In recent decades, it has become increasingly difficult to attract medical trainees to the clinician-scientist pathway. Several measures have been undertaken to increase the number of clinician-scientists, but the anticipated results have not been obtained.\(^1\) In many ways, the clinician-scientist can be considered an “endangered species.”\(^2\) To promote this career path, there is increasing interest in some specialties in developing training programs that would encourage medical students to pursue research by increasing their exposure to research early in their training.\(^3\) Our study sought to examine cardiology fellows’ perceptions of the clinician-scientist career path, and their ideas on how to promote it.

**Methods**

 Expedited ethics approval was obtained from the Research Ethics Board of the Faculty of Medicine of McGill University.

 We surveyed cardiology fellows of three McGill University teaching hospitals (Jewish General Hospital, Montreal General Hospital, and Royal Victoria Hospital) in 2009. Fellows were contacted by email, and all 19 fellows contacted agreed to participate. Each fellow participated in an individual, semi-structured, face-to-face interview with one of the authors (O.D.). Each interview was 5–15 minutes in duration and consisted of 20–25 open- or closed-ended questions regarding the participant’s research experience and perceptions of the clinician-scientist pathway.

 Collected responses were anonymized, and qualitative responses to open-ended questions were grouped to reflect the most significant perceptions. Selected quotations are presented in tabular format to illustrate fellows’ experiences and perceptions of this career choice.

**Results**

 Of the 19 participating fellows, 16 were male. Participant ages ranged from 28 to 34 years, and they were in years 1–3 of fellowship training. Time elapsed since medical school graduation varied from 4 to 11 years. The fellows had a variety of academic backgrounds prior to their medical training: four did not have university degrees, having instead completed a year of preparatory medicine; 10 had bachelor’s degrees; three had master’s degrees; and two had doctoral degrees.

**Interest in Research and Pursuing Additional Research Training**

 Of the 19 fellows, seven were planning to pursue careers as clinician-scientists, eight were not, and four were unsure. Of the seven fellows who were interested in the clinician-scientist career path, five had identified their interest prior to medical school. Only two fellows wished to pursue research degrees during or after their fellowship.

**Perceived Barriers to Pursuing the Clinician-Scientist Pathway**

 Common themes emerged among the perceived barriers to pursing the clinician-scientist pathway (Table 1). The uncertainty of obtaining a position in an academic centre was a considerable source of anxiety, as were concerns about the difficulty in obtaining funding and a lack of sufficient protected time for research. These perceived issues were identified by both those interested in pursuing careers as a clinician-scientist as well as those not interested in this career path.

 When asked to name the single most important barrier to pursuing a career as a clinician-scientist, the most frequently
identified barriers were insufficient protected time, grants, and lack of interest (see Table 1). The former two factors were also perceived as important contributors to the low number of clinician-scientists. However, despite their concerns about protected time, most fellows believed their current schedules permitted some time for research.

Other barriers mentioned were the lack of mentors, the scarcity of resources and positions in academic centres, and the difficulty in finding good ideas for research projects. While mentorship was considered important, there were mixed feelings about the utility of implementing a formal mentorship program (Table 2). However, there was consensus that there was a need to improve the research infrastructure to support trainee research, with a particular need for methodological and statistical support.

The majority of the cardiology fellows believed a
Table 2. Main Issues Discussed during Semi-structured Interviews with 19 Cardiology Fellows on Their Interest in the Clinician-Scientist Pathway*

<table>
<thead>
<tr>
<th>Character traits required to be a successful clinician-scientist</th>
<th>Should there be a mentorship program?</th>
<th>Importance of mentorship</th>
<th>What modifications would have facilitated your ability to do research?</th>
<th>Is it harder to do research when you are a clinician?</th>
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<td>“You have to be able to think outside the box. You have to like asking questions and to generally want to answer those questions and be good at observing things that happen because research really comes down to asking a good question, and that’s the hardest part to do in research.” (6)</td>
<td>“I don’t know if you can assign a mentor, because I think the whole point of a mentor is somebody that you end up meeting … It’s like if you say, is it better to meet somebody at a friend’s place and start to date them solely, or just directly off an Internet single date site, you know? I think you’re both going to meet people, but what’s ultimately better? I think it’s the more natural way.” (5)</td>
<td>“I did research with two different people, both of whom were clinician-scientists, and it was at that point that I realized that’s not what I wanted to do. So, it was important to do it.” (9)</td>
<td>“I have a lot of contacts in epidemiology or just general research who have a good access to health; but as far as statistics, I think it’s where I had the least support.” (3)</td>
<td>“The amount of knowledge that you need to know is literally doubled as a pure researcher or a pure clinician, and we know very well that you cannot survive by being a half-clinician or a half-researcher.” (1)</td>
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<td>“You got to be patient; that’s going to be your cup of tea.” (7)</td>
<td>“It’s elective for some people who prefer to have that, and I think it’s a good idea. Outside of that, I don’t think it’s essential for everyone to have a mentor.” (10)</td>
<td>“It’s worth it because it’s the responsibility of both. One, of the staff to make sure that there are residents from whatever year who have had enough opportunities. And the other thing is that there is no excuse for the residents not to have done any research project.” (12)</td>
<td>“When it comes to research, everything should be improved. I think there isn’t enough focus on resident research. There are not a lot of ideas.” (12)</td>
<td>“When it comes down to clinical research, I would think [doing research] would be the same [in either clinician-scientists or pure scientists], if not maybe easier, for the clinician-scientist who has access to patients.” (5)</td>
</tr>
<tr>
<td>“I think persistence and being able to work hard with not much gratification for long periods of time and being passionate about what they’re doing.” (9)</td>
<td>“It just provides you with a source of information and human experience so … you can have an idea how the future is. I think what most people are afraid of is the unknown. So, if you have somebody who has been going through what you’re thinking of doing, it takes away the fear of the unknown.” (11)</td>
<td>“I think that it’s often something that is lacking. We have research supervisors that meet with us once in 3 years, and mine met with me 3 weeks before I graduated, so it didn’t particularly help at that time.” (14)</td>
<td>“Instead of having a month doing whatever, we could have a month where we’re expected to help the medical students in some capacity.” (13)</td>
<td>“Research is better to be exclusive to non-clinicians because you can’t mix both of them. You can’t balance your personal life with research projects to do.” (17)</td>
</tr>
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<td>“I think you have to be determined and ambitious and, for the clinical part, you have to make it relevant to your research.” (10)</td>
<td></td>
<td></td>
<td>“Often times, we are requested/required to do our statistical analysis and all the research minding ourselves. If we [had] more support staff, that would be helpful.” (14)</td>
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*These quotations were obtained during semi-structured interviews with participating fellows. Numbers in parentheses refer to the participant identification number.
discrepancy existed between the income of clinician-scientists and full-time clinicians. Many fellows considered this discrepancy to be an important contributor to the low number of clinician-scientists, and almost half deemed it important in their own decision-making process.

**Discussion**

Our study was designed to examine cardiology fellows’ perceptions of the clinician-scientist pathway, and their ideas on how to promote it. We found that few cardiology fellows intended to conduct research in their careers, and even fewer wished to pursue research degrees. When asked to name their personal reservations about pursuing a career as a clinician-scientist, the fellows’ three most-cited issues were the scarcity of grants, positions in academic centres, and protected time.

One barrier to a career as a clinician-scientist appears to be the ability to achieve an adequate work-life balance. A previous survey of established clinician-scientists reported that they believed that they must work evenings and weekends, often to the detriment of their family lives, in order to achieve a satisfactory income and maintain their clinical skills. Another study found that residents shared the belief that clinician-scientists must inevitably take time from their personal lives in order to succeed. In the present study, most fellows agreed that they could make time in their schedules for research; however, the accompanying increase in the difficulty of time-management remained a concern.

Interestingly, although a large majority of fellows believed that there exists a discrepancy between the income of a clinician-scientist and that of a full-time clinician, many found this discrepancy personally unimportant. At the same time, fellows believed that the low number of clinician-scientists could be partially attributed to their lower incomes. Some institutions have recently increased remuneration for research time; however, the remuneration for clinician-scientists remains less than that of full-time clinicians.

Many fellows suggested that mentorship and early exposure to research in the medical curriculum would be helpful. Thus, a structured program with role models early in medical training could help attract new talent to the clinician-scientist pathway. A mentor can be a tremendous resource in guiding a trainee through this pathway. A mentor can provide advice on applying for grants, negotiating protected research time, and, perhaps most importantly, balancing one’s personal life with a clinician-scientist career. The impact of mentorship can continue long after medical school or even fellowship. Most fellows viewed mentorship as a healthy way to learn from experienced clinician-scientists.

One fellow noted that, on occasion, a particular mentor may simply be incompatible with a particular student. Similarly, a previous study observed that even a mentor who is known to be competent and trustworthy will not necessarily satisfy the needs of a junior faculty member. In such cases, the mentee may need to assume much of the responsibility of finding other role models. A structured program that purposefully introduces the student to a number of mentors throughout his training would be a great aid in creating successful mentoring relationships.

Previous studies suggest that many medical students wish to teach and conduct research during their careers; however, the number of clinician-scientists is not increasing. As suggested by the surveyed fellows, medical schools should initiate greater and earlier exposure to research in order to encourage the students to pursue research. Teaching evidence-based medicine, for example, is of great value in increasing the number of clinician-scientists. Medical schools should also encourage and promote participation in research projects outside of the curriculum and the early establishment of mentor-mentee relationships.

The fellows’ perception of the clinician-scientist pathway is generally consistent with the reality described by established clinician-scientists. Both groups share a favourable opinion of mentorship and early exposure to research. They also share concerns about grants and protected time. However, established clinician-scientists are not concerned about the scarcity of academic positions for those interested in this career choice, which was one of the fellows’ most-cited reservations about embarking on a career as a clinician-scientist. If the fellows’ perception of scarcity is not correct, this is an important misconception to correct.

**Limitations**

Our study has a number of potential limitations. First, our results reflect only the perceptions of fellows in one specialty at a single Canadian university system. The generalizability of our results is therefore unclear. Second, our sample size was modest. For this reason, we qualitatively summarized our data instead of conducting formal statistical analyses. Nonetheless, this qualitative approach allowed for the identification of the major barriers and perceptions of fellows regarding this pathway.

**Conclusion**

The number of clinician-scientists has decreased substantially in the past decades. Our study was designed to discover how the clinician-scientist pathway is perceived by current cardiology fellows. Our interviews revealed that the perceived
scarcity of protected time, grants, and positions in academic centres were the main factors deterring cardiology fellows from pursuing careers as clinician-scientists. These perceptions must be addressed, particularly the perceived scarcity of academic positions, which may be inconsistent with the reality of the clinician-scientist pathway. Mentorship programs and early exposure to research were suggested as means of promoting the medical trainees to pursue careers as clinician-scientists.

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