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Experiences and perceptions of clinical research participation at an academic medical center

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Abstract

Introduction: The purpose of this study was to capture experiences and explore perceptions of clinical faculty research participation at an academic medical center in the southeastern United States to allow leadership to train, recruit, and retain faculty members and increase research production by better understanding motivations for and barriers to academic research participation. A secondary objective was to gauge the impact of coronavirus disease 2019 (COVID-19) on clinical faculty and their research experiences.

Methods: This explanatory sequential mixed methods study was conducted in two phases. In Phase I, a quantitative questionnaire was distributed to 482 individuals across 18 of the academic medical center's 23 School of Medicine departments. Data were analyzed to determine if research experiences differed based on research participation, gender, tenure status, early career investigator status, and faculty rank. In Phase II, qualitative in-person interviews were conducted using a semi-structured interview guide.

Results: In total, 100 Phase I questionnaires were completed, 93 of which met study inclusion criteria. Sixteen Phase I participants opted-in to Phase II interviews, and 11 interviews were successfully completed. Results from Phases I and II indicated several important emerging themes, leading to the creation of three overarching study categories: barriers to clinical research, divide in research training and education, and the impact of COVID-19.

Discussion: Results indicated several important emerging themes related to clinical research experiences and perceptions at an academic medical center. These findings will provide leadership with important insight into the experiences and perceptions of clinical faculty and their research participation at the academic medical center, including their motivations for and barriers to research participation.

Take-home message: These findings offer valuable insights for leadership to enhance faculty recruitment, retention, and research productivity by addressing motivations and obstacles to research participation.

Keywords: Clinical Research Participation; clinical research barriers; COVID-19; explanatory sequential mixed methods study; organizational culture; physician-scientists; release time.

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INTRODUCTION

Physician-scientists are vital to the research mission of an academic medical center (AMC). However, institutional silos and cultural pressure to produce clinical revenue can potentially hinder their success. Physician-scientists provide the clinical expertise needed to promote the healthcare mission and patient care, the knowledge required for the education of future generations, and the dedication essential to advancing the field of biomedical science through innovation [1]. Their combination of rigorous scientific training and clinical skills aligns with both the mission of an AMC as well as the requirements of a faculty position [1,2]. In addition to the value physician-scientists provide through clinical care and training, successful physician-scientists generate funds for an AMC by receiving extramural research support from federal agencies, like the National Institutes of Health (NIH), non-profit organizations, pharmaceutical companies, and philanthropic giving. Nearly 83% of the NIH's $38.2 billion budget supports extramural research at academic institutions, including AMCs [3]. As the physician-scientist workforce ages, it will become increasingly important for AMCs to support and sustain these valued faculty members [1,4]. Studies have indicated that institutional barriers to this progress can lead to physician-scientists' disbelief in the viability of a research career, delays in career progression and success, and even burnout [5-7]. Alternatively, support of physician-scientists can generate a return on institutional investment and added revenues, institutional prestige, and advancement of the field of science leading to increased human health or understanding [8-11].

Statement of the problem

The number of active physician-scientists engaged in clinical research is declining nationally while the large number of reported barriers to participating in clinical research remains prominent [4,6,12]. As the physician-scientist workforce ages and the number of clinicians interested and willing to engage in a physician-scientist career dwindles, it is increasingly important to understand perceptions of research at an institutional level to adequately support physician-scientists [4]. Cultural silos or norms that make physician-scientists either unable or unwilling to participate in traditional investigative scholarship due to lack of resources or mentorship, administrative burden, or clinical obligations further perpetuate the underlying national problem. Understanding clinical faculty and physician-scientists' perceptions and experiences of research participation will allow AMCs to train, recruit, and retain physician-scientist faculty members and increase research production by better understanding their motivations for and barriers to academic research participation.

Purpose of the study

A mixed methods study was conducted between December 2020 and March 2021 to capture experiences and explore perceptions of clinical faculty and physician-scientist research participation. To do so, a quantitative questionnaire was distributed to physician-scientists in the School of Medicine at an AMC in the southeastern United States to analyze research experiences. Follow-up qualitative interviews were then conducted using a semi-structured interview guide to better understand physician-scientists' perceptions of research. A mixed methods approach provided a

better understanding of any perceived or actual barriers experienced and allowed for an in-depth follow-up to quantitative responses than a single approach [13]. Barriers and cultural pressures commonly reported at external institutions in the literature were used to create the tools for the study. These include clinical productivity requirements, extended training duration, financial concerns, excessive administrative responsibilities, difficulty obtaining extramural funding, lack of mentorship, and desire for a work-life balance [4,6,14]. In addition, qualitative and quantitative analysis placed an emphasis on determining if faculty believe that any pressures to bill a high number of RVUs, a culture that does not support research participation, or prioritization of clinical duties over research time exist.

Questions to be answered

1. What are the experiences of physician-scientists and clinical faculty who either participate in research or seek to participate in research at an AMC?
    a. How do experiences differ between physician-scientists and clinical faculty who participate in research and those who do not?
    b. Is there a difference in the research experience of physician-scientists and clinical faculty based on faculty rank?
    c. Is there a difference in the research experience between tenure and non-tenure physician-scientists and clinical faculty?
    d. Is there a difference in the research experience based on physician-scientist and clinical faculty gender?
    e. Is there a difference in the research experience between physician-scientists and clinical faculty who qualify as early career investigators and those who do not?
2. How do physician-scientists and clinical faculty perceive research at an AMC?

Due to the unexpected onset of COVID-19, a secondary objective was to gauge the impact that COVID-19 has had on physician-scientists and clinical faculty and their research experiences and perceptions. COVID-19 is caused by a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). This virus was first detected in late 2019 and spread rapidly across the globe throughout 2020 and 2021 causing a global pandemic [15].

Possible application of findings

The intended application of this mixed methods study is to provide hospital administrators, executive leadership, deans, chairs, division chiefs, department business administrators, faculty, and other staff members a better understanding of research perceptions and how these may impact physician-scientists and may prevent them from participating in the research mission. The study aimed to bolster research efforts through a greater understanding of physician-scientists' perceptions and by providing a summary of findings and potential solutions to leaders. The ultimate goal of the study was to assist physician-scientists by bringing potential issues to light, formulating solutions, and recommending them to leadership to facilitate the training, recruitment, and retention of physician-scientists. In addition, findings can serve to fill a gap in the literature, specifically as it pertains to AMCs in the southeastern United States, and comment on the ongoing debate of the future of physician-scientists and their role in academic medicine.

METHODS

Research design

A retrospective review of prior AMC surveys first took place. The purpose of this review was to investigate previous institutional research survey findings and formulate a basis for the mixed methods study. The review focused on uncovering previously reported barriers and trends in research administration at the AMC. While the aim of these prior surveys does not directly align with the research study, information on the support received from various internal divisions provided insight into any existing barriers. Data from faculty responses were grouped based on response type and extracted into a reportable format. These data were then analyzed to determine common themes. This information was used, along with information from the literature review, in the development of the research phases.

Next, permission was sought from each of the AMC's 23 School of Medicine department chairs. In total, 18 of the 23 departments granted approval and had faculty members who met inclusion criteria. A database of physician-scientists and clinical faculty within each participating department was then generated utilizing publicly available contact information found on the AMC's website.

Finally, an explanatory sequential mixed methods study was conducted to determine physician-scientist and clinical faculty perceptions toward research participation at the AMC. First, quantitative data were collected and analyzed. The findings were then utilized to plan the second qualitative phase, using results to identify participants and formulate interview questions. The quantitative questionnaire is referred to as Phase I and the qualitative personal interviews are referred to as Phase II throughout the analysis.

Setting, participants, and sampling methods

The study was conducted at an urban academic medical center located in the southeastern United States. Research participants consisted of clinical faculty and physician-scientists, defined as any clinical faculty member in the School of Medicine holding a D.O. or M.D. who either actively participates in or is interested in participating in research, or academic scholarship. These individuals were targeted directly in Phase I and Phase II to explore research participation perceptions. Clinical faculty members holding a D.O. or M.D. not engaged in research, but who responded to the questionnaire, were included in both Phase I and Phase II to capture barriers that prevent research participation entirely. In Phase I, the researcher contacted all clinical faculty from participating departments in the School of Medicine. Phase II interviews were conducted on an opt-in basis with no limit to the number of participants. Response rate and sample size data were calculated and reported.

Instrument development

The Phase I quantitative questionnaire was developed using Research Electronic Data Capture (REDCap). Questions aimed to determine physician-scientist experiences of clinical research participation. The questionnaire consisted of seven sections. The first section included an introduction to the study and provided background information as well as general instructions for completion. The second section included questions regarding general and de-identified demographic information. This included inclusion criteria, consisting of degree status and faculty appointment; faculty rank; gender; academic division; and career stage. This demographic information was utilized to ensure respondents meet physician-scientist inclusion criteria while also incorporating gender, academic division, and faculty rank trends and analysis. The next four sections consisted of 24 questions aimed at determining physician-scientist and clinical faculty perceptions and experiences related to research and career implications, clinical productivity, COVID-19, and the research mission. In addition to data gathered through the document review, barriers and cultural pressures commonly reported at external institutions were used in the Phase I questionnaire to determine if any barriers exist. In the existing literature, these include clinical productivity requirements, extended training duration, financial concerns, excessive administrative responsibilities, difficulty obtaining extramural funding, lack of mentorship, and desire for a work-life balance [4,6,14]. The final section allowed respondents to opt-in to Phase II by agreeing to be contacted at a later time. Prior to implementation, a pilot test was submitted for peer-review.

The Phase II qualitative interviews consisted of open-ended questions using a semi-structured interview guide. The interview guide was created using guidelines found in Qualitative Interview Design: A Practical Guide for Novice Investigators [16] and Research Design: Qualitative, Quantitative, and Mixed Methods Approaches [13]. Interview questions were created to expand on data generated from the survey review, literature review, and Phase I of the study. Prior to implementation, a pilot test was submitted for peer-review. Phase II participants were provided a gift card to a local coffee shop for their time.

Procedure and data collection

Phase I questionnaires were administered electronically through targeted emails to identified physician-scientists and clinical faculty utilizing a researcher-generated database. Responses were

automatically de-identified and assigned a numeric value in REDCap. Responses were exportable in Microsoft Excel and Statistical Package for Social Sciences (SPSS). Phase II interviews were conducted and recorded using Microsoft WebEx, due to the impact of COVID-19, and a pre-determined open-ended script. Transcriptions were completed using the Temi application and then manually checked for accuracy. Interviews took place over a three-week period at the participants' availability. Interview participants were assigned a numeric identifier, and, after transcription, the recordings were destroyed.

Data analysis

Data generated through REDCap in Phase I were stored on a password-protected device. Closed-ended questionnaire responses were analyzed, and represented in chart form, utilizing IBM SPSS software. Analysis focused on response prevalence and correlating faculty rank, tenure status, gender, division, and career stage with experiences in research participation.

To conduct the analysis, both an independent t-test and analysis of variance (ANOVA) method were utilized in addition to descriptive statistics detailing participant research experiences. Independent variables consisted of faculty rank, tenure status, gender, division, career stage, and research participation. Dependent variables consisted of 24 statements, based on themes expressed in the literature review, gauging research experiences of faculty members. These statements were coded numerically using a Likert Scale with the following options: strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree, strongly agree, and not applicable. An independent t-test was utilized for independent variables with categorical responses consisting of two options, such as tenure status or early career stage. Analysis of variance was utilized for independent variables with three or more possible responses to determine significance. A significance level of 0.05 was utilized to determine if there is a statistically significant difference between the response means.

Creswell and Creswell's [13] five-step data analysis process was utilized to analyze Phase II interviews resulting in the generation of several key themes. Data from Phase I and Phase II were analyzed separately to determine if any patterns or trends were present. Results from Phase II were then utilized to explain results from Phase I in greater detail.

Ethical aspects

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was approved by the University of Mississippi Medical Center's Institutional Review Board. Informed consent was obtained from all subjects involved in the study.

RESULTS

Phase I questionnaire

The Phase I questionnaire included inclusion criteria, consisting of degree status, followed by demographic information serving as the study's independent variables, consisting of research participation, faculty rank, tenure status, gender, and early career investigator status. 72% (n = 67) of participants reported being currently involved in research. Faculty rank was well represented with 35.5% of participants identifying as professors (n = 33), 24.7% identifying as associate professors (n = 23), and 39.8% identifying as assistant professors (n = 37). Less than half of all participants were on the tenure track (41.9%, n = 39). Sixty-two (66.7%) participants identified as male and 31 participants (33.3%) identified as female. Only 29 participants identified as early career investigators (31.2%). The next four sections of the questionnaire consisted of 24 questions aimed at determining physician-scientist and clinical faculty perceptions and experiences related to research and career implications, clinical productivity, COVID-19, and the research mission. These 24 questions, serving as the study's dependent variables, are outlined in Table 1.

Table 1. Phase I questionnaire questions.

Table 1: Phase I Questionnaire Questions
1. Research participation is important to my career goals
2. I believe research participation is important to fulfil my tenure requirements
3. I believe organizational culture supports research participation.
4. I believe I have adequate mentorship to achieve my career research goals.
5. I believe I received adequate research training in my medical education.
6. I believe research participation will positively impact my earning potential.
7. I feel I have an adequate amount of release time to participate in research.
8. I feel my protected research time is truly protected and I do not feel pressured to produce for the clinical or academic mission during it.
9. I feel I have an adequate amount of administrative support to create competitive grant or clinical trial applications.
10. I feel that research administration responsibilities are not overly burdensome.
11. I feel I can be clinically productive and participate in research.
12. I feel I can be clinically productive, participate in research, and have an adequate work/life balance
13. I feel it is feasible to pursue a successful research career in my department.
14. I believe it is feasible for a physician-scientist to be both a successful physician and a successful researcher at my organization.
15. I do not feel burnout from participating in or attempting to participate in research. For the purposes of this study, burnout refers to exhaustion of physical or emotional strength or motivation, usually as a result of prolonged stress or frustration as it relates to a physician-scientist's job duties (Shah et al., 2018).
16. COVID-19 has negatively impacted my ability to participate in research.
17. COVID-19 has delayed my ongoing research progress.
18. I believe the research mission has actively responded to COVID-19.
19. I believe the research mission supports physician-scientists at my organization.
20. I believe that research is prioritized at my organization.
21. I believe that research is prioritized in my department.
22. I believe there are barriers to research participation at my organization.
23. I believe the research mission is integrated with the academic mission at my organization.
24. I believe the research mission is integrated with the clinical mission at my organization.

Phase I questionnaire: Research participation

Statistical significance was found in the mean scores of research experiences in eight of the 24 independent variable questions between individuals who participated in research and those who did not. Result categories include research participation and career goals, tenure requirements, adequate release time, administrative support, clinical productivity, departmental support of research career, COVID-19 and research participation, and COVID-19 and research progress. These results are detailed in Table 2.

Table 2. Phase I research participation results.

Phase I Question: Dependent Variable	Significance	Participants Reporting Research Participation	Participants Reporting No Research Participation
Research participation and career goals	$p = 0.001$	M=4.16, SD=1.109	M=3.08, SD=1.412

Research participation and tenure requirements	$p < 0.001$	*M*=4.11, *SD*=1.208	*M*=2.44, *SD*=1.423
Research participation and release time	$p = 0.008$	*M*=2.82, *SD*=1.369	*M*=2.05, *SD*=1.046
Administrative support for competitive extramural funding applications	$p = 0.005$	*M*=2.88, *SD*=1.315	*M*=1.95, *SD*=1.129
Research participation and clinical productivity	$p = 0.007$	*M*=3.15, *SD*=1.351	*M*=2.59, *SD*=1.260
Departmental support of research career	$p = 0.011$	*M*=3.42, *SD*=1.316	*M*=2.63, *SD*=1.173
COVID-19 and research participation	$p = 0.005$	*M*=3.43, *SD*=1.403	*M*=2.35, *SD*=1.272
COVID-19 and ongoing research progress	$p = 0.02$	*M*=3.56, *SD*=1.353	*M*=2.29, *SD*=1.383

In all instances, participants engaged in research were more likely to feel research is important to their career, more likely to feel they receive adequate research support and incentives, and more likely to be negatively impacted by COVID-19 as it relates to research. These findings confirm the hypothesis that experiences differ between physician-scientists and clinical faculty who participate in research and those who do not across these eight categories. Statistical significance was not observed for the remaining 16 categories.

Phase I Questionnaire: Gender

Statistical significance was found in the mean scores of research experiences in one of the 24 independent variable questions based on gender. That statement was "I feel I have an adequate amount of administrative support to create competitive grant or clinical trial applications." A statistical significance of 0.023 was found, detailed in Table 3.

Table 3. Phase I gender results.

Phase I Question: Dependent Variable	Significance	Participants Identifying as Female	Participants Identifying as Male
Adequate amount of administrative support to create competitive grant or clinical trial applications	$p = 0.023$	*M*=2.16, *SD*=1.281	*M*=2.88, *SD*=1.199

This finding supports the hypothesis that research experiences differ based on gender and highlights the difference in administrative support available by gender. It could be suggested that participants identifying as male have more administrative support available to them to complete competitive grant or clinical trial applications. This finding is of particular interest as a majority of overall participants felt they did not have adequate administrative support to create competitive grant or clinical trial applications (51.8%).

Phase I questionnaire: Tenure

Statistical significance between the research experiences of clinical faculty and physician scientists based on tenure status was found in three of 24 independent variable questions. These instances of significance were related to research participation and career goals, tenure requirements, and clinical productivity. These results are detailed in Table 4.

Table 4. Phase I tenure results.

Phase I Question: Dependent Variable	Significance	Participants Reporting Tenure Track	Participants Reporting Non-Tenure Track
Research participation and career goals	$p < 0.001$	*M*=4.44, *SD*=0.968	*M*=3.56, *SD*=1.338
Research participation and tenure Requirements	$p < 0.001$	*M*=4.93, *SD*=1.084	*M*=2.94, *SD*=1.478
Research participation and clinical Productivity	$p = 0.023$	*M*=3.79, *SD*=1.196	*M*=3.22, *SD*=1.130

Findings indicate that tenured faculty are more likely to feel research participation is important to their career goals and tenure requirements while believing that they can successfully participate in research and maintain clinical productivity. In addition, this instance of significance supports the hypothesis that research experiences differ based on tenure status. Statistical significance was not observed for the remaining questions.

Phase I questionnaire: Early career investigators

For the purposes of the study, early career investigator status is defined as any faculty members who have completed their terminal research degree or end of post-graduate clinical training, whichever date is later, within the last 10 years [3]. Statistical significance between the research experiences of participants based on early career investigator status was found in 10 of the 24 independent variable questions. Results are provided in Table 5.

Table 5. Phase I early career investigator results.

Phase I Question: Dependent Variable	Significance	Participants Identifying as Early Career Investigators	Participants Not Identifying as Early Career Investigators
Adequate research training in medical education	$p = 0.005$	*M*=3.62, *SD*=1.208	*M*=2.77, *SD*=1.336
Research participation and release time	$p < 0.001$	*M*=3.43, *SD*=1.168	*M*=2.25, *SD*=1.244
Pressure to utilize release time toward clinical or academic mission	$p = 0.021$	*M*=3.05, *SD*=1.362	*M*=2.23, *SD*=1.306
Adequate administrative support	$p = 0.001$	*M*=3.37, *SD*=1.305	*M*=2.32, *SD*=1.208
Administrative responsibilities are not overly burdensome	$p = 0.003$	*M*=3.16, *SD*=1.313	*M*=2.26, *SD*=1.185
Research participation and clinical productivity	$p = 0.005$	*M*=3.93, *SD*=0.858	*M*=3.26, *SD*=1.264
Research participation and work/life balance	$p < 0.012$	*M*=3.54, *SD*=1.232	*M*=2.77, *SD*=1.334
Feasible to pursue research careen in home department	$p < 0.001$	*M*=3.93, *SD*=1.086	*M*=2.89, *SD*=1.297
Feasible to be a successful researcher and physician at my organization	$p = 0.014$	*M*=3.93, *SD*=1.1.052	*M*=3.22, *SD*=1.313
Research burnout	$p < 0.001$	*M*=3.82, *SD*=1.124	*M*=2.71, *SD*=1.364

In all instances of significance, participants identifying as early career investigators were more likely to have positive interactions with research participation and less likely to feel burnout from

research participation or the negative impact of work-life balance. These instances of significance support the hypothesis that research experiences differ based on early career investigator status and suggest that more senior clinical faculty and physician-scientists experience greater research barriers compared to their more junior peers.

Phase I questionnaire: Faculty rank

Finally, when analyzing how experiences differ between clinicians based on faculty rank, an ANOVA was conducted. There was a significant difference ($p = 0.012$) in the scores of question 18, "I believe the research mission has actively responded to COVID-19," for professor (M=4.07 SD=0.944), associate professor (M=3.57 SD=1.121), and assistant professor (M=3.27, SD=1.015). Overall, participants felt the research mission has responded actively to COVID-19, with 60.3% agreeing. While this instance of significance does provide insight into the fact that participants of higher faculty rank tend to more highly value the research response to COVID-19, this significance does not robustly support the hypothesis that research experiences differ based on faculty rank.

Phase II interview results

In total, 16 Phase I participants opted-in to Phase II interviews during the questionnaire period. Of the 16 initially indicating a willingness to participate, 11 interviews were successfully completed. Interviews were scheduled at the participants' availability and took place over a three-week period from February 10, 2021, to February 15, 2021. The length of interview times ranged from 12:12 to 39:37.

Qualitative analysis of clinical faculty perceptions revealed four themes: culture and resources, varied participation and support, divide in research training and education, and the impact of COVID-19. These themes indicate that there are resources available at the AMC; defined as individuals, core facilities, or offices who assist with or facilitate the research process; but a lack of uniform or available support; defined as material assistance such as release time, incentives, or requirements.

Participants believed the culture at the AMC prioritized clinical activity over research efforts, that there are not adequate incentives to promote clinical research participation, and that personal time had to be utilized to secure grant funding and therefore research release time. Individuals also felt that this use of personal time contributes to perceived research burnout. In addition, participants believed research participation and available support varies greatly by individual, department, and personal interest. Participants felt that there are adequate resources available institutionally but accessing these resources can be difficult for individuals who do not have prior knowledge of research systems, release time to dedicate to these efforts, or departmental support to assist.

There is also a cultural divide in the perceived importance of research participation that varies greatly across departments and individuals. Some individuals believe research training and education are critically important to guide and enhance clinical care while others believe it is a waste of time for trainees who will not pursue an academic career or be a part of a department that prioritizes research for residents.

Finally, participant perceptions varied regarding research participation during COVID-19. Individuals with active clinical projects prior to COVID-19 generally experienced delays and barriers to continuing research participation due to the pandemic. However, the AMC's response to COVID-19 provided others with impactful opportunities to participate in COVID-19-related research. Researchers in departments that were unable to provide care to patients during portions of the pandemic made use of this added administrative time to publish manuscripts and books that would have otherwise not been possible.

DISCUSSION

In seeking to determine how the Phase II qualitative data and the four associated emerging themes explain results from Phase I quantitative data in greater detail, the following result categories emerged: barriers to clinical research, research training and education, and the impact of COVID-19.

Barriers to clinical research

Just 53.7% of Phase I respondents believed culture supports research participation, 50.6% believed it is feasible to pursue a successful research career in their department, and 53.9% believed that it was feasible for a physician-scientist to be both a successful physician and a successful researcher at the AMC. Seven of 11 Phase II participants believed the clinical mission is seen as more valuable than the research mission and that the pressure they felt to be clinically productive limited their research capabilities. Furthermore, multiple participants indicated that the clinical mission incentives or requirements created a barrier to research participation. Studies have indicated that internal competition between mission areas at AMCs can be detrimental to both academic medicine and the research mission by promoting a culture in which faculty prioritize clinical billing over research and education [17, 18]. This siloing effect can potentially perpetuate a culture that prioritizes and even supports one mission area over another at an AMC [4,7-11].

Only 41.9% of Phase I participants were on the tenure track. Phase II responses indicated that four of 11 individuals believed promotion and tenure were a perceived incentive for research participation. However, as the number of participants on the tenure track represent a clear minority, tenure and promotion cannot be considered an adequate incentive for research participation. Therefore, without an individual or departmental focus on increasing the number of tenured faculty, and therefore incentives, clinical research participation may continually decline. Studies suggest that the number of physician-scientists, tenure requirements, and tenure promotion have all steadily decreased in the United States between 1977 and 2020 [12,19,20]. Studies also indicate that a sustained decrease in the physician-scientist workforce and tenure could negatively impact their critical and collective long-term contributions to an AMC's three-part mission [1,21].

Of the individuals currently participating in research, 71.6% reported receiving four hours or fewer per week of protected research time – including 53.7% reporting zero hours of protected research time. Furthermore, over half of respondents (53.4%) felt they did not have an adequate amount of release time to participate in research. In addition, the majority of participants (53.6%) also felt that their protected research time was not truly protected and that they may be pressured to produce for the clinical or academic mission areas during that time. Eight of 11 Phase II participants believed faculty needed to work extra hours or on nights and weekends to find time for research. Seven of 11 participants also indicated that protected time earned by receiving internal or external grants was an incentive to do research but participants who did express receiving release time indicated they only received it after securing grant funding – applications they reported creating on their personal time.

A majority of Phase I participants felt they did not have adequate administrative support to submit competitive grant applications, a statistic that disproportionately impacted participants identifying as women. Eight of 11 Phase II participants believed there are sufficient institutional resources available to support research participation while seven participants indicated that the availability of accessing these resources or additional departmental resources was dependent on each individual's department and availability of release time. These responses suggest that participants believe there are institutional resources available but not adequate amounts of administrative support to facilitate resource utilization or the completion of competitive extramural funding applications. In a study seeking to understand factors that contribute to institutional vitality and prevent physician-scientist burnout, researchers recommended ensuring that support services, such as research administrative support and professional development, are efficient and accessible to allow faculty to balance their activities and increase vitality [7].

Divide in research training and education

Just under half (49.5%) of all Phase I participants believed research training was a formal part of their medical education or residency program and only 38.5% of respondents felt they received adequate research training in their medical education. In addition, respondents did not feel strongly that they received adequate research mentorship. Five of 11 Phase II participants indicated that there should be mandatory and formal training in research for medical students. Furthermore, four of 11 believed research training is critically important as the research process and/or results generated by

research inform clinical knowledge and directly transfer to the clinical care of patients. However, three of 11 Phase II participants felt that research education should be tailored toward specific individuals rather than implemented for all students and an additional two participants believed student research participation was not necessary for all students. These findings detail a clear divide between the importance of research training and education among participants. Literature suggests that a scarcity of mentors and role models is a barrier to research participation in both the trainee and early career investigator stages [4]. In addition, studies suggest research innovations increase survival rates and improve patient outcomes [8,22].

Impact of COVID-19

Just under half (47.6%) of respondents believed COVID-19 negatively impacted their ability to participate in research and 53.3% of participants believed that COVID-19 has delayed their ongoing research progress. Phase II participants also documented a varied experience with research participation during COVID-19. Six of 11 participants who had active clinical research prior to COVID-19 experienced delays and barriers to continuing research participation due to the pandemic. However, the AMC's response to COVID-19 provided five of 11 participants with impactful opportunities to participate in COVID-19-related research. In addition, researchers in departments that were unable to see patients during parts of the pandemic made use of this added administrative time to publish manuscripts and books that would have otherwise not been possible. These findings suggest that COVID-19 had a detrimental impact on existing research efforts as well as available resources but provided new research opportunities and sparked research interest that would have otherwise been unavailable.

Summary

The two phases of this study and the retrospective review revealed important information about the experiences and perceptions of clinical research participation that can be used as a baseline for process improvement. Phase I findings revealed clinical research experiences as well as a statistical significance in the research experiences between clinical faculty and physician-scientists based on research participation, gender, tenure, and early career investigator status. Robust statistical significance was not observed based on faculty rank. Four themes emerged from follow-up Phase II interviews; AMC culture and resources, varied participation and support, divide in research training and education, and the impact of COVID-19. These responses provided additional context that shed light on Phase I findings. In seeking to determine how the Phase II qualitative data explain results from the Phase I quantitative questionnaire in greater detail, the following result categories emerged: barriers to clinical research, research training and education, and the impact of COVID-19. These result categories reflect participants' belief that a primary barrier to clinical research is a lack of adequate amounts of administrative support and release time to facilitate existing research resource utilization or the completion of competitive extramural funding applications. In addition, the categories highlight a clear divide between the importance of research training and education among participants. Finally, the categories represent participants' experiences with COVID-19 having a detrimental impact on existing research efforts as well as available resources but providing new opportunities for research and sparking research interest that would have otherwise been unavailable.

Study limitations

A major limitation of the study is the ongoing impact of COVID-19. The development of this global pandemic should be considered when interpreting study results. As discovered in Phase II interviews, COVID-19 impacted participant responses. Participants detailed the impact of COVID-19 on diminishing research resources and research participation, potentially skewing results. In addition, participants indicated that COVID-19 contributed to feelings of burnout that would otherwise not be experienced. As anticipated, COVID-19 also impacted the investigator's ability to conduct and schedule in-person interviews, causing multiple interviews to be canceled. For these reasons, the limitations caused by COVID-19 should be considered when reviewing study results.

A second study limitation related to the availability of participation. While 18 of the 23 School of Medicine departments provided the investigator with permission to solicit participation from faculty, seven departments did not participate. This was in part due to a lack of eligible faculty who met the inclusion criteria. However, several departments with applicable faculty did not elect to participate. In addition, targeted emails were provided to solicit participation based on publicly available faculty contact information on the AMC website. While 482 individuals were contacted, it was confirmed that this contact information, available on a department-by-department basis, was not always up to date. While the study did successfully capture responses from 16 departments and includes a 21% response rate, these limitations should also be considered when reviewing results.

CONCLUSIONS

The investigation sought to understand physician-scientists' perceptions and experiences of research participation at an AMC to allow leadership to train, recruit, and retain physician-scientist faculty members and increase research production by better understanding their motivations for and barriers to academic research participation. The results uncovered several important emerging result categories related to clinical research experiences and perceptions. These categories consisted of barriers to clinical research that include a culture that promotes the clinical mission over the research mission, a lack of research incentives or tenure requirements, inadequate release time, and lack of administrative support; a divide in the importance and availability of research training and education; and a divergent impact of COVID-19 on research participation and resources. These findings provide important insight into the experiences and perceptions of clinical faculty and their research participation. As such, an implementation and recommendation plan were established to disseminate and address results.

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