Twelve tips to facilitate the transition between research and clinical training in physician scientist education [version 2]

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Abstract
This article was migrated. The article was marked as recommended.

Medical scientist trainees who take extended scholarly time in the middle of their training experience challenges during transitions in training. As they complete their dissertation and re-enter the clinical years of medical school, there is marked by a loss of clinical knowledge and skills over a prolonged hiatus from medicine and mismatched expectations. We have developed a re-entry pathway including guidance, support, and a course to provide clinical skills and knowledge training to align expectations, dispel myths, and allow advanced planning to meet milestones. Students reporting satisfaction with their transition from PhD to MD3 and 90% of students reported that the pathway was valuable. We provide 12 tips on how to improve the transition from research to clinical training. Here we demonstrate that a planned pathway for the transition back to medical training can improve the student-mentor experience, reduce anxiety, and create a more seamless and successful transition.

Keywords
physician scientist, md/phd, individual development plan, transition, clinical refresher
Introduction
Taking a gap between pre-clinical training and clinical training can be a stressful experience for medical students. Such gaps occur when students take time in between phases of their medical training to pursue research or other activities. MD-PhD programs are dual degree programs that offer training in both research and medicine (Dyrbye et al., 2004). They are intended for trainees who are seeking to become physician scientists (Nagasako, 2011; Roberts et al., 2012). Most such programs structure the education such that students begin their medical training, then take a hiatus to complete their laboratory research, defend their dissertation, and then re-enter the clinical training portion of their medical education. While various permutations of this track exist, for those who take a 3-5 year gap between pre-clinical and clinical training, there exist a number of challenges in re-entering clinical training (Smith, 2007; Whitcomb, 2007; Goldberg and Insel, 2013; School, 2013). We developed a Clinical Refresher Course in 2007 that re-acclimates students to clinical medicine through hands-on clinical exposures, extensive feedback on presentation skills, didactic pathophysiology case discussions, and peer input (Swartz and Lin, 2014).

The Clinical Refresher Course has been well received and students report feeling a much greater level of comfort in clinical skills and greater readiness to return to clinical training. Any student who plans to complete a dissertation and re-enter medical school in the upcoming academic year is required to take this course. Despite the success of the course, we have noted that students were often unsure when they would be ready to defend their dissertation in time to rejoin the medical school class. Misalignment of goals and expectations between students and mentors results in delays and disagreements. Students experienced confusion from unclear expectations and inadequate conversation between students and mentors. The disagreements uniformly related to the lack of a continuous dialogue between students, mentors and program leadership. Our goal was to create a dialogue with students and mentors to allow them to consider progress and plans for meeting milestones in an advanced and deliberate way; that would help engage students with mentors; and that would allow for advance planning of meetings with advisory committees and appropriate preparations for dissertation defense.

To this end, we have developed a re-entry pathway in which students in the two years prior to anticipated completion of their doctoral research, along with their mentors, attend a meeting in which the process and logistics of re-entering clinical clerkships (typically the third year of medical school) is described. The goal of this meeting is to clarify expectations and help students and mentors to put together a timeline that is agreeable to all members of the students’ advising network. Focused meetings provide important milestones for completion of the PhD, necessary dates for participation in the medical school promotions process, and key dates for the Clinical Refresher Course.

The goals of the re-entry transition are:

- To familiarize students and mentors with expectations for their final dissertation year and re-entry into the medical school curriculum.
- To encourage dialogue between students and mentors about realistic expectations for a timeline to complete the doctoral dissertation.
- To prevent unnecessarily lengthy dissertation timelines by identifying students who are struggling to meet milestones and encourage guidance from advisory committee members.
- To allow a forum for addressing questions from students and mentors regarding the process.

Tips
1. Create an Individual Development Plan
An Individual Development Plan is a structured tool used to develop a training roadmap to outline accomplishments and goals. It is a set of questions that allows trainees to reflect on their progress and to determine their expectations in the short-term and long term. Development of a structured Individual Development Plan (IDP) has been recommended by the National Institutes of Health (NIGMS, 2018) for all trainees (Byars-Winston et al., 2011; Fuhrmann et al., 2011; Vanderford et al., 2018). Our MD/PhD program implemented a mandatory IDP form to be completed annually by students and reviewed with a faculty advisor / mentor. The form is intended to be educational for trainees and informative for programmatic data collection. One question identifies whether the student anticipates dissertation defense in the upcoming year, allowing the program to identify those students who are not on track to graduate in a timely manner. For any student who has been in the laboratory for more than 4 years and who indicates “no” or “uncertain”, a meeting is arranged between the student, mentor, and MD/PhD leadership to identify the reason for the uncertainty. Both student and mentor are strongly encouraged to attend a re-entry meeting that is held in Fall of each academic year.
2. Coordinate conversation with students and mentors
A meeting held in Fall of the year or two prior to re-entry includes all students who have been in the laboratory for more than three years, their mentors, MD/PhD program leadership, and representatives from Medical School Student Affairs. An overview of the re-entry process is outlined which emphasizes the initiation of a conversation between student and mentor regarding graduation plan and feasibility. General expectations for completion of the PhD are reviewed, including completion of experiments, committee meetings, manuscript submission, dissertation writing, defense, deposition, and vacation planning. Representatives from Medical School Student Affairs speak about the lottery process and timeline for compliance training. Students and mentors are provided with an overview of the Clinical Refresher Course and the clearly stated expectation that their time will need to be protected for 1 half day a week between April through June. A question and answer sessions allows student and mentors to explore concerns or complaints. This process has encouraged the initiation of a dialogue between students and mentors and that can help resolve conflicts and allow for discussions on realistic timelines and expectations for graduation (Gunnarsson et al., 2013).

3. Check in regularly
A meeting is held in Winter prior to the planned re-entry for all the students who remain committed to re-entry in which they are provided with more detail about the lottery, third year clerkships, and compliance training. This meeting provides students with a clearer understanding of the milestones that must be met for the completion of the year prior to beginning clinical clerkships. Regular check ins are emphasized for each individual student and can be important in helping ensure that expectations and milestones are being met (Fuhrmann et al., 2011; Harrington, 2018).

4. Map out plans and expectations for the final graduate year
The student and mentor should discuss realistic expectations for the completion of the research, including, but not limited to experiments, publications, collaborations, committee meetings, thesis defense, revisions, and thesis submission (Feldon et al., 2010; Duke and Denicolo, 2017). It is important to set goals based on reasonable estimations of time frames and to reassess them on a regular basis.

5. Organize a refresher course
For students who have taken prolonged time off (more than 2 years) between phases of their clinical training, some formalized coursework is beneficial in helping them to refresh and strengthen clinical skills and reorient to the role of the third-year medical student. At our institution, students take a Clinical Refresher Course and complete their dissertation. Their time is protected in the laboratory for this clinical exposure and mentors understand the demands made on the students during this challenging time. The course involves one full day orientation followed by 1 half day per week, for 8 weeks. Other details have been previously described (Bills et al., 2013; Swartz and Lin, 2014).

6. Prioritize wellness. Plan vacation time
Students begin their MD3 year in the last week of June, just prior to the start of clerkships, with a week of intense clinical skills training. They enter clerkships in July. It is emphasized that they should plan ahead to be sure that they have time for a well-deserved vacation after the completion of their dissertation work and the Clinical Refresher Course. It is especially important for these students to prioritize wellness, as this is a critical time during training when multiple high-stakes responsibilities coincide and the unknown of the future phase of training is a source of anxiety (Lyndon et al., 2017a; Lyndon et al., 2017b; Ziegelstein, 2017; Erschens et al., 2018; Pathipati and Cassel, 2018). It is important for students to know that they are not alone and that they can and should take care of their physical and mental health.

7. Pair students with peer advisors
Student peer advisors are an invaluable resource (Moore-West et al., 1990; Andre et al., 2017). They have experienced the unique challenges posed to this cohort of students and can advise on the best study tools and approaches to take during their transition year. In our program, a panel of Student Advisors was identified based on a self-selected cohort of students in their final year of clinical training. They are instrumental in meeting with students before the return to clinical training, providing them with suggestions and developing electronic resources to help in clerkship and elective planning (Gunn et al., 2018).

8. Pair students with faculty advisors
Students are assigned to faculty advisors who understand the complexities of clinical clerkships. Ideally that advisor would also understand the unique challenges posed to MD/PhD students making the transition back to medical school in the midst of completing a dissertation. This advisor can help to allay anxieties, plan appropriately for any needed flexibility in the transition, and help reinforce important milestone planning (Aagaard, 2015; McLuckie et al., 2018).

9. Expose students to clinical clerkships so that they know what to expect
The unknown of clerkships can be daunting to students, particularly those who have taken a prolonged gap between preclinical and clinical training. Introducing a preview into clerkships and expectations can help to allay some of these
Dissertations are not meant to be uniform. The goal of the PhD is to develop a novel hypothesis and to obtain evidence to support your new ideas. Therefore, the timeline may not and should not conform to a preset time. Multiple efforts at the institutional level can help to reduce the time to graduation, e.g. implementing an IDP, requiring regular (annual or biannual) advisory committee meetings, overlapping required courses with medical school requirements. Despite these interventions, all students may not complete their doctoral training within the same time frame and, therefore, it is important to build in some flexibility with respect to the re-entry pathway. For example, research work might be continued during elective time built into a clerkship. Another possibility might be to defer a required clerkship to the fourth year, allowing the student to enter within the same academic year and graduate at the same as those classmates who entered at the start of the year.

PhD theses can vary in length and the associated work may be published broadly or in highly specialized journals. Regardless, it is important to celebrate the achievement of students as they transition from one phase of training to the next. The completion of a doctoral dissertation is a formidable accomplishment and each student’s achievements should be celebrated as they master a scientific discipline and transition into clinical training. This transition marks an important one in which they will experience a steep learning curve needing to acquire new skills while not using many of those they have spent the past several years cultivating. A celebration can mark this transition together with students and faculty and can boost morale and help students feel proud of their accomplishments.

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11. Celebrate achievement

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12. Reflect, evaluate processes, and modify as needed

Students are asked to evaluate their transition experience during an intersession week between the first and second blocks of clerkships in Fall following their re-entry. The survey asked students to evaluate their satisfaction with the transition experience including advising and curriculum in preparing them for MD3, and whether the planning meeting the prior year was valuable and/or informative. They rated their transition experience from PhD to MD3 (4.1, Likert 1-5. Among respondents, 90% reported that a planning meeting with mentors and students the year prior was valuable and informative. Responses to the Clinical Refresher Course included sentiments that it helped to ease the transition back to medical school, it was appropriately tailored, and it helped relieve anxiety associated with the transition. The responses to the question “What challenges do you face in MD3?” overwhelmingly pointed to a lack of preclinical knowledge. In response to the question: “What advantages do you have as an MD/PhD student in MD3?” students cited feeling more mature than their medical student colleagues and better able to navigate the unknown and having a greater comfort level with analysis of data and practice of evidence-based medicine.

Conclusions

Overall, the program has fundamentally changed the way that MD/PhD students approach the transition from PhD years to MD3 training. In the past, students reported great anxiety in approaching the transition, citing the unknown, a lack of preparedness, unclear expectation, and unwelcome discussions with their mentors. Through developing this timeline that forces conversations with mentors well in advance to help students anticipate milestones, students are reporting feeling more satisfied with their overall transition experience including advising and curriculum in preparing them for MD3 re-entry. We plan to continue this program to optimize student preparedness and student-mentor communication. This program improves dialogue regarding graduation planning and increases student satisfaction as they navigate the challenging transitions in the program.

Transitions in training are particularly challenging for MD/PhD students, who experience prolonged gaps in their training and need to recover large skill and knowledge sets. It will be of great interest to evaluate the long-term effectiveness of this pathway. Outcomes to consider would include student performance in their clerkships, whether the program improves their exam scores and residency match, and whether this pathway is effective at reducing time-to-degree.

One major concern is that students who take a prolonged gap between preclinical and clinical training will always experience a knowledge gap. While courses and intense review may help to close this gap, the reality is that some knowledge will not be recovered unless it is specifically needed. Students can be reassured that much of their clinical learning will build off of fundamentals that they can review as needed, and that an important skill moving forward will be to understand what knowledge needs to be reviewed in order to meet the clinical needs at hand.
Here we demonstrate that development of a pathway for re-entry of MD/PhD students from graduate training to medical training can improve the student and mentor experience and reduce the anxiety surrounding re-entry. Our observations indicate that encouragement of dialogue between students, mentors, and MD/PhD, medical and graduate school leadership can promote a more seamless transition from graduate training back to medical school training. The success of the program depends on open communication of all parties and the ability to identify concerns by milestone tracking and conflict resolution to ensure that problems are resolved in an expeditious fashion. The goal will be to continue to develop this pathway along with rigorous evaluative measures to determine the extent to which students and mentors benefit from these interventions.

**Take Home Messages**

- A re-entry pathway for students returning to clinical medicine from prolonged research should include guidance and clinical skills training
- Individual development plans help to align goals between students, mentors, and program leadership
- Multiple avenues of communication can improve outcomes and program satisfaction

**Notes On Contributors**

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**Declarations**

The author has declared that there are no conflicts of interest.

**Ethics Statement**

No identifying information was included in this report

**External Funding**

The authors wish to acknowledge the following funding sources 5T32GM007280 (MHB) and K08AI120806 (THS).

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Migrated Content

Version 2

Reviewer Report 18 July 2021

https://doi.org/10.21956/mep.20244.r31393

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Helena Filipe
Hospital of the Armed Forces/PL-EMGFA

This review has been migrated. The reviewer awarded 4 stars out of 5

Thank you for the opportunity to review this article. Despite the availability of programs offering a dual degree, the word “transitioning” shows the challenges to combine / merge both ends for the best outcomes of those interested. Usually rich of opportunities and new options, interface zones present the challenges of the uncertainty of the next one and the need to conclude the former to be able to fully embrace the future. Limbal zones can offer exciting growing opportunities, and guidance will be more than adequate at this stage. In an interesting manner, the Authors intertwine the tips in how best to leave one stage to embrace the next one with a particular focus on concluding the PhD phase. By reading the article, one could say that these hybrid programs, besides offering the twofold opportunity of learning to be PhD-MD professionals, the participants benefit of guidance on how to conclude their PhD program more effectively. This is particularly shown in tip 12. Probably the questionnaire that scaffolds this same tip could be worked in a different article by the Authors and create solid evidence. Besides highlighting the experience of the Authors, most of the tips show to be in accordance to the literature reviewed. This article will interest curriculum developers, scientists-mentors, clinical educators and in some extent future PhD-MDs.

Competing Interests: No conflicts of interest were disclosed.

Reviewer Report 13 May 2020

https://doi.org/10.21956/mep.20244.r31392

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Richard Hays  
James Cook University  

This review has been migrated. The reviewer awarded 3 stars out of 5  

This is a review of Version 2. I did not formally review Version 1 but have followed the discussion thread and agree with the comment that some concerns were not addressed. I think the topic is important and rather complicated. Students in dual pathway programs have told me that it is rather like being in two races at once. Both races are in a similar direction but there are different hurdles to jump, some unexpected. Research and professional clinical training are very different. Research lab work is even more different. It may be easier to step completely out of the clinical track and focus on research, but this may make more difficult the return to clinical training. The authors focus on MD/PhD programs but my experience at other levels suggests that similar issue prevail. I found the 12 steps interesting, although rather brief. Perhaps examples for some would help elaborate the issues and approaches to their resolution. I also wonder if two other issues could be emphasised more strongly. The first is a need at the start for clear, agreed objectives, timelines, milestones and opportunities for re-negotiation. Supervisors for both tracks should meet regularly with the student. This is there, but spread out over several points. The second is a need for a dispute resolution process if things do not work out as intended. Combined research/clinical pathway programs are not as popular as many expected, as they are very hard work, although some institutions have been successful. Understanding differences between more and less successful programs would be helpful. The paper should be of interest to all involved in combined pathway programs.  

**Competing Interests:** No conflicts of interest were disclosed.  

Reviewer Report 02 July 2019  

https://doi.org/10.21956/mep.20244.r31391  

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Ken Masters  
Sultan Qaboos University  

This review has been migrated. The reviewer awarded 3 stars out of 5  

This is a revised version of the paper, in which the authors have attempted to address the concerns raised about the original version.Unfortunately, the authors have not adequately addressed all of the important points. • In an effort to clarify the time line of events, the authors have made small changes, such as changing “September” to “Fall” and changing “January” to “Winter”; unfortunately, this does not really help
much. In my comments on the original version, I pointed out that the timing should give “some idea of a number of months before the start of the academic year, and or relationship between these timings and vacations/holidays, etc”. The reason was that “academic years begin at different times of the calendar year for different institutions and countries”. For instance, in many countries in the southern hemisphere, the academic year more closely resembles the calendar year, with the year starting in January/February/March. So, really, what we are looking for is something like “One month before the start of the academic year,” or “At the beginning of the academic year,” or “one month before re-entry,” etc. Unfortunately, only changing months to seasons does not address this problem. (In addition, there are places (e.g. “between April through June”) where no changes have been made. Although the reader might then be able to tie this to the later reference to the start of the clerkship in July, that is indicated only 4 tips later, so the original month designation is uncertain in the timeline context of other events). • Tip 12 had the problem that the percentages cited had no real context, and “numbers of students, demographics, dates, number of times the survey was run, etc. are required” (or, if the information were available elsewhere, then those sources should be cited). Unfortunately, in the revised version, while parts of Tip 12 have been re-written, this information has not been supplied nor cited. The Tip still speaks of “The survey” with no information about the survey, how it was run, or numbers of subjects, etc. (In their response to the comment on the previous version, the authors did indicate that they were emphasising the trend, but, in this revised version, they still indicate a figure of 90% of the students “reported that a planning meeting with mentors and students the year prior was valuable and informative” without giving a suitable context for this 90%). • Smaller issue: although the authors have placed the abbreviation IDP after the use of the term “Individual Development Plan”, it really should have been done after the first instance of the use of the term (in line 1 of Tip 1). So, although there have been some changes to the paper, unfortunately, the revision still suffers from the main problems of the first version: an unclear timeline, and uncontextualised statistics.

**Competing Interests:** No conflicts of interest were disclosed.
The paper gives tips on how to facilitate the transition between research and clinical training in physician scientist education; this problem occurs when students divert from their clinical training into academic work, and then return to their clinical training. The authors have grounded the introduction to their paper well in the literature, and then draw their advice based upon the Clinical Refresher Course that they have developed as a “re-entry pathway”. All the of tips are well-grounded in both experience and literature. The problem is that the tips are based so heavily on a single course at a single institution, and the paper seems to waver between a report of an individual course survey and a generalisation of the experience into advice, but the generalisation is not broad enough: • Some of the ideas expressed are directly related to a narrow context, and should be generalised more. For example, “A meeting held in September of the year or two prior to re-entry” and “A meeting is held in January by Student Affairs” (and similar references elsewhere) make sense only if one knows exactly when the academic year begins. As academic years begin at different times of the calendar year for different institutions and countries, it would be better if the authors gave some idea of a number of months before the start of the academic year, and or relationship between these timings and vacations/holidays, etc. • Similarly, “frontloading” is not a universally common educational term, and should be explained. • Tip 12 introduces statistics from a survey of the course. For these statistics to have validity, the authors really do need to supply more information. I am not suggesting a full-blown research report, but numbers of students, demographics, dates, number of times the survey was run, etc. are required. Either that, or, if the evaluation has been published elsewhere, then it is necessary to cite it. Otherwise, there are really just vague numbers and percentages. • The conclusion appears to repeat these statistics (although the phrasing of the surrounding text is a little different, requiring the reader to refer again to Tip 12 to confirm that these are same statistics.) • In fact, the conclusion appears to be more fitting to the conclusion of a research paper dealing with an evaluation of a course; it is almost as if the authors originally wrote it as an evaluation of a course, and then converted it into a 12-tips paper. I'm not sure if that is the case, but that is the impression that is given. So, I would recommend that the authors re-look at their conclusion, and focus on it as a conclusion to a series of tips. Small issues: • The abbreviation IDP should be inserted in brackets immediately after the term Individual Development Plan is used. Overall, the paper has the kernel of a useful solution to a (albeit not common) problem, but the authors need to ensure that they generalise their advice far more and supply required details behind their statistics in order for it to be of value to all other readers.

**Competing Interests:** No conflicts of interest were disclosed.