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SHORT COMMUNICATION

The question of dissection in medical training: Not just "if," but "when"? A student perspective

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Abstract

While debate about the use of—and alternatives to—human cadaveric dissection in medical training is robust, little attention has been paid to questions about timing. This study explores the perspectives of medical students and recent graduates with regard to two key questions: when in the degree program do students prefer dissection opportunities and what are the students getting out of participating in dissection? Self-report survey data from students in preclinical years ($n = 105$), clinical years ($n = 57$), and graduates ($n = 13$) were analyzed. Most (89%) preferred dissection during the preclinical years, with no effect by training year ($\chi^2 = 1.98$, $p = 0.16$), previous anatomy ($\chi^2 = 3.64$, $p = 0.31$), or dissection ($\chi^2 = 3.84$, $p = 0.26$) experience. Three key findings emerged. First, the majority of students prefer to dissect in the preclinical years because they view dissection as important for developing foundation knowledge and delivering an opportunity for consolidation prior to transitioning to primarily clinical studies. In addition, students recognize that it is a time-consuming activity requiring specialized facilities. Second, three main understandings of the purpose of dissection were reported: depth of learning, learning experience, and real-world equivalence. Third, these student perspectives of the purpose of dissection are associated with timing preferences for dissection opportunities. The results identify the preclinical phase as the optimal time to strategically integrate dissection into medical training in order to maximize the benefits of this unique learning opportunity for students and minimize its impact upon curricular time.

KEYWORDS
curriculum, dissection, gross anatomy education, medical education, student perspective

INTRODUCTION

> "One must start on a cadaver and end up operating on a patient, unless one wishes to start with a patient and end up with a cadaver"
>
> Ernest Juvara (1870–1933)
> (Palade, 2005; Gogalniceanu et al., 2008).

Human cadaveric dissection has substantial value in medical education. Not only is it viewed as a valuable educational tool for teaching and learning anatomy (Estai & Bunt, 2016) but it also scaffolds professional and emotional development in preparation for a career as a doctor (Flack & Nicholson, 2018). However, human cadaveric dissection is a large financial, logistic, and scheduling challenge, particularly in the context of modern medical training (Geldenhuys et al., 2016). The questions that are now asked about the inclusion

of dissection in medical curricula largely focus on attempting to balance these concerns and determine if dissection should be included. The literature has not, as yet, turned itself to the equally important question, in the case where the decision is made to include, of when dissection should be incorporated in order to maximize student gains.

Dissection offers unique learning opportunities not just for the study of anatomy but also for fostering the development of skills and attitudes relevant to the practice of medicine (Ghosh, 2017; Flack & Nicholson, 2018). Its relevance in modern medical education continues because, unlike other modalities used for the study of anatomy, it provides students with an opportunity to observe and experience structures in situ with a texture similar to that of a living body and appreciate their spatial relationships, variations, and pathology while acquiring manual skills (Aziz et al., 2002; Azer & Eizenberg, 2007; Sugand et al., 2010; Geldenhuys et al., 2016; Ghosh, 2017). Concurrently, the introduction of students to a human cadaver has been found to cultivate the development of medical professionalism, empathy, and coping strategies for death and dying (Lachman & Pawlina, 2006; Pearson & Hoagland, 2010; Flack & Nicholson, 2018). Furthermore, by undertaking the dissection process with peers, students develop teamwork and communication skills (Lempp, 2005; Böckers et al., 2010; Ghosh, 2017). Conversely, the drawbacks of incorporating dissection in a medical program include the reduction of curricular time allocated for anatomy, accommodating and resourcing increasing student numbers, expenses associated with maintaining a body donor program, physical and psychological impacts upon students, and health concerns related to exposure to biological and chemical hazards (McMenamin et al., 2018; Crosado et al., 2020; Okafor & Chia, 2021).

Debate about the inclusion of dissection in the modern medical curriculum continues (McMenamin et al., 2018; Wilson et al., 2018a). Historically, a decline in the use of dissection in medical education has occurred in association with reduced curricular time available for anatomy teaching and learning, a trend common to both undergraduate and graduate-entry medical schools around the world (Craig et al., 2010; Singh et al., 2015; Pais et al., 2017; McBride & Drake, 2018). This decline is compounded by the increasing availability of new technologies such as virtual and augmented reality that demonstrate equivalent knowledge acquisition at lower financial cost compared to dissection (Wilson et al., 2018a; Moro et al., 2021; Chumbley et al., 2021). Despite the growth in digital anatomy resources, a resurgence in dissection has been observed in many countries through the creation of new avenues for its integration into the medical student curriculum (Larkin & McAndrew, 2013; Bouwer et al., 2016; Memon, 2018; Whelan et al., 2018). Voluntary (Larkin & McAndrew, 2013), optional (Pais et al., 2017; Eppler et al., 2018), and extracurricular (Chambers & Emlyn-Jones, 2009; Whelan et al., 2018) dissection opportunities have been created to give interested students the opportunity to dissect while minimizing impact upon the formal curriculum schedule. Another strategy has been to optimize the integration of dissection and its clinical relevance within the curriculum by sequencing it with other teaching and learning activities such as problem-based learning (PBL) cases (Thompson et al., 2019), medical imaging (Murakami et al., 2014; Wilson et al., 2018b), pathology (Geldenhuys et al., 2016; Noriki et al., 2019), and surgical techniques (Jeyakumar et al., 2020). In some institutions, students take turns to participate in dissection in order to continue to offer dissection opportunities to all students despite the reduced curricular time available, increasing student numbers, reduced staff numbers, and/or limited availability of cadavers (McWhorter & Forester, 2004; Bentley & Hill, 2009; Kim et al., 2019).

The optimal time for students to undertake dissection during medical training has not been established. When students dissect varies considerably between medical schools. Dissection may be offered in the early preclinical years, where the majority of anatomy education typically occurs, and/or in the later clinical years where anatomy is applied and used in patient contexts (Bouwer et al., 2016; Memon, 2018). Given the time and financial costs (McMenamin et al., 2018; Chumbley et al., 2021) associated with providing dissection opportunities, an informed approach to curricular design is necessitated. This is especially relevant at the present time as institutions around the world navigate the benefits, limitations and financial implications of the recent rapid transition to online learning platforms to deliver anatomy education during the Covid-19 pandemic (de Carvalho Filho et al., 2021; Harrell et al., 2021). Understanding at what stage of medical training it is optimal for students to dissect, and the factors that influence this, will ensure that medical schools who choose to use this approach for learning anatomy can strategically integrate it into their program. Therefore, the current study seeks to discern the optimal time and role for dissection in the medical curriculum in order to maximize this unique learning opportunity. As the question of "optimal" timing for inclusion implies an experimental model not available in education research for reasons of ethical access to learning resources, we consider instead a valuable and under-used source of evidence on the quality and utility of educational models: student perspectives (Flack & Nicholson, 2018; Thompson & Marshall, 2020). Thus the aim of this study is to explore the student perspective of when conducting dissection is most beneficial during medical training to ensure it is relevant, useful, and applicable. We sought the perspectives of students in all years of medical training with different levels of anatomy and dissection experience, as well as recent graduates working as interns and junior doctors in order to answer the following research questions:

1. When during medical school do students prefer opportunities to undertake human cadaver dissection, and why?
2. What do students perceive they are gaining from participating in dissection?
3. Are there any relationships between student perspectives, timing preference, gender, previous anatomy/dissection experience, and year of study?

MATERIAL AND METHODS

Context of study

The Medical School at the Australian National University (ANU), Canberra, Australia, delivers a four-year graduate-entry medical program with approximately 100 students in each year. The program consists of four themes (medical sciences, clinical skills, population health, and professionalism and leadership) and four frameworks (social foundations of medicine, rural health, Aboriginal and Torres Strait Islander health, and research). In the first two years, the seven systems-based blocks are built around PBL at the university campus with a clinical day at the hospital each week. During the six clinical blocks in Years 3 and 4, students spend most of their contact time learning during clinical rotations in hospital and community health settings.

Anatomy, one component of the medical science theme, is formally delivered to all students during Years 1 and 2 using multimedia resources such as videos, online lessons, and formative assessments with immediate feedback (50 hours); interactive lectures (50 hours); and active learning laboratory-based anatomy practical sessions (80 hours) involving small groups of five students studying prosected specimens, plastic models, computer models, bones, surface anatomy, radiological anatomy, and clinically applied case studies. All students receive the same introduction to anatomy at the commencement of the program. Anatomy is also integrated into PBL and clinical skills activities and revisited during the six clinical blocks and rotations in Years 3 and 4. All students have the opportunity to voluntarily undertake a minimum of 8 hours dissection during Years 1 and/or 2 (approximately 30% of Year 1 and 2 students participate each year) where they are introduced to the instruments and techniques to dissect a body region of their choice in a pair. Anatomy is a component of the integrated written examinations that occur at the end of each systems-based block. Because it is a graduate-entry program, students may have experience of anatomy and/or dissection from a previous degree.

Study participants

Ethics approval for this study, conducted at the ANU and Canberra Hospital, was granted by the ANU and Australian Capital Territory Human Research Ethics Committees, respectively. An anonymous electronic survey (Survey Monkey, Palo Alto, CA) was distributed at the commencement of the academic year to all medical students (Year 1 = 93; Year 2 = 98; Year 3 = 88; Year 4 = 97) and Canberra Hospital interns/junior doctors (n = 96) who had graduated within the last two years. Participants were given 4 weeks to respond with reminders sent weekly. Participation was voluntary and consent was given by answering the online survey.

Survey

The survey consisted of nominal choice items and open-ended questions that addressed the research questions as follows:

1. When do students prefer to dissect during medical school, and why?

Students were asked to indicate where in their degree program they think dissection would be most useful. The timing options included: while studying anatomy during the preclinical years (Years 1 and 2); during the final block at the end of Year 2, when the formal anatomy curriculum has been completed; during the clinical years (Years 3 and 4) when applying anatomy in clinical contexts; or never. Students were also asked to provide their reasoning for this preference (free-response written feedback item) and these were probed to explore: (a) why students prefer dissection at that time during their training and (b) whether the reasoning shifts with degree progress and increased clinical exposure or previous experience of anatomy or dissection

2. 2. What do students perceive they are gaining from participating in dissection?

In order to address the latter research question, about student gains from participating in dissection and whether these are patterned by degree progress, responses to a second free-response item were examined. The item was "why do you want to participate in dissection?", for students with no dissection experience, and "why is dissection useful?" for those who had previous experience of dissection.

The questions were developed from a review of the literature and pilot tested with staff and students who were not potential study participants. Open-ended questions were used to avoid influencing student responses. Because the items were intended to stand alone, rather than be collapsed into scales, and are analyzed descriptively on a per-question basis, no reliability analyses were performed. Demographic data collected included age, gender, year of study, and previous experience of anatomy and human dissection to explore any relationships with student perspectives and timing preference.

Analysis

Analysis was conducted on the student demographic data, the categorical response to the timing question, and the two free-text items. Because the dataset was at a nominal level, it was only possible to consider distributions of responses. Thus, chi-squared tests of association were used to examine relationships between one nominal variable (e.g., cohort) and another (e.g., timing preference). Where $n < 5$ in any cell, Fisher's exact test was used. The electronic survey data were exported to an Excel 2016 spreadsheet file (Microsoft Corp., Redmond, WA) and

organized for import to and analysis using SPSS statistical package, version 25 (IBM Corp., Armonk, NY). Free text items were qualitatively examined, using a thematic analysis approach. Initial coding was done by one author (LS), using a combined inductive/deductive approach. Using constant comparison (Gibbs, 2018), an initial code-book developed from the literature was applied, and also added to where the data indicated. The final codebook was consensualized between three authors (LS, AW, and KV) and re-applied to a fresh copy of the dataset. Once all data were coded, themes were identified, discussed, and consensualized among the research team. Themes were triangulated from the impressions of the three coders (AW, KV, and LS). The lead on the thematic analysis (LS) was entirely independent of the anatomy and dissection programs, and two of the coders lead the dissection program (KV and AW).

RESULTS

Participants

Participants were 175 of 376 current and 96 former medical students at the ANU Medical School. Mean age was 24 years (SD ±4; range 19–45) and the sample was majority female (female $n = 102$; male $n = 73$). The participants fell into three broad categories: students in their preclinical years (Years 1–2; $n = 105$), clinical years (Years 3–4; $n = 57$), or who had graduated within the last 2 years and were now working as interns or junior doctors ($n = 13$). Most participants had previously studied anatomy ($n = 112$; 64%) but few had experience of human dissection ($n = 22$; 13%). Students in Year 2 and above had experience of studying anatomy in a previous degree (64%) and/or at ANU (100%), and 55% of Year 1 students had experience of studying anatomy prior to ANU. At the time of the survey, anatomy classes had not yet commenced at ANU for the new cohort of Year 1 students. Students with human dissection experience had acquired this in a previous degree (13%) and/or at the ANU (25%).

When do students prefer to dissect during medical school, and why?

Most respondents (89%) indicated that during—or at the conclusion of—the preclinical years would be the most useful to dissect. The distribution of responses was examined across student categories (Figure 1) and differences emerged ($\chi^2 = 10.05$, $P = 0.04$). While the overall trend was a preference for the preclinical years, clinical students and graduates were more likely than preclinical students to recommend dissection in the clinical years or recommend against dissection. As there were low response numbers in the graduate category, and low numbers of students who indicated dissection should be conducted "never" (5% overall), this comparison was simplified further for the sake of validity. Responses were coded as either coming from a "preclinical" or "clinical" student (graduates excluded) and responses were either that dissection should happen preclinically or clinically ("never" excluded). This comparison was not significant: ($\chi^2 = 1.98$, $P = 0.16$), suggesting that the pattern identified is stable across degree progress: students prefer preclinical dissection, regardless of where they are in their degree. Additional analysis revealed that previous anatomy ($\chi^2 = 3.64$, $P = 0.31$) and previous dissection ($\chi^2 = 3.84$, $P = 0.26$) experience had no effect upon student preference.

Student responses indicated three main rationales for this preference for preclinical dissection: foundational process in learning

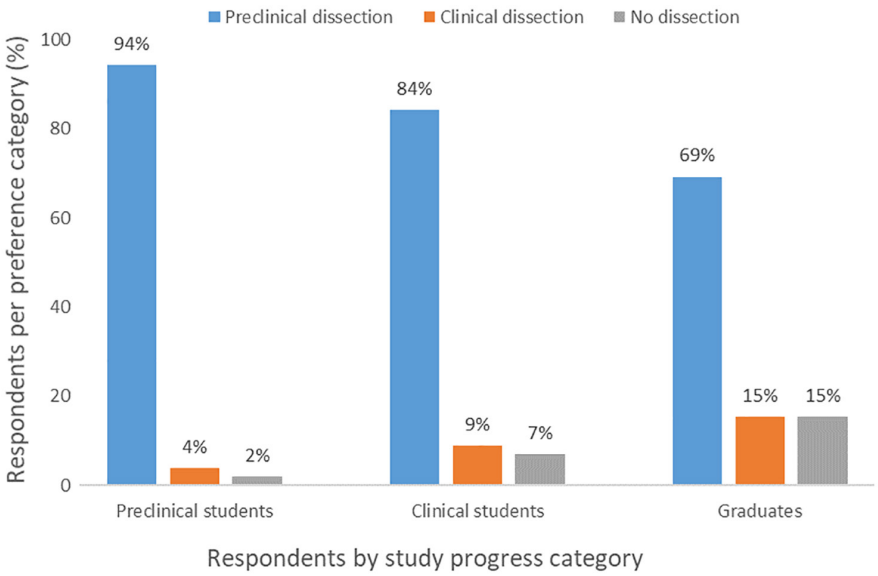

FIGURE 1 Distribution of preferences of when to undertake dissection during medical school by preclinical (Year 1 and Year 2; $n = 105$) and clinical (Year 3 and Year 4; $n = 57$) students and recent graduates ($n = 13$)

anatomy and medicine, tool for consolidation and revision, time-consuming activity requiring specialized facilities. All but 2 of the 175 respondents provided some written description of their reasoning for their preference. Each of the three understandings were associated with a range of possible rationales (Table 1). These justifications were then examined across year groups, timing preference, and

TABLE 1 Summary of overarching and subthemes in the descriptions of rationale to conduct dissection during the preclinical years by medical students and recent graduates

Understanding of the role of dissection	Main themes of rationales	Examples of student responses
Dissection as a foundational exercise in getting to grips with anatomical knowledge (mentioned by 67% of respondents)	• Dissection as a component of learning anatomy-key modality for the study of anatomy to be undertaken whilst studying lectures, practicals etc. • Dissection as fundamental foundation—essential to acquire this experience early as a foundation for other learning experiences • Preparation for clinical training—essential experience prior to clinical studies in later years of the program	• "Complement lectures" (Y1) • "It will be close in timing to the lectures" (Y1) • "To coincide with learning anatomy" (G) • "Anatomy underpins a lot of what we are learning; good to get a handle on it as early as possible" (Y1) • "Being exposed to dissections earlier will help contextualise knowledge" (Y2) • "Anatomy is an important foundation subject in medicine and it would really help a lot with learning if dissection is done early on" (Y3) • "To obtain a strong understanding of human anatomy before starting a clinical training regime" (Y1) • "It'll give a good background before entering the clinical years" (Y2) • "Useful to have anatomical basis before clinical years" (Y4)
Dissection as a tool for revising, consolidating and applying anatomical knowledge (mentioned by 57% of respondents)	• Consolidation—key time to consolidate previously learnt anatomy • Relevance—linked to/relevant to other disciplines studied concurrently	• "I think people would benefit from having dissection as a way to consolidate all of the information" (Y1) • "If we continued to dissect as we learnt the anatomy of different regions it we could see how all the systems work together and allow us to learn more effectively as we go" (Y2) • "It seems like we learnt so much anatomy in the first few weeks of year one, so it would be good to then apply this and reinforce this knowledge" (Y2) • "Best done at the time to consolidate learning" (Y3) • "After learning core anatomy and the fundamentals in physiology it's a great time to do some dissecting to tie it all together" (Y4) • "Anatomy underpins a lot of what we are learning; good to get a handle on it as early as possible" (Y1) • "Learning about basic anatomy would align well with the other basic sciences we need to learn in the first 2 years and allow greater integration" (Y2) • "To get a good understanding of anatomy as we were exposed to it block by block matching the clinical examinations learnt during clinical days" (G)
Dissection as a time-consuming activity that requires specialized facilities (mentioned by 42% of respondents)	• Focus on time (workload)—due to student curricular availability, conflicting activities and priorities • Focus on location (convenience)—due to primary location of students and facilities	• "Time availability" (Y1) • "Less busy with clinical work" (Y1) • "More time and less pressure. Year 3 and 4 clinical commitments would make it difficult to spend the time" (Y4) • "Dissection is time consuming and should not interfere with clinical time in the hospital" (Y4) • "It is easier to coordinate when we are on campus" (Y1) • "We are based on campus" (Y2) • "Years 3 and 4 are at the hospital and very busy" (Y2) • "Easier to perform during laboratory hours while on university campus" (Y4)

Note: Percentages will not sum, as some responses covered multiple themes.

Abbreviations: G, graduate student working as a junior doctor; Y1, Year 1; Y2, Year 2; Y3, Year 3; Y4, Year 4 medical students.

(Continues)

gender to explore patterns (note: percentages will not sum, as some responses covered multiple themes). The majority of explanations (67%) included the theme that dissection was a foundational process in learning anatomy and medicine. There were no differences in use of this theme by gender ($\chi^2 = 0.98$, $P = 0.75$) or year of study ($\chi^2 = 1.77$, $P = 0.77$). Significant differences emerged when examining use of this theme by timing-preference category ($\chi^2 = 49.35$, $p < 0.001$). Those who indicated dissection would be more useful in the preclinical years were very likely to describe dissection as foundational (73% of those who selected the preclinical timing provided a justification referring to the foundational learning value of dissection). Those who selected other timings almost never mentioned this theme (only one respondent of those who selected the clinical or "never" timing options mentioned this theme). A further 57% of responses characterized dissection as a tool for consolidation and revision. Differences emerged for gender ($\chi^2 = 12.5$, $P < 0.001$), such that female respondents were more likely to discuss consolidation. Results further indicate that those in their first year of studies were far less likely to discuss consolidation than any other year group ($\chi^2 = 30.97$, $P < 0.001$). Finally, mentions of consolidation and revision varied with timing preference ($\chi^2 = 22.23$, $P < 0.001$). Distributions indicate that, while those who prefer preclinical dissection mention consolidation about half the time (55%), those who prefer clinical-years dissection *all* mentioned consolidation (100%). No significant differences across categories emerged for the time and location theme.

What do students get out of dissection?

Five main perceptions of the value of dissection in medical education were identified from participant responses to this item ($n = 69$): learning experience, depth and type of knowledge, skill acquisition, real-world equivalence, and no value. Each of these understandings were associated with a range of subthemes (Table 2). The themes were examined across student categories to determine if they were patterned by gender, year of study, previous anatomy/dissection

TABLE 2 Summary of overarching and subthemes in the descriptions of perceptions of the value of dissection by medical students and recent graduates

Perception of the value of dissection	Main subthemes	Examples of student responses
The learning experience itself	• Mode of learning: hands-on, interactive, effective • Unique and/or novel learning modality • Active learning	• "Hands on experience, future desire to be a surgeon" (Y1) • "It will provide another way to learn anatomy-a very powerful way" (Y1) • "It would be beneficial as you could take your time and cement your anatomy learning by actively taking part in the study of anatomy, rather than observing" (Y2)
Depth and type of knowledge	• Deep learning: better understanding, integration, structural relationships, consolidation, more details, better comprehension • Understanding function and relationships	• "It would allow us to integrate our knowledge of all the systems learnt so far" (Y2) • "Better understanding of anatomy in general and the positioning/connections of organ and tissues within body" (Y1) • "Gain greater insight into how structures are interconnected and function" (Y1)
Skill acquisition	• Technical skill • Surgical relevance	• "To become more familiar with the human anatomy and to build confidence in surgical procedures" (Y1) • "Because it's a valuable learning experience and the closest thing to a surgery that we will do for a long time" (Y1)
Real-world equivalence	• Realistic learning- abnormality, variation • Ability to see pathology	• "It makes all of the pictures you see in a textbook so much more realistic!—even the texture of the parts of the cadaver could help in our understanding of body parts" (Y2) • "Appreciate anatomy from a whole-cadaver perspective, spending time to locate the anatomical features under the direction of an instructor would allow you to appreciate anatomical variation and apply clinical concepts; appreciate effects of pathology" (Y2)
Perception of no value	• Negative previous experience • Personal feelings	• "I have past dissection experience and I feel you can gain the same info with excellent preparation, tutors and looking at models" (Y1)

Abbreviations: G, graduate working as a junior doctor; Y1, Year 1; Y2, Year 2; Y3, Year 3; Y4, Year 4 medical students.

experience, or dissection timing preference but no significant differences emerged. Across all categories the same profile of responses held roughly constant: most students mentioned depth of learning (77%) and learning experience (54%). Real-world equivalence was also relatively common (23%) but the other themes were rarer.

DISCUSSION

The time and financial costs associated with providing dissection opportunities during medical school necessitate an evidence-based approach to curricular design. Understanding at what stage of medical training it is optimal for students to dissect will ensure that medical schools who choose to use this approach for learning anatomy can strategically integrate it to their program. Medical students and graduates, from a small 4-year graduate-entry medical program in Australia, indicate a preference for human cadaver dissection in the early preclinical years of their training. The three primary reasons for this preference are that dissection is considered a foundational modality to aid the study and understanding of anatomy, a helpful tool for reviewing, consolidating and applying anatomy, but a time-consuming activity that requires access to specialized facilities. Students, when asked what they perceive they are gaining from participating in dissection, most frequently identified three themes: depth of learning, learning experience, and real-world equivalence.

The opportunity to review, consolidate, and apply anatomy were the primary reasons driving student preference to dissect in the preclinical years. This is consistent with studies exploring the benefits of voluntary dissection (Larkin & McAndrew, 2013; Pais et al., 2017; Whelan et al., 2018). Given that these benefits are also common to compulsory dissection programs (Van Wyk & Rennie, 2015), it is likely that the results of this study are applicable to both voluntary and compulsory dissection programs. Although no studies to date appear to have explored academic perspectives on the optimal time to deliver dissection during medical training, the results of this study were in agreement with the view of anatomists that dissection adds to anatomy education in a way that, while complementary to other learning methods, is different and offers something that these other learning resources cannot provide (Estai & Bunt, 2016; Ghosh, 2017; Arráez-Aybar et al., 2021). Although the results indicated a preference for dissection in the preclinical years, student written comments highlighted that this was most useful once some anatomy content had been covered. Presumably this is to achieve the benefits of review and consolidation elucidated in this study. This insight is useful for curriculum planning. An interesting observation was that Year 1 students were least likely to discuss consolidation and all students who nominated dissection to be undertaken in the clinical years mentioned consolidation. This may reflect their identification of the importance and relevance of a holistic comprehension of the human body for effective clinical work (Farey et al., 2018).

Three factors that influence student involvement in dissection include participation in a new experience, gender, and time (Plaisant et al., 2011; Larkin & McAndrew, 2013; Abdel Meguid & Khalil, 2017; Whelan et al., 2018). First, the new experience of dissection is regarded as a rite of passage in medical training and is associated with high levels of anxiety (Plaisant et al., 2011; Romo Barrientos et al., 2019). Students with previous anatomy experience are less enthusiastic and less anxious about dissection (Abdel Meguid & Khalil, 2017; Romo Barrientos et al., 2019). For this reason, we included Year 1 students with no experience of anatomy or dissection, in addition to students with experience at different stages of training, to identify whether prior exposure is a factor influencing when students prefer to dissect. Neither previous anatomy nor dissection experience influenced student decisions in this study. However, the number of students with previous dissection experience in this study was low (13%) compared to those with previous anatomy experience (64%) and so warrants further exploration in future studies. Second, unlike previous studies that identified males, compared to females, are more likely to participate in an optional dissection course (Eppler et al., 2018;) and are more curious, more motivated, and less anxious (Plaisant et al., 2011; Abdel Meguid & Khalil, 2017; Romo Barrientos et al., 2019) of the dissection experience; gender was not a factor in student preference of when to dissect in this study. Finally, the time required to dissect is a frequent barrier to student participation in dissection (Larkin & McAndrew, 2013; Whelan et al., 2018; Jeyakumar et al., 2020) despite the slow but active sequential process of discovery being one of its attributes for studying anatomy (Dissabandara et al., 2015). Given that the de-emphasis of dissection in medical schools is related to reduced curricular time (Estai & Bun, 2016), student preference for dissection during preclinical years due to time is a significant finding that requires consideration during program design. Building in time efficiencies may help to overcome this issue. This can be achieved by adopting approaches that preserve (Kim et al., 2019; Hunter et al., 2020) rather than replace the hands-on experience of dissection (Granger & Calleson, 2007; Mahmud et al., 2011). However, it is recognized that during the Covid-19 pandemic digital alternatives to dissection became a necessity in order to maintain continuity of education during emergency remote learning (Pather et al., 2020; Harmon et al., 2020).

Students most highly value the learning opportunities to enhance their anatomy knowledge and skills that dissection offers. In agreement with previous studies of student and staff perceptions of dissection (Azer & Eizenberg, 2007; Larkin & McAndrew, 2013; Dissabandara et al., 2015; Flack & Nicholson, 2018; Whelan et al., 2018) the most frequent responses in the present study were related to the unique hands-on and realistic learning experience together with the comprehensive acquisition, reinforcement, and integration of anatomy knowledge and skills. However, an interesting difference was that our students did not identify additional attributes such as professional skills, teamwork, and concepts associated with death and dying (Marks et al., 1997; Azer & Eizenberg, 2007; Netterstrøm & Kayser, 2008; Dissabandara et al., 2015; Flack & Nicholson, 2018). The survey did not include any explicit questions about these aspects. As described in the methods section, the open-ended

questions were designed to avoid influencing student responses. It is possible that students did not consider these aspects in this context because they are discussed in-depth in other parts of the ANU medical program such as social foundations of medicine and professionalism and leadership. Another contributing factor might be that the majority of the participants had previous experience of anatomy and were accustomed to the study of prosected body donors.

Limitation of the study

This study comes with some limitations. The aim of this study was to collect student perspectives from all years of the medical program, with and without anatomy and dissection experience, as well as graduates working as interns/junior doctors. While this was achieved, consistent with other studies (Farey et al., 2018), the number of respondents from the clinical student and graduate group was low, cohorts that would benefit from further exploration. The results of the study might also be affected by self-selection bias given that only approximately 40% of potential participants answered the survey. The focus of the study was on traditional regional-based exploratory dissection of a body region. It is acknowledged that dissection as a learning modality has been reimagined in some educational contexts to make it more clinically relevant and time-efficient. For example, procedure-based dissection (Jeyakumar et al., 2020), task-based dissection (Kang et al., 2012), and dissection integrated with clinical rotations (Evans & Watt, 2005). The approach used may influence student responses to the optimal time to offer dissection and is recommended as an area for future investigation to ensure that dissection opportunities are adapted to address the changing needs of students as they progress through medical school. While reported data characterize the perspectives of medical students and graduates at a small Australian medical school, these data are likely to be transferable to the many medical programs in Australia and the world that offer a medical program composed of preclinical and clinical phases.

CONCLUSIONS

The benefits and disadvantages of dissection have been discussed extensively but there has been no deliberation given to the optimal time for medical students to undertake dissection during their training. Given that dissection is an expensive and time-consuming activity, recognizing that students identify the preclinical phase as the optimal time to integrate it into medical training is important in order to maximize its benefits for student learning.

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CONFLICT OF INTEREST

The authors do not have any competing financial interests regarding this manuscript.

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