Differing motivations and requirements in PhD student cohorts: A case study

Ryan Naylor, Sumone Chakravarti and Chi Baik
University of Melbourne, Australia

The PhD student experience is an increasingly important area of education research in Australia and internationally. Although many factors supporting the PhD experience have been identified, there has been a tendency towards examining the issue through a cohort-wide lens, in which the nuances of experience of smaller groups and individuals may be lost. This paper seeks to illustrate this issue using a case study from an Australian institution. Here, we use thematic analysis of focus group interviews to examine the experiences and expectations of two distinct cohorts of PhD students (one from science backgrounds and one from clinical backgrounds) studying in the same discipline. This qualitative study shows that while students from clinical backgrounds are similar in many of their reported challenges and needs for support, there are some important differences, particularly with respect to their motivations for undertaking a PhD, their technical skills and opportunities for academic development. These findings demonstrate opportunities for university leaders and academic developers to better support clinical students in their PhDs, and provide a case study illustrating the value of more detailed cohort analyses to support the PhD experience for an increasingly large and diverse population.

Introduction

In recent years, there has been a substantial increase in the number of students seeking to enrol in graduate study, and increasing concerns about the composition and durability of the academic workforce that PhD graduates will go on to work in (Edwards, Bexley & Richardson, 2011; Edwards, Radloff & Coates, 2009; McAlpine & Norton, 2006). The number of PhD students in Australia, for example, increased by over 25% in the 5 years between 2009 and 2014, compared to an increase of 22% among all postgraduate students and 20% among all undergraduates (Department of Education and Training 2016). Undertaking a PhD involves a substantial investment of time, energy and resources on behalf of the student, supervisor, institution and, through government funding, society at large. These factors have led to considerable research into the PhD student experience and, particularly, the relationship between motivations and the student experience on one hand, and attrition on the other. However, these studies often examine the issue through a broad or cohort-wide lens, seeking to identify factors that apply as universally as possible to PhD students (e.g. Tinto et al., 1994, Harman, 2002) and, in doing so, the nuances of experience that affect smaller groups and individuals can be lost and findings over-generalised. This paper seeks to examine the experiences and expectations of two distinct cohorts of PhD students studying in the same discipline and at the same research-intensive university as a case study to illustrate this issue in educational research.

Although the authors acknowledge there is variation from the ideal, previous research (Edwards et al., 2011) has gone some way towards identifying a "typical" science PhD student in Australia. A large proportion (43.3%) of PhD students in the sciences make the

transition to a PhD directly from undergraduate studies. Those that do not enrol in a PhD immediately following graduation were typically in full-time employment directly related to their undergraduate studies, for example working as a research assistant, before undertaking a PhD. These students are typically aged 25 to 29 years old. Approximately 60% of PhD students intend to go on to a research career — a figure that has not changed in the last decade (Edwards et al., 2011; Harman, 2002). PhD students tend to report feeling positive about the support they receive from their supervisors, their peers and their institutions (Edwards et al., 2011; McAlpine & Norton, 2006).

This conception of a typical PhD student is important because there is a minority of students, particularly in the biomedical fields, that come from a clinical rather than a science background. These students have entry-to-practice degrees in medicine, nursing and allied health disciplines rather than science, typically with several years of professional experience (and are therefore several years older than science students), and are often on a considerably higher income than those on a PhD scholarship. Typically, as in this case study, approximately a third of the total number of oncology PhD students may come from a clinical background.

These differences are of concern in the retention and success of PhD students from clinical backgrounds, as many of these attributes have been identified as risk factors for attrition. For example, the likelihood of successful completion has been shown to be higher for those students who begin their PhDs earlier, such as in their twenties, than those who enter at later ages. Moreover completion rates decline as the age at inception increases (Martin, Maclachlan & Karmel, 2001; Wamala, Oonyu & Ocaya, 2011). This may be due to increased financial and personal responsibilities as students get older, making it more difficult to establish an appropriate work-life balance (Martin et al., 2001). Similarly, mature aged students have been shown to be less likely to participate in postgraduate student societies and other peer support activities, which may reduce their sense of belonging and increase their likelihood of attrition (Gardner, 2009; Govendir, Ginns, Symons & Tammen, 2009; Humphrey & Simpson, 2012; Kehrhahn, Sheckley & Travers, 2000). Little research specifically into the PhD experience of students from a clinical background has been reported, so it is difficult to hypothesise whether these factors are as significant for clinical PhD students as they are for the more widely studied "mainstream" cohort.

These observations led us to pose several questions. Are students from clinical backgrounds substantially different in their expectations and PhD experiences to science students or what is reported in the literature? Are their needs different in any meaningful ways? We therefore examined the qualitative experience of students from both science and clinical backgrounds in order to compare their motivations for enrolling in a PhD, and to determine whether their experiences, challenges and requirements for support differed from those of 'mainstream' science students.

Methods

Participants

Participants were recruited for focus-group interviews via emails sent to PhD researchers undertaking research projects in oncology and enrolled at a research-intensive Australian university. Respondents were asked to specify if they had an entry-to-practice degree (indicating that they had a clinical background) or whether they had a science background. Due to the organisational structure of oncology research at the university, these students were all based in off-campus research institutions and affiliated hospitals. The study had ethics approval from the researchers' home university.

Fourteen PhD researchers with a clinical background expressed interest in participating. This represented approximately 20% of the total number of oncology PhD students from clinical backgrounds enrolled at the university of interest. A similar number of those with a science background were also recruited to provide a comparison cohort. Responses from these students were expected to be similar to those reported in the literature. The 15 students with a science background that were recruited represented 13% of that population. The 29 participants therefore represent approximately 15% of the total number of PhD researchers undertaking off-campus oncology research at the university of interest.

Data collection and analysis

Focus group interviews were used for this study as they have a number of advantages over individual interviews (Hess, 1968; Vaughn, Schumm & Sinagub, 1996). These include synergism, when a wider bank of data emerge through group interaction; an increased sense of security, encouraging more candid responses; and increased spontaneity and genuineness in responses because participants are not required to individually answer every question (Barbour, 2005; Halcomb, Gholizadeh, DiGiacomo, Phillips & Davidson, 2007). Comments from one participant may also initiate comments from another, leading to a richer data set (Vaughn et al., 1996). However, due to the difficulties of scheduling focus-group interviews, particularly for clinical students, some participants underwent individual interviews.

Participants completed a consent form and demographic questionnaire. They were informed that the interviews were confidential but would be recorded to aid future analysis, and asked not to disclose content discussed by other candidates. Focus group interviews were of 30 to 60 minutes in duration, depending on the number of participants. Individual interviews were approximately 30 minutes in duration. Eight focus group interviews (typically with three participants) and five individual interviews were conducted.

Interviews used a semi-structured format (Figure 1). The interview schedule was pilot-tested with a group of 6 participants prior to general recruitment of the formal study's 29 participants. Interviews were digitally recorded and transcribed to facilitate coding. Thematic analysis Was used to identify major themes within the interview data. Two

researchers independently analysed each transcript for themes, theme prevalence and illustrative quotes, which were then combined into a single dataset.

What did you expect your PhD experience to be like before you started?
Tell me about your PhD experience so far. Has it matched your expectations?
What has been the most challenging or difficult aspect of undertaking a PhD?
What has been particularly useful or helpful in supporting your PhD studies or experience?
Have you participated in any programs or activities that have helped or supported your PhD studies?
 If yes, please describe
 If no, what were your reasons for not participating?
What types of support would be most useful in helping you complete your PhD?
What kinds of programs/activities would you most likely participate in?

Figure 1: Format for semi-structured interviews

Findings

Demographics

Clear demographic differences were observed between the 14 participants who came from a clinical background and the 15 from a science background. As expected, clinical students were older, and had completed their undergraduate studies, on average, 4 years earlier (Table 1). The average age of participants from a science background was approximately 27, which was consistent with previous research (Edwards et al., 2011). One student from a science background, and 4 from clinical backgrounds, reported having childcare or family responsibilities. Three science students and one clinical student spoke English as an additional language.

Table 1: Demographic and enrolment characteristics of participants

Cohort background	n	Age group				Undergraduate completion (median and mode)	Number of years of enrolment in PhD			
		23-27	28-32	33-37	38+		1	2	3	4
Science	15	7	6	1	1	2008	2	2	5	4
Clinical	14	0	5	9	0	2004	5	4	5	0

All participants, except one clinical student, were enrolled on a full time basis, and reported spending an average of 50 hours per week on their PhDs (median 50 hours). The maximum reported estimate was 70 hours per week for science students and 80 for clinical students; the minimum was 35 for science students and 30 for clinical students. The part time student also reported spending 50 hours per week on their PhD. Participants from a science background were typically more advanced in their PhDs than participants from clinical backgrounds (Table 1).

Two science students undertook paid work outside their PhDs (as laboratory demonstrators in undergraduate classes, for an average 5 hours per week). In contrast, 12 clinical students undertook paid clinical shifts, for an average of 8.2 ± 6.6 hours per week (median 6 hours per week; maximum 25 hours per week).

These differences aside, the two groups were largely similar in the broad features of their PhD enrolment and consistent with previous studies (e.g. Edwards et al., 2011), which suggests that any differences found in their responses to interview questions were likely to be due to their backgrounds as clinicians or scientists, rather than differences in the nature of their enrolment or demography.

Major themes in the data

Research questions focused on four main areas: expectations prior to undertaking a PhD; experiences during the PhD; specific challenges faced; and major sources of support (whether experienced or required). The major themes uncovered cut across all four areas. Participants raised their current experiences and challenges while discussing their expectations, for example, and frequently referred to their expectations (e.g. around workload and financial constraints) while discussing challenges and support programs. Participants' daily experiences of the PhD was often subsumed within a more detailed discussion of expectations met or unmet and challenges and supports experiences. For that reason, the findings presented here are therefore grouped into these three areas, with specific themes identified below each heading. The final section, focusing on clinical students' challenges in lab-based work is separated out from other challenges identified because of its importance and specificity to the clinical students.

Expectations and motivations for undertaking a PhD

Although both science and clinical students had similar expectations for the PhD, there were notable differences in the motivations for undertaking a PhD for clinical students. These students expressed clearer career-building aspirations than was seen among the science students.

The most commonly discussed theme regarding initial expectations for their PhDs (by approximately a third of participants from both science and clinical backgrounds) was that the PhD would be "challenging" or "frustrating". Three further participants expected it to be "intense", which is perhaps a more positive rendering of the same expectation. Only one participant thought it would be easy. In terms of their initial expectations, students from the two cohorts did not differ substantially from each other.

Common themes in both cohorts regarding students' reasons for undertaking a PhD were the desire to make a difference (which was consistently followed by comments about having to moderate those expectations for more modest outcomes) and a desire for increased autonomy and personal development.

> The reason I did [a PhD was] because I was a research assistant and as much as I loved being at the bench I was frustrated with the lack of control and power. (Science background 1)

A third of students with a clinical background also reported being motivated by an interest in research, and expressing a desire for a better understanding of fundamental science (both of which were similar to the motivations for science students). However, of the 14 clinicians, 11 mentioned increasing their future employability as a major reason for undertaking a PhD. While some of the students with a science background alluded to needing a PhD to improve future career prospects, this response was not as common as it was among clinical students, nor was it as clearly (or pragmatically) expressed.

> For me, without doing a PhD my career progression was probably limited beyond what I was doing already. So that was part of it for me, to progress through more senior positions, perhaps in the academic setting. (Clinical background 9)

Additionally, 4 students sought a break from their clinical practice.

> One of the difficulties, I think, about being an oncologist is… telling patients that there's no other options for them, or we don't really understand why X has happened to you, and I think if you don't spend some of your life trying to address those big fundamental questions in cancer, it's quite frustrating… [E]verybody who sees me says, "you look so much more relaxed than normal!" because you don't have the constant pressure and stress and difficulty of telling people difficult things for most of the day, every day. (Clinical background 1)

This was potentially a source of conflict between the two groups of students.

> I had a disagreement with her in one of the labs because she'd said that doing a PhD or an MD was like a holiday for her. It wasn't serious. It was a break from her career. We got really upset because this is our career. (Science background 4; different focus group to previous quote)

Interestingly, a third of the clinicians talked about the importance of mentors in convincing them to undertake a PhD when opportunities presented. This guidance was not reported by students from a science background. It is feasible that this may be because many science students had experienced a research-intensive environment as a research assistant or Honours student prior to undertaking a PhD; for these students, there may have been a clearer pathway or expectation towards undertaking a PhD.

Peers and supervisors are important sources of support for both groups

Two thirds of students from both backgrounds identified other members of the research group, including other PhD students, research assistants, and junior post docs (sometimes from outside their immediate lab group), as the chief means of support during a PhD, both in terms of research support and broader social support or friendship.

> Not your supervisors but either people a year above in their PhD or people that have just finished, so before they have had a couple of years' experience in a post-doc and they've forgotten what it's like, they're by far the best. (Science background 1)

> Right now I've got two RAs [research assistants] that are helping me… and obviously they are also free with their knowledge of the field, and from my point of view it's always good to have a discussion of ideas with people who are experienced. (Clinical background 7)

Half of the cohort identified their supervisor as an important means of support, although responses were sometimes more equivocal. This was similar for students from a science background.

> My supervisor helps to an extent, but he does expect me to know certain things already and perhaps overestimates because he's used to dealing with other scientists. (Clinical background 7)

> You can have stuff that enhances your experience, but if your relationship with your supervisor is no good then that overrides everything. (Science background 13)

Furthermore, opportunities for formal and informal mentoring from successful academics, whether they were a student's supervisor or not, were highly regarded.

Friends and family were also reported as a key source of support, particularly for students from clinical backgrounds. Student societies were mentioned as an important means of support by some science students.

> It's very useful to have that kind of interaction, because people can vent whatever is going on during the week to themselves and others over a beer, and they share their positive experiences as well… So that's a very useful support. (Science background 7)

This was not the case for clinical students. A lack of "common ground" was identified as a possible reason for this difference.

> The student committee's background are predominantly science students and I think they're good people, no doubt, but they probably don't have a good understanding of what people from a clinical background need. (Clinical background 3)

> Its role from what I can see is primarily social… That's probably fine. But I do think then that the things that are organised and events organised aren't probably very relevant to people in my social and life circumstance. (Clinical background 1)

Science students reported that student-run academic development programs, such as journal clubs, student retreats and academic skills workshops were useful. Clinical students commented that they were either not aware of them, or chose not to make use of them ("I delete the [student society] emails as soon as they come" — Clinical background 12). Both groups of students concurred this was possibly due differences in outlook or stage of life underpinned by differing career trajectories of the two groups (one clinician

referred to science students as "kids"). One student suggested a clinical-student retreat or clinical lab hub would be valuable to "present to each other what our projects are so that we can actually develop them with a really clinical mindset."

Challenges experienced during the PhD

Students from both groups were largely consistent in the challenges they experienced during their PhDs. Motivation, stress, and lack of adequate supervision were seen as major challenges. However, clinical students reported feeling less financial stress than science students.

A large number of students from both cohorts identified maintaining motivation and optimism throughout the PhD as a significant challenge, particularly in the face of pressure to obtain results.

> It was quite challenging… very different [to Honours]. You have to learn everything by yourself and as a PhD student you are expected to be independent. It's an expectation but that doesn't mean it is always the case. (Science background 7)

> The hardest thing has been mental. So, doing a PhD, standing at the… cliff edge of what we know and… thinking "is this possible?" I'm trying to come in every day with some hope, that yes, I can possibly push this up the next rung. (Clinical background 2)

Students also identified finding an appropriate work/life balance as a cause of stress, illustrated by feelings of guilt when they weren't working. This balance was particularly hard to maintain when family or friends didn't understand the demands of undertaking a PhD.

A number of students identified a lack of supervision or structure in the PhD as a major challenge. In total, a quarter of participants identified problems with their supervisor as a major challenge, although in all but a few cases these problems centred around specific issues such as authorship or particular periods, for example during the first few months of the PhD. The perceived power disparity during these situations was challenging.

> One of my supervisors had some personal issues outside of supervising me and went from being very friendly and very supportive to all of a sudden being very snappy and very short, "why haven't you done this? Why haven't you done that?"… There's no real place to report it because I need this person as well for my MD and I actually consider them a friend as well. (Clinical background 5)

Half of the participants, from both cohorts, reported feeling financial pressure, in some cases severe: one student (from a science background) reported being unable to afford heating at home in winter, but several reported negative impacts on their work/life balance, mental health, or ability to complete their PhDs in a timely manner. Although both clinical and science students commented on how little they were paid, several clinical students felt it was worse for science students. Science students, despite rarely having mortgages and children, were less financially secure, often didn't have partners who could

support them, were less likely to have savings, and couldn't make up the difference with clinical shifts.

> Well, the huge [drawback of doing a PhD] is financial… I could be earning twice or three times as much right now if I were a full time consultant. (Clinical background 7)

> For me personally… and I think for most clinicians [it's] a calculated financial sacrifice to do research. (Clinical background 2)

> I have to take half a day off during the week to go to my casual job to earn some money to pay my bills. Which is half a day that I don't have working on my PhD. (Science background 3)

Students from clinical backgrounds do not feel well prepared for lab work

Clinical students faced a specific challenge, however, in their confidence and degree of preparation for undertaking lab-based research. Many science students had experience from their Honours year or working as a research assistant prior to undertaking a PhD. Both clinical and science students believed this lab experience provided better preparation for lab-based research than the experience of those from clinical backgrounds.

> I was an RA for three or four years before I was a PhD student, so I kind of knew what I was getting into… Like I know how the lab actually is working now… how people interact with each other. And that's sort of given me a new perspective of research. (Science background 5)

For clinical students, this early period was frequently identified as a period of great stress that required a mental adjustment from the "instant gratification" of clinical work. Half of those with clinical backgrounds discussed the difficulty in mastering lab-based technical skills that other lab members assumed they knew. This was frequently coupled with frustration at having to start at the bottom, despite their previous accomplishments, particularly when previous experience was relevant and perceived to be ignored. Of note, some students from a science background felt similarly.

> I guess it's hard to really remember what it's like to know nothing.[…] The step backwards is bigger than you can anticipate. (Clinical background 1)

> [I had] to do the university-based things that I already knew how to do… How to network, how to do a conference poster, how to talk in front of a crowd… There was no flex in the fact that I had already done them in my previous workplace. (Science background 3)

Being seen as "just a student" was a source of frustration for a quarter of participants, who felt this did not adequately reflect their role in the institution or their level of expertise.

> People had no idea that I'd had very senior academic roles before, that I'd been a senior clinician, that I'd managed teams. I didn't need them to know that, but I knew if they did

> know that I would have been treated quite differently. I really struggled with that… people didn't value what I could contribute because I was "just a student." (Clinical background 9)

For clinical students, an initial induction in basic lab skills was frequently suggested as an important orientation and academic support. Students recognised that for many projects, training in lab-specific skills was best performed in the lab itself, but many found this training to be overly ad-hoc and too reliant on assumed knowledge. The clinical students therefore felt that a basic theory and lab skills induction would be beneficial, especially given that many did not possess research experience.

> People in the early phase definitely need practical things. And I think that's probably true throughout, really, dotted throughout. Things that will help them upskill rapidly in a short space of time. And I think things like research method, you know, how to do X, how to do Y, they're the sorts of things that would really appeal to people in our sort of situation. (Clinical background 3)

> I think this… intro course is, is very important. I think there's a lot of basic laboratory techniques that is probably common to virtually all projects that you probably need to know or have some kind of conceptualisation of. (Clinical background 13)

Discussion

In his model of doctoral success, Tinto identified five areas contributing to a successful PhD (Tinto, Goodsell-Love, Russo & Parsley, 1994):

- Academic integration - the accessibility and quality of interactions with faculty;
- Social integration; opportunities for friendship and support, and a sense of common purpose amongst peers;
- Research opportunities - being able to actually perform the research;
- Advising relationships - the accessibility and quality of interactions with PhD supervisor(s); and
- Financial support - having adequate financial means to meet personal commitments.

This study demonstrates that, although the core of the PhD student experience is similar for clinical students to the more widely studied science student experience, there are differences between the two groups in every aspect of Tinto's model except the relationships with the supervisor (where students from both groups talked about its importance and the challenges associated with a difficult relationship in much the same way).

The science students interviewed for this study were relatively consistent with the 'typical PhD student' in science described in the literature, both in terms of their demography and their responses to questions (Edwards et al., 2011). In contrast, the students from a clinical background were older, more likely to have family responsibilities and more likely to have part time jobs outside their PhDs. As previously noted, this cohort is largely understudied; several of these factors have been described as likely to be risk factors for

attrition (West, Gokalp, Pena, Fischer & Gupton, 2011; Martin et al., 2001; Price, 2006; Wamala et al., 2011), but may also potentially be mechanisms of support for PhD students. Family responsibilities, for example, may create stress due to the extra demands on a student's time, but a spouse may also provide emotional and financial support, reducing the risk of attrition (Price, 2006). While there is undoubtedly individual variation in how these factors play out, to our knowledge the effects of these factors on this cohort specifically has not previously been described. As both groups of students were studying in the same research institutions, enrolled in the same discipline at the same university, and were broadly similar in their progress through their PhDs, we argue that any differences observed are due to differences between the cohorts, rather than artefacts arising from external factors.

In contrasting the two groups in this study, the science students participated more actively in social and academic enrichment activities, whereas clinical students generally appeared to be in a stronger financial position and their integration with academic faculty was arguably more successful than for science students. Although clinical students still complained about their financial situation, they typically considered themselves to be better off than the science students due to their savings and financial support from partners. They were also more likely to have well-established conceptions of themselves as professionals rather than students. A future study, investigating this positioning and how this affects academic integration, may be of interest.

Further discussion here will focus on the areas with major implications for policy, practice and research: differences in motivations for undertaking a PhD; academic and social integration; and research opportunities for students.

Differences in motivations for undertaking a PhD

Beyond this common core, several differences were observed in responses from clinical students. Over three quarters of participants from this cohort mentioned enrolling in a PhD to increase their future employability. This figure was much higher, and much more clearly expressed, than it was among the science students. It is unsurprising that clinical students, who typically have several years' experience as clinical practitioners prior to commencing a PhD, were clearer about the expected career benefits than science students. Science students, who were typically younger and entered a PhD soon after completing their undergraduate studies, may not have given the same amount of clear and directed thought to their future careers. Alternatively, it may represent inculcation into a different genre of career progression between clinical medicine and the perhaps less formal or hierarchical world of academia. Further research into the prevalence of this attitude in other cohorts, and the underlying reasons, may prove insightful. One participant described the choice to do a PhD as a "calculated financial sacrifice", and it is this degree of calculation that appears to be an interesting difference between clinical and science students. While a third of the clinicians discussed the importance of mentors in convincing them to undertake a PhD, science students did not; this mentoring influence may be consistent with the clinicians having more articulated career plans regarding the PhD. Moreover, a large proportion of Australia's research output is carried out by PhD

students (Group of Eight, 2013), and building the clinical scientist workforce is a current national policy focus. For these reasons, understanding the motivational differences between the clinical and science students may prove useful in the development of effective recruitment strategies for the future.

Academic and social integration

While clear differences were observed between clinicians and scientists in terms of their social integration, both groups identified their peers as a major source of support. The themes identified here — the importance of peer support, and the desire for formal and informal mentoring — are consistent with previous research (Lunsford, 2012; Webb, Wangmo, Ewen, Teaster & Hatch, 2009).

However, members of the two groups of students didn't appear to completely consider members of the other group as "peers". While clinical students appeared happy to accept technical help from science students, regular horizontal engagement between clinical and science students did not exist, which they attributed to differences in outlook or stage of life. Science students participated in postgraduate student societies, which hosted both social and academic development programs; clinical students were reluctant to engage in these activities and more likely to use friends and family for social support. Several clinical students appeared unaware that the student societies offered academic development activities such as journal clubs or student retreats, while at least one clinician (working on a lab-based project) felt presentations from the science students had little to offer, suggesting a separate clinical research hub instead.

Given their frequently reported problems with technical aspects in the early stages of their PhDs, it is important to consider the academic environment and subsequent development of clinical PhD students alongside their limited engagement with science peers and academic enrichment programs during their PhD. It is perhaps unfortunate that students from clinical and science backgrounds were unwilling to mix informally, as we believe the two approaches to oncology have much to offer one another, and there are potential medical and research benefits that might arise from experienced clinicians and scientists being exposed to each others' work. Setting this aside, however, the student-organised academic programs were regarded favourably by a number of students from science backgrounds; the unwillingness of clinical students to engage with student societies socially may be excluding them from useful academic support.

There is clearly a relationship between informal social interaction (which may lead to academic interactions) and formal professional development and academic enrichment activities. In this cohort, students from both clinical and science backgrounds are eager for academic integration, but see little relevance to social interaction, despite peer support being so clearly identified as important to them. There may be an opportunity for postgraduate student societies or departmental leaders to institute formal peer mentoring programs or more clearly advertise student-led academic development programs (separately from social activities) to ensure the needs of both groups are being met and to thereby increase social integration and opportunities for broader peer support.

Research opportunities

It is in the fifth area of Tinto's model, research opportunities, that the most obvious difference between students from the two groups was observed. Many students from clinical backgrounds reported finding the early stages of their PhD particularly stressful. This was often partly due to the mental adjustment in moving from clinical work to research, but many requested an initial induction to refresh their basic theory and technical skills.

Clinical students frequently reported technical problems at the start of their PhDs due to being out of practice with basic lab skills. Several reported frustration in being held back by their unfamiliarity with the lab, despite previous expertise, intelligence and willingness for hard work, and that there was too much assumed knowledge. Although PhD orientations programs in general have much support in the literature (Devenish et al., 2009; Gardner, 2009; Kehrhahn et al., 2000; Lunsford, 2012), to clarify expectations and institutional support facilities or introduce peer-mentoring schemes, there is a clear desire for more specific programs to address this skill deficit for clinical students and allow them to make the most of the research opportunities their PhDs offered. Addressing this gap may be an important consideration for improving the PhD experience and outcomes for these students.

Commonalities in the PhD experience

Despite these differences, it is important to note the common core to the PhD experience that is consistent between both clinical and science students, and with findings reported in the literature. In many aspects, the expectations and PhD experience of students from clinical backgrounds in this study were similar to those from science backgrounds. As has been previously reported in the literature, motivation, stress, and lack of adequate supervision were seen as major challenges (Gardner, 2009; Govendir et al., 2009; West et al., 2010; Tinto et al., 1994). Many discussed the importance of their relationship with their supervisor to their PhD experience or reported that a lack of appropriate supervision had been a major challenge; maintaining motivation and financial pressure were also significant challenges. A number of participants from both groups were frustrated that their previous experience was not recognised and that they were treated as students rather than junior colleagues. These findings are consistent with previous literature (Devenish et al., 2009; Edwards et al., 2011; Juniper, Walsh, Richardson & Morley, 2012; Kehrhahn et al., 2000; Pyhältö, Toom, Stubb & Lonka, 2012).

Conclusions and implications for practice

In undertaking this research, we posed two questions. Are students from clinical backgrounds substantially different in their expectations and PhD experiences to science students or what is reported in the literature? Are their needs different in any meaningful ways? As an inductive, qualitative study, it must be noted that the findings discussed here stem from the responses of two groups of students at a single Australian university, and may not be representative of the two populations more generally. However, this research

provides a case study which clearly demonstrates that there are important differences in the PhD experience between these two groups that could be lost in a more general analysis.

Our study showed that students from clinical backgrounds have different motivations for undertaking a PhD. They report being less socially engaged with peers from a science background and being less well prepared for the technical problems associated with lab-based research. We suggest this is a major area where increased academic development or orientation could improve the PhD experience for these students. This study is therefore of value to university leaders and those involved in the development of PhD programs for clinical students in the biomedical sciences.

Although this research was performed within the Australian context, these findings are likely to have relevance to PhD programs in other nations. Australia's PhD graduate output is comparatively strong among the OECD nations, with relatively high levels of completion and larger growth over the past decade than the USA and Canada (Edwards et al., 2009). PhD completion rates in Australia are estimated to be approximately the same or slightly higher than in the USA (Jiranek, 2010; Martin et al., 2001), with an estimated attrition rate in the biological sciences of 24% or less (Jiranek, 2010; Pion, 2001; Sinclair, 2004).

Prior to this study, there has been little research into the specific needs and requirements of students from clinical backgrounds, although these students comprise a substantial and important minority of PhD students in biomedical science. Although this study has examined the experience of oncology students, we believe the differences identified for clinical students in this cohort are likely to apply in other biomedical fields.

It is worth considering the importance of organisational, divisional and supervisory leadership to encourage integration between science and clinical research students during their training. Currently, one of the key divides in the rapid translation of medical science into clinical outcomes is a lag in communication between these two professional groups. A long held solution to this has been to build workforce capacity with the clinician-scientist — an individual who carries the skills of both scientific and clinical domains. Importantly, this study highlights that integration between clinician scientists and academic scientists may be poor. Of further significance, this divide may be established during their junior research-training tenure. In order to nurture communication between the science and clinical communities at all levels, it is imperative to consider innovative approaches to connect these students in their formative years, to ensure greater collaboration in the latter years.

Overall the findings from this study endorse the need for better lab induction, and the opportunity to improve the academic and social integration between clinical and science students, and these present clear opportunities for further research and intervention from university leaders.

More broadly, this research also acts as a case study illustrating the drawbacks of over-generalising findings from education research. It is clear that there is a productive balance between generalisability and specificity in research into the student experience. As these data show, there does appear to be a common core to a successful PhD experience. However, we argue that there is a strong case for more specific cohort analyses in this area, particularly given the importance of PhD training to the future academic workforce and the personal and financial investments made in PhD study. This is particularly the case in identifying and supporting specific needs for subgroups of students, which might otherwise go unidentified if findings are over-generalised.

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Dr Ryan Naylor is an Early Career Researcher with the Melbourne Centre for the Study of Higher Education at the University of Melbourne. His current research focuses primarily on student equity and the student experience.
Email: rnaylor@unimelb.edu.au

Dr Sumone Chakravarti is currently a member of the Strategy and Planning Unit, Melbourne Medical School, at the University of Melbourne. At the time of research, she was the Program Manager – Education and Training for the Victorian Comprehensive Cancer Centre Alliance.
Email: sumonec@unimelb.edu.au

Dr Chi Baik is a senior lecturer in higher education. Her research areas lie broadly in topics related to curriculum design, internationalisation, the quality of university teaching and the student experience. She is currently co-director of two national projects funded by the Office for Learning and Teaching: one on advancing the quality and status of teaching in Australian higher education, and the other on designing curriculum to support student wellbeing.
Email: cbaik@unimelb.edu.au