much more permanent learning than ... might otherwise happen."</p>

Table 1. Continued.

Themes and Subthemes	Representative Quotes
Theme 2: Exposure to the breadth of pulmonary medicine	
Improved access to clinical experts in different disciplines	<p>“Without ambulatory block, we don’t really take advantage in any way of having talented subspecialists here. You might work with an attending whose expertise is PH ... or ILD and they’ll teach you a little bit about what they’re subspecialized in, but you don’t really get a sense of what they do in a given day without ... being with them in clinic.”</p> <p>“Over the 3 years of my fellowship, [the ambulatory block structure] has been the most positive experience for my education ... getting to work with attendings in their specialty clinics, which was not previously always available to us.”</p>
Exposure to the nuances of diagnosis and longitudinal management in subspecialty clinics	<p>“The patients that are ... generally referred to fellows’ clinic ... are ... very different than the patients who are directly referred to the subspecialty clinics. So, I feel like if I only had my fellows’ clinic, the breadth of patient pathology that I would see ... would be much, much, much smaller.”</p> <p>“I also feel like ... the mundane diagnoses, like COPD and asthma, are so much more complex and nuanced than I thought.”</p>
Enhanced fellow confidence in their pulmonary knowledge base	<p>“I think those of us who are going into subspecialty have a tendency to sort of focus in on that ... and lose the bigger picture of [how] pulmonary critical care fellows ... should sort of be trained as general practitioners ... I feel more confident going to clinic understanding a little bit more about pulmonary medicine more broadly.”</p> <p>“If you’re an independent outpatient pulmonologist, you’re gonna see that whole range of presentations come into your clinic. And so I think having been exposed to them and ... at least knowing where to start with an assessment or a workup is absolutely invaluable. And I feel so much better with [that] to embark on independent practice than I think I would have otherwise just doing continuity [clinics].”</p>
Theme 3: Career development	
Identification of clinical niches for future careers or solidifying confidence in career choice	<p>“The clinic exposures ... helped me figure out where I want to go with my career ... I think it helped me get onto a professional track earlier too.”</p>
1:1 time with faculty fostered mentorship	<p>“I think it’s not only clearly good for preparing us for practice, but it also helps identify mentors ... not just professional and research mentors, but also personal mentors ... as we’re all trying to figure out what we’re gonna do when we’re finally done with training.”</p>

Table 1. Continued.

Themes and Subthemes	Representative Quotes
Understanding the practicalities of navigating their own future ambulatory practice	<p>“Creating sort of mini-immersive experiences helps us better understand what the attending workflow is, which I think is beneficial for us when picking careers but also very helpful for looking at what you may want as an attending, like seeing how attendings work with scribing services and... how a pharmacist works in a clinic and... resources that we may want to look for in practices.”</p> <p>“That is not something that we’re used to... the weight of the work that exists here... consistently spending hours every night reviewing patients, going over things, calling people. I think that’s something that I wasn’t necessarily doing as much... on a consistent basis prior to this. I think that’s probably closer to the reality of outpatient medicine.”</p>
Theme 4: Interaction with engaged faculty experts	
Faculty engagement enhanced ambulatory learning	<p>“This has been an investment in our education... and I think that’s the crux of it and probably why there’s positive feedback so heavily toward this... a truly visible effort to, like, teach us and help us grow as pulmonologists.”</p> <p>“What I really, really appreciated was how many of the subspecialty attendings kind of bought into the curriculum and sort of helped develop their own curriculum to really make those subspecialty clinics incredibly productive. There was a lot of thought put into it. It was all very intentional.”</p>
Theme 5: Interprofessional competence	
Membership in a holistic care management team	<p>“I think what was really important for the block is that you get immersed in clinics. You get to know the support staff a lot more. Like I wouldn’t know the nurses at all if I didn’t have ambulatory block.”</p> <p>“I think... having dedicated time also and... at least being in the [clinic] a bunch, you get to know the staff and how to work with the staff... That helps you when you’re in outpatient medicine ‘cause you realize that you don’t have to do everything yourself... Here you actually got to know people and who does what.”</p>
Development of workflow efficiency	<p>“Versus half a day every week or every other week... you never find your rhythm... The last years before this I was constantly fumbling around trying to figure out where to find different orders, where to find things. Clinic was a lot more efficient for me this year, just from having that repetition.”</p>

Table 1. Continued.

Themes and Subthemes	Representative Quotes
Theme 6: Areas for growth	
Variable expectations from subspecialty attendings	"A universal ... who/what patients to see would be helpful. Like the expectation should be universal no matter what kind of clinic you're in."
Desired flexibility to pursue individual interests	"As much as I think it was really helpful to focus on certain subspecialties, there was not much flexibility in pursuing interests maybe outside of it ... allowing for a slight bit of tailoring toward career focus would be nice."

Definition of abbreviations: COPD = chronic obstructive pulmonary disease; ICU = intensive care unit; ILD = interstitial lung disease; PFT = pulmonary function test; PH = pulmonary hypertension.

complex or advanced disease than they typically encountered in their own longitudinal clinics, providing opportunities to learn nuanced diagnosis and management pearls. Lastly, fellows noted that these clinical experiences and learning opportunities were distinct from their other experiences as inpatient consultants or intensivists. Fellows expressed these enhanced clinical exposures improved their self-confidence to practice outpatient pulmonary medicine independently after graduation, regardless of career intent.

Theme 3: Career development. Fellows noted numerous ways in which the ambulatory block structure aided in career development and expressed appreciation that these experiences were being introduced earlier into their training. Those who had selected a future subspecialty focus expressed appreciation for the diversity of pulmonary medicine outside of their stated interest(s). Other fellows noted the ambulatory blocks helped to identify areas of clinical and academic interest. One-on-one exposure to attendings through the ambulatory block structure also helped fellows to identify mentors. Lastly, ambulatory blocks

helped fellows understand the practicalities of navigating their own future ambulatory practice as they experienced the pace of a full outpatient schedule and were able to observe attending practice habits.

Theme 4: Interaction with engaged faculty experts. Fellows perceived the faculty engagement in the ambulatory block structure as evidence of a strong commitment to their learning. The faculty engagement described by fellows took many forms. The repeated one-on-one contact with attendings was rated by fellows as highly educational. Fellows specifically appreciated having schedules far in advance to allow for planning with subspecialty attendings on which patients to see, allowing subspecialty attendings to bring relevant, high-yield teaching points to accompany these clinical experiences.

Theme 5: Interprofessional competence. Ambulatory blocks helped foster interprofessional competence. Fellows described enhanced relationships with nonphysician clinic staff (nurses, pharmacists, social workers, respiratory therapists), resulting in perceived improvements in team dynamics.

Increased familiarity with these team members and their roles in outpatient pulmonary care also improved fellow perception of their ability to incorporate collaborative approaches for clinical practice. In better understanding how to leverage team members, fellows also noted better efficiency in workflow within the clinic. The 2-week blocks of continuous clinic exposure also amplified fellow understanding and retention of clinic workflow and resources, including members of the multiprofessional team.

Theme 6: Areas for growth. When rotating through different subspecialty clinics, fellows described variable expectations from attendings regarding how to prepare for a half-day in subspecialty clinic, note writing, and how to manage results from shared patient encounters. Generally, this improved throughout the course of the year, as all participants (learners and instructors) adapted to the novel structure and responded to feedback. Separately, although many fellows appreciated exposure to the breadth of pulmonary medicine, upper-year fellows expressed a desire for flexibility in subspecialty exposure, allowing customization of rotations based on career or clinical interests.

DISCUSSION

Despite the well-described benefits of the $x + y$ model in IM residency programs, this is, to our knowledge, the first description of dedicated ambulatory blocks in an IM subspecialty fellowship program. Subspecialty fellowships often demonstrate variability in rotation structure and educational exposure (16, 17). For subspecialties that have a large presence in the outpatient setting, there have been calls for enhanced ambulatory training (18).

Didactics alone are likely insufficient to address this need; in a study involving implementation of a 1-year or 2-year pulmonary curriculum compared with a control group, >50% of program directors in the postintervention survey agreed that the amount of fellowship content dedicated to ambulatory pulmonology was insufficient (2). Based on our findings illustrated in Figure 4, ambulatory blocks address the above by increasing and standardizing PCCM fellow ambulatory exposure, and leveraging a combination of small-group discussions and experiential learning.

In this study, the ambulatory block structure successfully provided a significant increase in clinic and subspecialty exposure for PCCM fellows across all class years with minimal increase in clinical service time. The block model was associated with improved fellow perception of their ambulatory training in all areas assessed. The preintervention surveys were administered in May 2021 after the beginning of the COVID-19 pandemic, which negatively impacted ambulatory rotations (19). Although impacts of the COVID-19 pandemic may have negatively impacted preintervention survey results, it does not affect how well received the ambulatory block structure was in the postintervention fellow surveys. In addition, the preintervention survey did include 10 upper-year fellows who had experienced the prepandemic ambulatory training model.

Our PCCM faculty demonstrated similar dissatisfaction with ambulatory education in the preintervention survey. However, although there were some improvements in faculty impressions of fellow ambulatory training, our results did not support a change in attitudes in other areas assessed, including fellow

preparedness for independent practice. Although 78.3% of faculty agreed that fellow ambulatory pulmonary education improved with the implementation of ambulatory blocks, it is possible the ambulatory blocks highlighted the need for enhanced outpatient training and the novel structure remained insufficient to address this need. This is suggested by 70.8% of faculty agreeing in the postintervention survey that fellows would benefit from additional time in the outpatient setting. Thus, although faculty surveys indicate perceived improvement in fellow training with the implementation of ambulatory blocks, they also suggest outpatient education should be further enhanced.

The focus group findings offer insight into how the ambulatory block model might be conceptualized across PCCM fellowship programs, regardless of program size or resources. The separation of outpatient clinics from competing responsibilities helped fellows to better focus on their ambulatory training and increased the amount of time dedicated to learning from patient encounters. The importance of separating outpatient and inpatient training is supported by the success of the $x + y$ model in IM residency programs and is further corroborated in a survey of nephrology fellowship program directors, which suggested that overlapping clinic and inpatient responsibilities decreases the educational value of both (17). In addition, it has been suggested that one clinic teaching environment is insufficient for PCCM trainee exposure to the entirety of pulmonary pathology (20). Even in the absence of dedicated pulmonary subspecialty programs, rotation through attending clinics expands the breadth of pulmonary pathophysiology experienced by fellows, fosters mentorship,

educates fellows to the practicalities of navigating ambulatory practice, and allows for development of workflow efficiency. The ambulatory block model highlights the importance of consolidating clinical experiences, allowing for timely reinforcement of knowledge and deliberate practice of new skills. Lastly, regardless of clinical rotation structure, faculty engagement is perceived by fellows as a key to successful ambulatory training.

Limitations

There are several limitations to our study. First, one of the authors (K.A.M.) was a PCCM fellow at the time of data collection. We attempted to reduce response bias by making surveys anonymous, using neutral non-PCCM focus group moderators, informing participants about transcript deidentification, and granting participants the opportunity for member checking. We also attempted to reduce reflexivity by including a non-PCCM faculty member (K.A.G.), who played no role in the design and implementation of ambulatory blocks, in data acquisition and review. Our study was conducted at a single academic medical center with robust pulmonary subspecialty availability and an 18-month clinical requirement, limiting generalizability of our ambulatory block structure for smaller, nonacademic programs or those with a 24-month clinical requirement. Lastly, our ambulatory blocks incorporated many simultaneous changes, including consolidated outpatient time, faculty engagement, dedicated time for curricular teaching, and enhanced subspecialty exposure, making it difficult to identify the individual impacts of each intervention. Given our findings, we recommend a holistic approach to ambulatory training.

Conclusions

The ambulatory block structure exemplifies a model to enhance PCCM fellow training in outpatient pulmonary medicine by offering fellows structured clinical rotations and dedicated time for ambulatory teaching. To better understand its feasibility, generalizability, and benefits, the ambulatory block structure should be assessed in a multi-institutional study.

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