



The Anatomy Course During COVID-19: The Impact of Cadaver-Based Learning on the Initiation of Reflection on Death

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Abstract

Background During the COVID-19 pandemic, in-person cadaveric dissection laboratories for teaching anatomy were omitted by many schools around the world. While knowledge domains can be easily evaluated via remote exams, non-traditional discipline-independent skills such as those encouraged through reflection on the topic of death are often overlooked. This study investigated how different anatomy course formats played a role in initiating students' reflections on death during the COVID-19 pandemic.

Method In fall 2020, 217 medical, dental, premedical, and health sciences students from 13 international universities discussed differences in their anatomy courses online. Formats of anatomy courses ranged from dissection-based, prosection-based, hybrid (combination of dissection and prosection) to no laboratory exposure at all. Students' responses to the question, "Did/does your anatomy course initiate your thinking about life's passing?" were collected, and they self-reported themes that were present in their reflections on death using a multiple-choice prompt. Statistical analyses to detect differences between students with and without exposure to cadavers were performed using the chi-squared test.

Results When comparing students who had exposure to human anatomical specimens to those who had no exposure, the majority of students with exposure thought that the course did initiate thoughts about life's passing, compared to students without exposure ($P < 0.05$). Reflection themes were consistent across groups.

Discussion These findings indicate that anatomy dissection courses are important for the initiation of students' feelings about the topic of death. Omission of cadaveric dissection- or prosection-based laboratories will decrease the likelihood that students initiate reflection on this topic and gain important transferable skills.

Keywords Anatomy course · Dissection course · Students · Reflection on death · COVID-19 · Peer interactions

Introduction

During the onset of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; COVID-19) pandemic, major changes in the delivery of anatomy teaching have been reported across the globe. Due to social distancing mandates, many programs underwent significant redesigns in the delivery of their anatomy teaching, as was necessary for remote education [1–4]. In many schools around the

world, in-person cadaveric dissection was omitted, or time allotted to the cadaver laboratory was significantly reduced [1]. Concerns that these changes and the omission of cadaveric dissection would persist were raised by many in the anatomy education community [3, 5].

One aspect of anatomy education that instructors most feared would be lost in the transition to remote teaching was the benefits of the "hidden curriculum" associated with the cadaveric dissection laboratory [2]. The hidden curriculum in medical education is known to be an effective forum for teaching skills that are not explicit goals of the standard activities outlined in the curriculum [6]. In anatomy, the cadaver laboratory is one area that has long been shown to

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have a rich hidden curriculum, offering educational benefits outside of simply teaching anatomical facts [7].

Historically, dissection-based anatomy courses have been shown to improve health professions students' clinical education outcomes, ethics, and humanity, as well as to encourage them to reflect on and process the concepts of death and illness that they will undoubtedly encounter in practice [8–13]. Working in small groups in the cadaver laboratory has also been shown to have benefits for the formation of professional identities, including the practice of behavior and attitudes required of medical and health professionals [13, 14]. In addition to the initiation of introspection on ethics, empathy, and humanistic values observed in medical students [15–19], some have reported that dissection-based anatomy teaching can promote respect and compassion [20]. Furthermore, dissection-based laboratory environments help students to develop coping mechanisms for encounters with and around the topic of death [21]. These are all crucial elements of the hidden anatomy curriculum that prepare students for a future of patient interactions in clinical practice.

The associations between participation in cadaveric dissection, strong emotions, and reflection on the topic of death among students have been reported extensively in the education literature [13, 22–26]. It is generally agreed upon that reflective practices are important, particularly for young health professions students as they begin life-long careers as medical and allied healthcare practitioners [27]. However, while knowledge-based assessments can be easily administered via remote examination [28], evaluation of non-traditional discipline-independent skills that are commonly conveyed via cadaveric dissection (e.g., empathy, compassion, reflection on the topic of death) are difficult to assess and often overlooked. Furthermore, because human anatomy education is traditionally an in-person discipline, published research on how different anatomy teaching formats initiate students' reflections on ethics and other topics, including reflection on death, are mostly based on traditional approaches that include exposure to a full-body human cadaver or cadaveric specimens [6, 13, 15, 16, 21, 29–31]. There is a paucity of research on whether non-traditional or modified anatomy curricula can elicit similar outcomes as traditional cadaver-based settings, especially during the persistent COVID-19 pandemic [32, 33].

This research team recently observed the impact that the format of anatomy teaching can have on how anatomy course participation can initiate students' reflections on the topic of death [34]. Through identifying different themes of reflection and categorizing them based on the students' enrollment in either dissection, prosection, hybrid, or non-dissection-based course formats, the authors observed that preclinical students' exposure to a deceased person, as a whole human body or in part, may have encouraged them to reflect more on death and

dying than their peers in less cadaver-focused curricula. Courses that did not expose students to any cadaveric specimens did not appear to initiate reflection on the topic of death at all [34]. This initial observational study did not include a quantitative portion and was conducted prior to the COVID-19 pandemic, with only a limited number of participants. However, the findings indicated that the presence of a cadaver in the learning activities seemed important for students to initiate reflective thinking [34].

Based on the above observations, the authors formulated a study to investigate whether anatomy course formats (e.g., dissection, prosection, or remote instruction) had disparate impacts on the initiation of reflection on the topic of death among health professions students. The objective of the current study was to elicit additional qualitative data and provide quantitative data to support the previous findings in anatomy courses during the COVID-19 pandemic in 2020 [34]. It was hypothesized that the anatomy course formats that included exposure to whole-body human cadavers and/or prosected cadaveric specimens would be more likely to initiate students' reflections on the topic of death.

This report provides details of the changes made to anatomy course formats at 13 institutions from various countries during the 2020 COVID-19 pandemic. The changes are described and associated with their impact on students' reflections on death. Analysis of the student feedback obtained in this study will help to elucidate the impact of cadaver exposure on the hidden anatomy curriculum. This type of insight may influence how educators choose to teach anatomy in the future and/or initiate a discussion on how different modalities can be leveraged to encourage reflection on the topic of death when it is not possible to teach using cadaveric specimens. Regardless of the findings, discussions on how best to promote the development of non-traditional discipline-independent skills that are typically learned during in-person dissection-based anatomy courses are needed if traditional laboratory formats are omitted in the future.

Material and Methods

In the fall semester of 2020, 217 medical, dental, premedical undergraduate, and health sciences students from 13 international universities met to discuss differences in their anatomy courses in small online focus groups on Zoom (Zoom Video Communications, Inc., San Jose, CA), as part of the “International Collaboration and Exchange Program (ICEP) – Preparing Global Leaders for Healthcare” [35, 36]. The ICEP program facilitates online networking and travel exchanges (when international travel restrictions permit) between students enrolled in anatomy courses at pre-medical, medical, and dental levels around the globe.

The goal of the program is to convey skills to future global healthcare leaders so that they can solve healthcare issues in a globally collaborative manner. Details of the participating students’ demographic information are listed in Table 1.

Descriptions of the formats of anatomy education delivery at the 13 universities were collected as part of a student survey in Qualtrics XM (Qualtrics International, Inc., Seattle, WA) and confirmed via faculty questionnaires. The faculty questionnaires to determine changes made to anatomy course formats in response to the COVID-19 pandemic were collected via Google Forms (Alphabet, Inc., Mountain View, CA).

For the quantitative comparison, a multiple-choice question was administered to determine whether or not students felt that the anatomy course initiated their reflection on the topic of death. The question “Did/does your anatomy course initiate your thinking about life’s passing?” was adapted from previous work where students were asked “How did your anatomy course initiate your thinking on life’s passing?” [34].

Previous work has shown that this question was capable of eliciting thoughtful responses from students, which were analyzed through inductive thematic analysis to describe the prominent themes [34]. This previous work, which employed an inductive and deductive coding analysis, generated themes that included appreciation, avoidance, benefits, dichotomy, dignity, fragility of life, spirituality,

and salience of death along with unchanged thought on the topic of death [34]. Based on those results, the current study aimed to address whether or not the type of exposure (i.e., dissection, prosection, and hybrid) to human cadavers or anatomical specimens had any impact on the themes represented in students’ reflections on the topic of death. Because it was expected that self-reporting would likely include several common thematic categories, students were given a list of such themes and asked to select which ones were most associated with their own reflections on death. These themes were adapted from previous observations on students’ initiation of reflection on death [34]. The questions included the following:

1. “Did/does your Anatomy course initiate your thinking on life’s passing?”
2. “The anatomy course initiated my thoughts on ... *Fragility of Life/Shortness of Life, Sanctity of Passing, Dignity of Life, Beauty of Life, Religion and Life, Dichotomy between Body and Soul, Mixed feelings on Death*”

Given that the themes were already identified in previous work, a repeat of this qualitative analysis was not included in the present study [34]. All data were collected using multiple-choice questions administered on the Qualtrics XM® survey platform.

Table 1 Student demographics. At the time of the survey, the students were at different stages within their respective anatomy courses

University	Self Identification (n)			Age (n)			Total (n)
	Male	Female	Undisclosed	<20	20-25	>25	
Columbia University (New York, USA)	9	6	1	1	12	3	16
King’s College London (London, UK)	15	23	4	26	16	0	42
Kyoto University (Kyoto, Japan)	2	9	0	0	9	2	11
Ludwig Maximilians University (Munich, Germany)	2	9	0	3	8	0	11
Martin Luther University (Halle-Wittenberg, Germany)	5	12	0	6	10	1	17
McGill University (Montreal, Canada)	4	3	0	0	5	2	7
Medical University of Vienna (Vienna, Austria)	5	3	0	1	6	1	8
National Taiwan University (Taipei, Taiwan)	2	3	0	0	5	0	5
University of Cambridge (Cambridge, UK)	23	40	1	59	5	0	64
University of Copenhagen (Copenhagen, Denmark)	0	1	0	0	1	0	1
University of Helsinki (Helsinki, Finland)	6	1	0	0	6	1	7
University of Paris (Paris, France)	6	10	0	4	11	1	16
Yale University (New Haven, USA)	3	4	0	0	7	0	7
Undisclosed information							5
Total	82	124	6	100	101	11	217

The analyses involved two components. The first was a comparison of students' responses based on their self-reported anatomy education format (Group 1, comprehensive dissection; Group 2, hybrid dissection plus prosection; and Group 3, no dissection at all). Because students were at different stages within their anatomy courses at the time of the survey, with some students having already completed a year of anatomy education with body donors prior to COVID, a second portion of the analysis grouped the responses into students who had already been exposed to human bodies or remains and those who had not, prior to COVID.

Statistical analyses were performed using the Chi-squared test in Microsoft Excel[®] with an alpha value set at 0.05. These were used to detect any group differences in initiation of reflection on death between students who were exposed to cadaveric materials and those who were not. Additionally,

the Chi-squared test of independence was used to compare the identification of themes related to the topic of death between these groups.

Ethical approval for this study was obtained at Columbia University (IRB—AAAS0074), McGill University (IRB Study No. A07-E54-17B), and the National Taiwan University (IRB—202001069 W).

Results

Anatomy Course Formats at Different Universities During the COVID-19 Pandemic

Table 2 depicts the differences in course formats at the participating universities before the onset of the COVID-19 pandemic and during the fall, 2020. Anatomy laboratory

Table 2 Anatomy course formats pre-COVID-19 and during the COVID-19 pandemic at 12 universities. Two schools did not change their anatomy course formats during the pandemic (National Taiwan

University and University of Paris). Information from one university was not available. In fall 2020, some schools offered virtual prosections only and some offered in person prosections

University	Pre-COVID		COVID Fall 2020					
	Hands-on dissection?		Prosection?		Hands-on dissection?		Prosection?	
	Yes	No	Yes	No	Yes	No	Yes	No
Columbia University (New York, USA)	54 h	-	-	-	-	(Fully virtual; 3D Atlas or Imaging only)	-	-
King's College London (London, UK)	30 h	-	90 h	-	-		90 h (Virtual prosection with open learning sessions)	-
Kyoto University (Kyoto, Japan)	56 h	-	-	-	-	(Fully virtual; 3D Atlas or Imaging only)	-	-
Ludwig Maximilian University (Munich, Germany)	90 h	-	-	-	90 h (Smaller groups)	-	-	-
Martin Luther University (Halle-Wittenberg, Germany)	78 h	-	4 h	-	54 h (Reduced hours)	-	4 h	-
McGill University (Montreal, Canada)	20 h	-	-	-	2 h	-	Virtual prosection	-
Medical University of Vienna (Vienna, Austria)	27 h	-	-	-	100 h	-	10 h (Virtual prosection)	-
National Taiwan University (Taipei, Taiwan)	150 h	-	-	-	150 h	-	-	-
University of Cambridge (Cambridge, UK)	104 h	-	20 h	-	84 h (Reduced hours)	-	64 h	-
University of Copenhagen (Copenhagen, Denmark)	24 h	-	58 h	-	6 h	-	58 h	-
University of Helsinki (Helsinki, Finland)	12 h	-	6 h	-	-	-	6 h	-
University of Paris (Paris, France)	(Fully virtual; 3D Atlas or imaging only)							

delivery formats included full dissection, hybrid (virtual, dissection-, and prosection-based), prosection only, and no laboratory exposure at all during the pandemic.

Comparisons between pre- and post-COVID-19 formats demonstrated that at least seven schools added a virtual component and/or reduced the course contact time with human cadavers during the pandemic. Columbia University did not offer students any exposure to human specimens at the time of the survey, but subsequently did. The University of Paris did not offer hands-on dissection before or during COVID-19. King’s College London taught a virtual prosection class during the pandemic. One school’s anatomy course was not affected by COVID-19 (National Taiwan University), where teaching continued in an unchanged format (full dissection without prosections).

Initiation of Reflection on the Topic of Death

In total, 217 students across 13 universities completed the survey. Out of that, 105 students indicated that they had dissected (Group 1), 21 had a hybrid dissection- and prosection-based course (Group 2), and 80 noted that they had no dissection-based experience (Group 3) at the time of the survey (Table 3). At the time of the survey, a total of 149 students responded that they had exposure to human cadavers or anatomical specimens (Group A), and 52 indicated that they did not (Group B; Table 4). Note, however, that not all students responded to this question. In addition, 11 participants (health professions students) had no anatomy course at all and therefore were excluded from further analyses. Response rate after accounting for the excluded control group was high; 201 students out of 206 responded to the exposure question.

There was a discrepancy caused by students indicating that they had a dissection-based course despite not having had any actual exposure to human cadavers or anatomical specimens. This difference stemmed from the fact that the survey was taken at too early a time point in the anatomy course for some students. While their schools may have offered dissection later in the curriculum, they had not yet had any physical contact with human cadavers at the time

Table 4 Comparison between groups based on their exposure to a cadaveric specimen in the anatomy course at the time of the survey. Some students did not respond to this question ($n=201$ responded). When comparing responses from students who had exposure to a cadaveric specimen versus students without exposure there was a significant difference between the two groups ($P=0.0001$). More students in the exposure group felt that the anatomy course led them to reflect on the topic of death

	Group A Exposure to cadaveric specimen	Group B No exposure to cadaveric specimen	Total
Reflection on death initiation	113 (76%)	24 (46%)	
No reflection on death initiation	36 (24%)	28 (54%)	
Total	149	52	201

of the survey. Therefore, the main analysis was based on students’ responses indicating if they had exposure or not at the time of the survey and the two groups (exposure to human cadavers and no exposure to human cadavers) were compared (Table 4).

Significantly more students who had exposure to human cadavers or anatomical specimens reported that the course did initiate thoughts about life’s passing, compared to students who did not have this exposure ($P < 0.05$; Table 3). Of note, there were a number of students who did not think that the anatomy course inspired them to think about the topic of death, despite being exposed to a human cadaver or anatomical specimens ($n = 9$). Furthermore, a high number of students did not have any exposure to human cadavers, yet they felt that the anatomy course did initiate reflection on this topic ($n = 24$; Group B; Table 4).

Two Chi-squared tests of independence were performed. The first was to assess the relationship between anatomy course format and themes on death and life shared by the students in the post-course reflections; the second was to assess the relationship between the students’ exposure to cadaveric specimen and the same themes on death and life. There was a significant

Table 3 Comparison between different groups based on anatomy format. There was a significant difference between student responses in the dissection course and students with no dissection course, regarding the initiation of the reflection on death ($P=0.023$)

	Group 1 Dissection course	Group 2 Hybrid dissection- prosection course	Group 3 No dissection course	No anatomy course	Total
Reflection on death initiation	79 (75%)	15 (71%)	45 (56%)	1 (10%)	
No reflection on death initiation	26 (25%)	6 (29%)	35 (44%)	10 (90%)	
Total	105	21	80	11	217

relationship between course format and reflection themes ($X^2(21, 667) = [32.49]$, $P = [0.10]$). There was also a significant relationship between exposure to cadaveric specimen and reflection themes ($X^2(14, 654) = [75.03]$, $P = [0.05]$).

Themes About Reflection on Death

When students were asked to identify which of the suggested themes were most associated with their own reflections on the topic of death, *Dignity of Life*, *Fragility of Life*, and *Dichotomy of Body and Soul* were the prevalent themes that students identified with. A statistical comparison to determine whether the distribution of different themes was dependent on exposure to human cadavers revealed no significant differences between the two groups (exposure versus no exposure to a cadaveric specimen), indicating that the overall thematic content (representative of the depth of the reflections) from each group was not dissimilar (Fig. 1). However, a significance of $P < 0.1$ was observed between the groups.

When comparing dissection-based courses to hybrid courses within the group that did have exposure to cadaveric material, no statistically significant differences in themes was observed (Fig. 2).

Discussion

The current study emphasizes the importance of anatomy dissection courses for promoting beneficial outcomes of the hidden curriculum, and it offers quantitative support to previous observations that dissection-based anatomy courses and exposure to human anatomical specimens can help students to initiate reflection on the topic of death [34]. This follow-up study shows that courses that do not offer exposure to human remains via dissection- or prosection-based components have a lesser likelihood of supporting students in their reflection on this topic and their subsequent development of non-traditional discipline-independent skills. Overall, these findings may have implications for the future of anatomy courses as the COVID-19 pandemic restrictions begin to be lifted in many countries.

Anatomy Courses and the COVID-19 Pandemic

During the pandemic, many anatomy courses had to temporarily discontinue in-person dissections for the first time. Prior to the above, some institutions had already successfully implemented anatomy courses that omitted full hands-on cadaveric dissections, citing resource constraints such as budget reductions, or the lack of expert

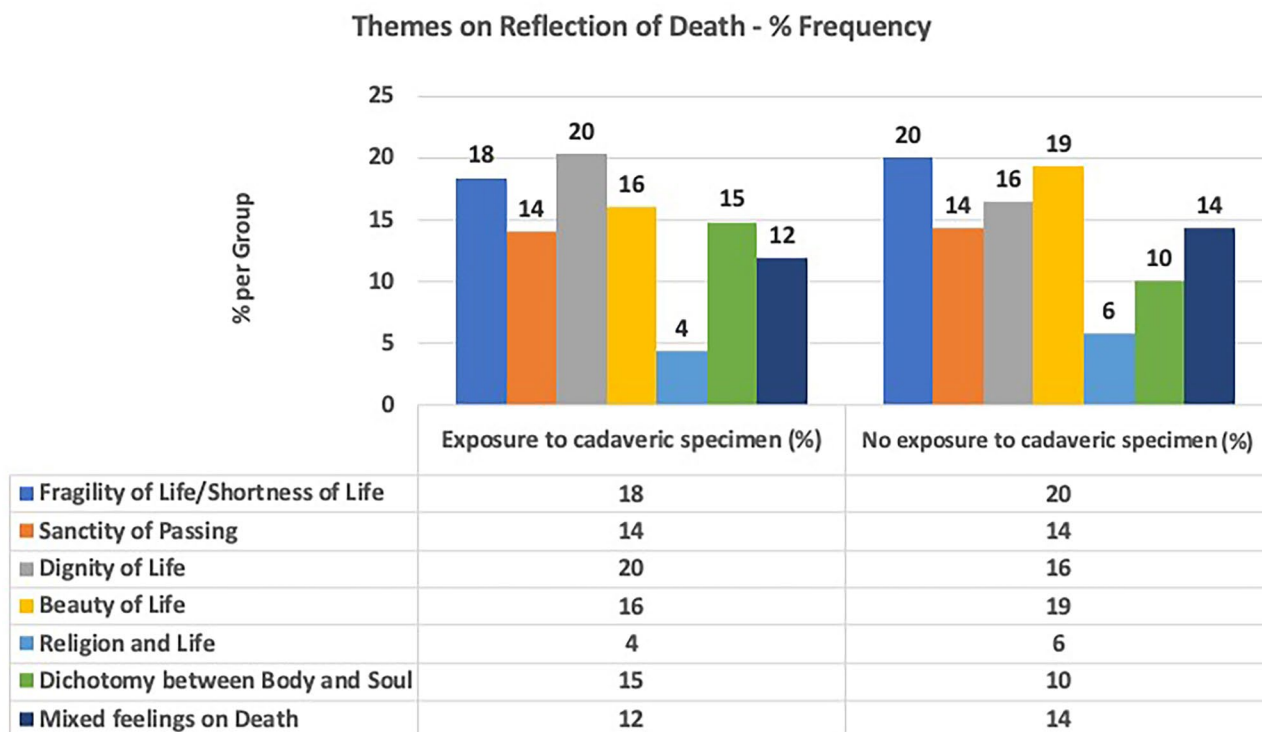


Fig. 1 Comparison of themes of students who had exposure to cadaveric specimens and students who did not have exposure

Themes of Reflection on Death (% distribution in each group)

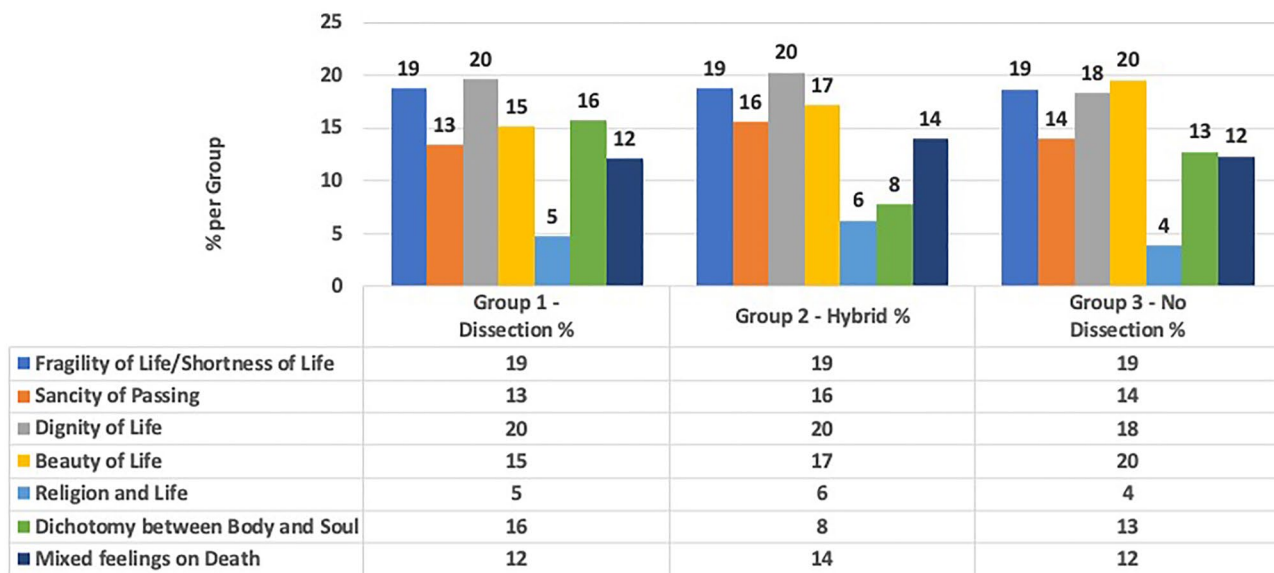


Fig. 2 Comparison of groups of students who dissected or had a hybrid course or no hands-on dissection course

faculty members [37]. Virtual 3D imaging technology has significantly improved and is becoming more readily available and utilized. Although there is still limited data available and the debate about the overall impact these technologies have on students’ learning persists [4, 38–53], the recent forced reductions of comprehensive dissection-based anatomy courses may encourage educators to include virtual 3D imaging technology in order to supplement their laboratory components. If virtual and 3D teaching are well received and result in comparable examination outcomes during this period, some institutions may consciously decide to reduce or omit cadaveric dissection altogether to save resources in the future [54]. Furthermore, an increasing shortage of expert faculty in anatomy education with skills in dissection may lead to decisions to not reintroduce dissection courses after the pandemic. Therefore, full hands-on cadaveric dissection risks becoming a relic of the past, which would reduce students’ exposure to experiences that encourage reflection on the topic of death that is beneficial for their future as healthcare professionals. When comparing the formats of anatomy teaching between the different schools in the present study, only one out of 13 schools did not offer any exposure to a cadaver even prior to the pandemic. A follow-up study is needed to explore how many of the schools that changed their teaching formats during the height of the pandemic reverted back to their original formats of teaching with hands-on cadaveric dissection and whether some schools instead modified their courses to have shorter dissection times or complete omission of dissection and/or cadaveric exposure.

Hidden Curriculum

Studies have shown that the hidden curriculum associated with anatomy courses is very extensive and goes well beyond the boundaries of the overt teaching of anatomical facts and concepts [6, 13, 14]. The non-traditional discipline-independent skills encouraged by the initiation of reflection about the topic of death such as, empathy, compassion, and ethics are important learning objectives that anatomy courses can provide [17–20, 23–25]. These skills are often not specifically taught or addressed in other subjects in medical or dental school, particularly in the early preclinical years. These often-called “soft” skills are typically not evaluated or assessed; however, students are expected to have obtained these competencies by the time they enter their clinical years or at least before they graduate. The authors are concerned that the generation of health professions students who have been taught mostly online may lack an early transformational encounter with death and therefore miss out on an important developmental opportunity.

Traditionally, medical schools build upon the skills that students obtain in their preclinical years as they progress through to their degrees. The long-term impact of deficiencies in these skills may not become evident until years into the future—perhaps not even until students enter their clinical years or after graduation. Therefore, the authors suggest that if cadaveric dissection was omitted during the pandemic, curricular enrichment to include teaching and reflection on the topic of death outside of the anatomy course is needed. Supplementing students’ learning with

other activities that can enhance empathy, compassion, and ethics in the years after the pandemic is vital—potentially via courses in the overt medical curriculum. This study indicates that without exposure to human cadavers or anatomical specimens, there is a lesser likelihood that students will think about the subject of death. While empathy, compassion, and teamwork may be incorporated into other subject matters, the very sensitive topic of death may be difficult to initiate without the exposure to a deceased human being. The authors suggest that exposure to other experiences (e.g., a visit to a hospital morgue, an internship in a pathology autopsy department, or work experience in a funeral home) in combination with reflective writing exercises may be a way to incorporate this topic into the curriculum if anatomy dissection is omitted. While elements of autopsy approaches have occasionally been offered in the past, the focus was often on the autopsy experience, and the reflection on death within this experience is currently not part of a standard curriculum [55–60]. Further research is needed before alternative experiences are instituted.

Initiation of the Reflection on the Topic of Death

The first encounter with death is challenging for young students [23, 61]. Although previous studies have shown that many students have had experience or encounters with death prior to the start of the anatomy course [24, 62], it has become less and less likely in this modern era that a young person in their late teenage years or early 20 s has encountered death. Improved medical care, times of peace, and rare epidemics make it more likely that today's students' grandparents are still alive, and any previous experiences that they may have had with death were most likely due to unusual or tragic circumstances. However, the recent pandemic may have changed young peoples' experiences with death, and it will be important to follow up with student populations in the global health professions to determine if the pandemic has initiated reflection on the topic of life and death. Nevertheless, for many students, the cadaver laboratory and dissection-based anatomy courses will remain their first contact with death and an environment in which they have the opportunity to intensely reflect on this topic [62].

Despite having had exposure to human cadavers, there were some students who did not think that the anatomy course inspired them to consider the topic of death. This may have been due to a variety of reasons such as young age, cultural avoidance of the topic of death, a perceived professional expectation to hide emotions, detachment as a coping mechanism, a regard of the cadaver as a patient/mentor/teacher and not as a deceased person, and other factors [63–65]. This finding confirms observations from a study prior to the COVID-19 pandemic that some students

may avoid this topic despite having access to a full-body human cadaveric dissection-based course [34]. Thus, further investigation is needed regarding how to persuade these future medical and health professionals to reflect on and discuss the sensitive topic of death.

In contrast, there were students who did not have any exposure to human cadavers or anatomical specimens, yet they felt that the anatomy course still helped them to initiate reflections on this topic. An explanation for this finding is that by thinking of the human body donors or being exposed to photos of anatomy laboratories online, some students will reflect on this topic due to the historical association of the anatomy course with cadavers and death. If anatomy is increasingly taught without any human cadavers or human remains, this historical association will fade among the following several generations of students. Thus, preventive measures (e.g., inclusion of the history of anatomy teaching and body donation in anatomy courses) should be considered now.

Themes About Reflection on Death

It was interesting to observe that the depth and themes of the reflections were similar in all students that reflected on this topic. However, it appears that once the students initiated their reflection on the topic of death, there was no significant difference in the types of themes that they focused on. Nevertheless, there may have been slight differences in the individual context and depth of their reflections as shown in our analysis. *Dignity of Life* and *Sanctity of Passing* were important topics the dissecting students felt that the anatomy experience led them to think about. Introducing a young person to value life and to think about death can be essential on their path to maturing in their career as a healthcare professional. This thought process of realizing the “gray zone” between the physical body and the soul of a person may trigger thinking in students that can help them to mature and look beyond a patient's physical ailments towards a holistic approach in medicine [66–70]. Such reflection is difficult to initiate without some exposure to, or experience with death.

Of further note is the framework of the international exchange program, which included small group peer discussions about the respective anatomy courses at schools in different countries. These discussions often shifted into a conversation about body donation (anecdotal observation) and may have influenced students who would have otherwise not reflected on the topic of death. Thus, more students indicated they reflected on this topic (especially, those who did not have exposure to human cadavers) and may have felt that the course initiated their reflections on the topic of death. However, without the prior peer discussion, this may not have been the case.

As restrictions on anatomy courses continue to encroach on teaching time and resources [71, 72], the authors feel that a network of international collaborations among anatomy and medical educators, such as the ICEP, can help with teaching anatomy in the twenty-first century, particularly, regarding “soft” skills development and other areas of the hidden curriculum.

Limitations

A major limitation of the study is the setting of the project and its timing in the virtual international program. Because there was no timeline given with regard to submitting the survey, some students began discussing this topic in small groups prior to submission of the survey. Therefore, a small number of students who did not dissect may have been influenced by their interactions with their peers. A follow-up study that excludes students who have had prior discussions about this topic is needed.

Furthermore, because many of the participating schools resorted to virtual teaching during the pandemic, it will be important to study if actual physical exposure (e.g., being in the same room, touching, and dissection experience), versus online visual exposure, to human bodies and remains has an impact on the students’ experiences.

Conclusion

Anatomy dissection courses are important for the initiation of students’ reflections on the topic of death. This study suggests that eliminating the opportunity for students to interact with human cadavers during COVID-19 resulted in insufficient reflection on this topic by preclinical students. While there are alternative ways to introduce the topic of death to students, the experience with human remains in the anatomy course cannot easily be reproduced for many reasons. Further research is needed before such alternatives should be considered or instituted.

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Declarations

Ethics Approval Ethical approval was obtained at Columbia University (IRB—AAAS0074), McGill University (IRB Study No. A07-E54-17B), and the National Taiwan University (IRB—202001069 W).

Consent to Participate Obtained as part of student questionnaires per IRB.

Conflict of Interest The authors declare no competing interests.

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