

FOUNDATIONS FOR A LIFETIME: A QUALITATIVE
INQUIRY INTO THE RECOLLECTION,
RECONSTRUCTION AND MEANING-
MAKING PROCESS OF CADAVER
DISSECTION

by

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ABSTRACT

Cadaver dissection has been a central part of the education of medical professionals for centuries. Throughout that time, anatomists have claimed that dissection is a learning experience rich with life lessons encompassing more than simply gross anatomy. Yet, no published empirical data exist of the long-term impact that dissection has on medical professionals. The objective of the current study was to explore the aspects of cadaver dissection that remain salient following the transition from medical student to medical professional. This qualitative research utilized grounded theory methodology exploring the autobiographical narratives of physicians ($n=38$) 5 to 57 years postgraduation. Data were drawn from multiple sources: interviews, written reflections, focus group, and archival data. Four interconnected themes emerged from the data. They are (a) Working with Peers, (b) Future Learning, (c) Patient Care, and (d) Confidence. Foundational learning for the future was the overarching core concept that connected the multitude of experiences within the dissection laboratory, and each of the four themes played a specific role within that concept. Implications of these results add to the pedagogical value of dissection. The consolidation of the important aspects of healthcare reflected in the four themes arising from the data provide empirical evidence that dissection does in fact offer a multifaceted learning experience as noted in the conceptual literature. Although many of the experiences can be acquired in some form or another at

various points through the process of medical education, the gross anatomy laboratory provides a situation where it is possible for all of these factors to occur in unison.

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CHAPTER I

INTRODUCTION AND REVIEW OF THE LITERATURE

Overview

For nearly 5 centuries, medical students throughout the world have learned human anatomy through the dissection of human cadavers (Bender, 2002; Bouchet, 1996).

Certain principles have changed over the years, such as the move from the perception of dissection being a punishment for the deceased to a belief that it is a gift from the donor.

Nevertheless, one central conviction that the medical community continues to hold is that dissection is a rite of passage along the path towards becoming a doctor. However, dissection has never been free of controversy, and that continues to be the case today.

Many have asked if dissection is necessary for students to learn gross anatomy (Guttmann, Drake, & Trelease, 2004). Others claim that dissection is a rich learning experience for students that encompasses more than simply learning anatomy. The central question in the current controversy is, “What do medical students really learn during cadaver dissection?”

The literature surrounding cadaver dissection in the education of medical professionals falls in one of two categories: research and conceptual literature. For the purpose of this study, it is important to understand the published empirical research regarding the use of cadavers in medical education, as well as the extant conceptual literature expressing the opinions held by experts in anatomy and medical education.

Research Literature

It is clear that the exploration of dissection as an educational tool is a fruitful area of research. The use of cadavers in medical education is a nearly universal practice. In 2002 (Drake, Lowrie Jr, & Prewitt), the American Association of Anatomists distributed a survey to 141 allopathic and osteopathic schools in the United States regarding course hour and laboratory activities in gross anatomy, microscopic anatomy, neuroscience, and embryology. A follow-up survey was distributed electronically to these schools in 2009 (Drake, McBride, Lachman, & Pawlina). From the most recent survey, data were collected regarding 65 gross anatomy courses. All 65 of the respondents for gross anatomy reported that some type of cadaver experience was incorporated into the course. When asked what experiences comprised the laboratory component of the gross anatomy course, 49 of the responding schools stated that students participated in a complete dissection, 23 of the schools used a combination of prosection and dissection, and the remaining two schools relied solely on prosection. The primary difference between these two methods of cadaver use is the medical students' level of involvement. In dissection, students themselves cut apart and separate tissues for anatomical study, whereas with prosection, students examine cadaver material that has been dissected by someone else, usually an instructor or laboratory assistant. The average number of course hours dedicated to gross anatomy was 149, down from 196 in 2002. The total gross anatomy course hours ranged from 56 to 231 hours. Laboratory experience was a significant part of the course, taking up an average of 63% of course time. Drake noted a difference in the total number of course hours for those using prosected materials rather than dissection, but this difference was not statistically significant. These results indicate that

gross anatomy instruction, and more specifically cadaver dissection, makes up a substantial portion of the medical school experience for students in their preresidency years.

The research regarding cadaver dissection as a training tool has seen robust movement in recent years. The countries of origin of related research spanned the globe, including North America, Europe, Asia, Africa, the Middle East, and Australia. This research primarily focuses on three major points: the perception of emotional impact of cadaver dissection, the utility of dissection as an educational tool, and the academic performance of those students utilizing one form of gross anatomy instruction (such as dissection) compared to those using another method. The research surrounding the first two focal points tends to take the form of student response surveys, while the latter is studied by comparing scores on practical or national examinations. While a few of the articles focused solely on one area of impact, the majority of the research incorporated two or all three areas of focus.

Emotional Impact of Dissection

One of the more recent areas of exploration in the research has been the study of the emotional impact of cadaver dissection. A number of researchers have acknowledged that there is a psychological and emotional component to the dissection experience. In the late 1980s Horne, Tiller, Eizenber, Tachevska, and Biddle (1990) surveyed 100 1st-year medical students about their level of preparation for and reaction to their first encounter with a human cadaver in the dissection lab. Their results indicated that nearly one third of the students experienced adverse psychological effects following the gross anatomy course, including self-reported depression and anxiety and, in one instance, panic attacks.

Not surprisingly, these results spurred further research into the emotional impact of cadaver dissection. It was concerning to think that a notable portion of educational process could cause psychological harm to a significant number of medical students. However, these findings have not been supported in subsequent studies. One possible reason for this could be that the study results were based on responses to a pre- and postdissection questionnaire administered during the initial dissection class and the 24 hours following the class, thus missing how the experience of dissection evolves with time and experience.

Dinsmore, Daugherty, and Zeitz (2001) published a study that spanned a 4-year period. In that time, medical students were asked to participate in a survey regarding the delivery of the gross anatomy lab experience and, prior to the experience, the perceived emotional impact they expected from the cadaver dissection. A follow-up survey was administered after the experience for comparison. The results indicated that, prior to the experience, the majority of students were “eager to begin/excited,” but 10% felt either “fear/anxiety” or “nausea/disgust.” The follow-up survey indicated that most students viewed their time in the gross anatomy lab as a positive experience. These results have been replicated in subsequent studies. Cahill and Ettarh (2009) assessed the attitudes of medical students at an Irish medical school toward cadaveric dissection. They found no evidence of traumatic distress. In fact, the majority of students did not endorse the dissection experience as stressful but rather found the time to be valuable. Similar findings were revealed by a recent survey of medical students in the UK. The authors controlled for gender, anxiety, prior exposure to dissection, and bereavement (Quince, Barclay, Spear, Parker, & Wood, 2011). Their findings indicated that the majority of

students held a positive view of dissection. Students with high levels of anxiety and recent bereavement were the most likely to express negative sentiments about the dissection experience. It is notable that both recent studies noted that the students felt that they could have been better prepared for the dissection experience. Near identical results were found in a study in Ethiopia (Mulu & Tegabu, 2012) in which students initially experienced apprehension, but following the experience they found dissection exciting and believed it had very important educational value.

In 2008, Arráez-Aybar, Castaño-Collado, and Casado-Morales published a study focusing on death anxiety and emotional reactions to cadavers. They surveyed 425 1st-year medical students from three Spanish schools of medicine. The study found that the majority of students felt curiosity and interest about the dissection process and that the number of students feeling negative emotions decreased significantly over the study period. This seemed to indicate that, for the most part, the students learned to manage these negative emotions; the students who had the highest ratings on the Death Anxiety Inventory maintained the highest negative emotions in the cadaver lab. These results concur with the findings of Dinsmore, Daugherty, and Zeitz (2001) and indicate that the majority of medical students do not have significant adverse negative reactions to cadaver dissection, but dissection does pose a threat to a few students' emotional well-being. Similar findings were demonstrated by Bernhardt, Rothkötter, and Kasten (2012), who surveyed the experience, specifically death anxiety, of 155 1st-year medical students in Germany at the beginning and end of a dissection course. The study found that, prior to the course, nearly 50% of the students surveyed experienced some stress at the idea of confronting the cadaver; but, after the first course, the number of students experiencing

stress dropped significantly and the majority of students found the process to be a positive learning experience. Another study from Germany demonstrated that students' initial experience of distress in the dissection laboratory could be significantly reduced if the students attended an anatomical demonstration course, thus providing early experiences to prosected cadaveric material before being confronted with a complete human cadaver (Böckers, Baader, Fassnacht, Öchsner, & Böckers, 2012).

The experience of anticipatory stress followed by excitement and appreciation of dissection was also supported in two qualitative studies exploring medical students' experiences with cadaver dissection (Lempp, 2005; Skinner, 2010). Lempp (2005) noted that many of the students were originally apprehensive about the idea of dissection, but the majority of students moved to feelings of excitement and enthusiasm. Lempp attributed some of the students' change in emotional state to the attitudes and consideration demonstrated by their instructors. Only about 10% of the students interviewed gave negative accounts of the dissection process. Skinner (2010) found that the medical students used the dissection experience to learn how to balance their respect for the human body, on one hand, with their enthusiasm and negative and uncomfortable dissection experiences, on the other. As with other studies, the majority of students stated that they perceived the dissection experience to be beneficial. One out of the 17 students who participated in the in-depth interviews related experiencing a traumatic incident while dissecting. Yet, that individual stated that, over all, he felt that the dissection experience was valuable and that he would participate again given the opportunity.

Utility of Dissection

The utility of cadaver dissection has been another robust area of research in the field. Skinner (2010) found that the concept of utility played a major role in how medical students learned how to balance respect for the human body. By perceiving the process as useful to their future careers, students were able to work through the uncomfortable aspects of dissection. Earlier research by Arráez-Aybar and colleagues (2004) examined both the perceptions of utility as well as the emotional impact that cadaver dissection has on future medical professionals. The majority of the respondents believed that dissection is a vital ingredient in training medical professionals and developing professional skills. Further research surveyed nearly 600 medical professionals on their views of the relevance of human anatomy in daily clinical practice (Arráez-Aybar, Sánchez-Montesinos, Mirapeix, Mompeo-Corredera, & Sañudo-Tejero, 2010). Not surprisingly, gross anatomy was considered the most relevant basic science taught to future surgeons, but it was also endorsed as a vital component to basic daily medical practices.

Other research has looked at students' perceptions of the utility of cadaver dissection. Azer and Eizenberg (2007) surveyed 475 1st- and 2nd-year medical students at the University of Melbourne regarding their beliefs about dissection's advantages and disadvantages. The study found that 1st- and 2nd-year students differed in their attitudes regarding dissection, with 1st-year students ranking it as the most useful learning tool and 2nd-year students rating it as the second most useful tool after textbooks. Both groups agreed that dissection deepened their understanding of and enhanced their respect for the human body. When considering disadvantages, the students endorsed only two areas of concern: the smell and the difficulty in identifying structures. Both groups of 1st- and

2nd-year students across gender, educational background, and nationality felt that they would be disadvantaged if they did not attend a dissection course, even if provided with other forms of anatomical study.

Such findings have been echoed in subsequent studies. Rajkumari, Das, Sangma, and Singh (2008) surveyed 1st-year medical students at the Regional Institute of Medical Sciences in Imphal Manipur India. The majority of the students endorsed dissection as important and indispensable and superior to studying prosected specimens. When comparing plastinated prosections to hands-on dissection, students in the UK found the plastinates valuable but stated that the experience was compromised and that dissection would have better suited their educational needs (Fruhstorfer, Palmer, Brydges, & Abrahams, 2011). Similarly, a second UK study surveying students' perceptions of multiple methods for teaching anatomy found that dissection was considered the "best fit" overall in meeting learning outcomes because it provided broader learning opportunities (Kerby, Shukur, & Shalhoub, 2011). Similar findings were shown in a study from Poland, which also showed indications that cultural differences may play a role in the perceived utility of dissection as an educational tool (Żurada et al., 2011). In that study, Polish and American students showed a significant preference for dissection over other study techniques, whereas Taiwanese students showed less interest in dissection.

Dissection and Academic Performance

Early research on cadaver dissection focused primarily on the academic performance of medical students who used dissection over some other method of learning anatomy. The classic research conducted by Jones, Olafson, and Sutin in 1978 was one of

the research projects that focused solely on academic performance. For 5 consecutive years, students were randomly assigned to either an experimental group that used multimedia and computer-assisted instruction or to a control group that followed the traditional training methods that included the gross anatomy lab. Both groups had access to cadavers for study and dissection, but dissection was not required for the experimental group. The results of the study indicate that there was no significant difference between the two groups.

A similar change in curriculum was studied more recently by Sargent Jones, Paulman, Thadani, and Terracio (2001). This research examined whether students performed better on their assessment of anatomical knowledge after participating in traditional dissection compared to studying prosection prepared by peers. The students were split into three teams per dissection table. Each team was responsible for six dissections and then required to instruct the other two teams. Following completion of the course, students took the National Board of Medical Examiners (NBME) Gross Anatomy and Embryology Subject Exam. The questions on the exam were coded based on the group that dissected the material the question was based on. The results of the study found statistically significant differences between the scores of the dissectors versus the nondissectors on the practical exams, with the dissectors outperforming the nondissectors. However, the study found no significant difference between the groups on the NBME exam.

Following a change in curriculum that reduced gross anatomy instruction, alumni of the University of Michigan Medical School were surveyed on their perceived preparedness for residency (Bohl & Gest, 2011). Those alums who had participated in

cadaver dissection endorsed a greater sense of preparedness than those who had not taken the dissection course.

A similar area of interest in the research on the use of cadavers is how students actually use the tools available to them in the gross anatomy lab. Winkelmann, Hendrix, and Kiessling (2007) surveyed 371 students in three German medical schools about the amount of time they spent actively involved in dissection. The students were also asked about their motivation, general attitude, and emotional and ethical values as they related to dissection. The course time spent was generally split into thirds, with 33% of the time in active dissection, 27% of the time studying prosected material, and 31% of the time on other activities not related to the cadaver. However, there was a significant individual difference among the students on the allocation of time for active dissection, ranging from 0% to 82%. Student attitude towards dissection was the only positive predictor for involvement in active dissection. The findings suggest that the learning experience in the gross anatomy lab is not a uniform process across students.

Winkelmann (2007) also published a literature review of 14 objective studies examining the effect of cadaver dissection on learning outcomes by comparing students using cadaver dissections to students studying anatomy without dissection. These comparison groups differed from the traditional dissection groups by one of many factors including time spent dissecting, the addition of learning tools such as models and Computer Aided Learning (CAL) programs, and the use of prosection instead of dissection. In all of the studies Winkelmann reviewed, the comparison groups varied on more than one variable. Despite the difficulty in comparing these heterogeneous groups, Winkelmann found that students using traditional dissection had a slight advantage. He

noted that this result is of interest given that the majority of researchers he reviewed developed their research with the intent of supporting a new course design—in other words, with a bias against dissection. However, Winkelmann was clear in stating that he felt that more sophisticated research is needed in order to gain a clearer understanding of how best to teach gross anatomy.

Conceptual Literature

Although research articles make up a notable percentage of the literature in the field of anatomical education, one can also find a number of conceptual and theoretical articles as well as editorial and opinion articles expressing both the pros and cons of cadaver dissection. These conceptual articles espousing a view in favor of the use of dissection give a multitude of reasons to support that point of view. Multiple authors across these articles express similar benefits.

Positive Views of Dissection

The benefit noted most frequently in the articles supporting the use of cadavers is the notion that cadavers offer students a greater understanding of anatomical variability (Aziz et al., 2002; Granger, 2004; Korf et al., 2008; Older, 2004; Pawlina & Lachman, 2004). Human beings display variability across all traits (i.e., physical, emotional, mental), and some authors postulate that this is an evolutionally adaptive response (Aziz et al., 2002; Korf et al., 2008). An understanding of the uniqueness of each human body benefits the medical student in two ways. First, preparing students for bodily variations buffers against misdiagnosis and malpractice due to an unrealistic view of an idealistic “normal” body (Aziz et al., 2002; Granger, 2004). Granger (2004) quoted one student as

saying “for me, one of the most important lessons I learned in anatomy was that a vast range of structures are considered normal (or at least will never cause dysfunction).” In addition to the practical aspect of understanding normal human variation, the concept of individuality adds to the humanistic value of medical practice (Korf et al., 2008; Older, 2004). All patients deserve to be recognized by their physicians as unique individuals. This concept of individualized care is threatened when student exposure to variability is limited by the use of only idealized models and textbooks or a restricted number of plastinations or prosections (Aziz et al., 2002; Granger, 2004; Korf et al., 2008; Older, 2004; Pawlina & Lachman, 2004).

Many authors indicated that a major benefit of cadaver dissection is that it introduces students to human mortality (Aziz et al., 2002; Granger, 2004; Korf et al., 2008; Older, 2004; Rizzolo, 2002). Aziz and colleagues state that one of the purposes of medicine, if not the primary purpose, is the postponement of death. By building the foundation of the doctor-patient relationship with the cadaver, students are forced to contend with their patients’ mortality (Aziz et al., 2002). The emotional responses that students experience as a result of this confrontation with death and dying presents a valuable teaching opportunity (Granger, 2004; Rizzolo, 2002). This experience can introduce future medical practitioners to the notion of humanistic care (Granger, 2004; Korf et al., 2008; Montross, 2009). When given a safe environment to explore their reaction to this deceased “first patient,” students can learn to balance the idea that the cadaver must be objectified as an entity to be observed with emotional distance against the notion that the cadaver must be personalized as a human being to be respected and cared for.

An extension of the “first patient” relationship theory also postulates that full cadaver dissection helps educate students in professionalism (Pawlina & Lachman, 2004). Aziz and colleagues (2002) referred to the physician-patient relationship as the “primacy of the patient.” In other words, the primary purpose of medical school is learning how to care for the patient, and as a result the patient comes first. However, a survey of medical students by Bohl, Bosch, and Hildebrant (2011) indicated that students may actually find the concept of “body as teacher” rather than “body as first patient” to be more beneficial in engendering humanistic values towards future patients. That is, the students in the survey more strongly endorsed a view of the body donor as having an active role as one of their instructors rather than a passive role as a patient.

In addition to improving future relationships with patients, supporters of cadaver dissection also claim that the group work required in the gross anatomy lab encourages learning in peer groups and functioning as part of a team (Granger, 2004). The collaborative atmosphere in dissection is noticeably different from the competitive environment and didactic teaching style that pervades much of the medical school experience. The social bonding and communication that comes from group learning is beneficial to students (Aziz et al., 2002; Older, 2004).

The small-group environment and active participation also helps students to apply medical terminology that they have gathered through rote memorization (Aziz et al., 2002). The active use of the basic language of medicine helps to solidify that knowledge, and the discussion among the members in small-group activities provides this facility with the terminology. It is assumed that, by connecting the concepts to concrete

examples, students are better able to access this information when called upon in future situations (Granger, 2004; Older, 2004).

Further supportive arguments for the use of cadavers state that dissection can enhance practical skills such as hand-eye coordination and manual dexterity (Granger, 2004; Older, 2004). Dissection allows students to learn through active touch and teaches essential skills that are enhanced by the touch-mediated perception of the body (Aziz et al., 2002; Granger, 2004; Korf et al., 2008; Pawlina & Lachman, 2004). By engaging multiple senses, the learning process is enhanced (Pawlina & Lachman, 2004). Students surveyed about their experience using plastinated prosections rather than dissections specifically noted the lack of tactile experience as one of the significant deficits of not having the opportunity to dissect (Fruhstorfer et al., 2011). Korf et al. (2008) praised the benefits of procedural knowledge as reproducible and valuable. They stated that dissection is an “active acquisition of knowledge.” During dissection, the students not only deconstruct the human body, but they must do it in such a way that they can reconstruct it as well.

This constructive learning allows students to test hypotheses actively and learn through deductive reasoning (Korf et al., 2008; Older, 2004). Pawlina and Lachman (2004) echoed a similar belief that one of the benefits of cadaver dissection is that it avoids the “normal education model,” thus encouraging students to hone their observational skills, verify what they have learned, and develop working hypotheses.

Another frequently cited benefit of cadaver dissection is that it allows students to develop a multidimensional understanding of the organization of the human body (Granger, 2004). This is important because, in this era of medical imaging, having an in-

depth understanding of gross anatomy allows for a better conceptualization of in vivo anatomy (Paalman, 2000). Aziz and colleagues (2002) stated that an understanding of anatomy is a prerequisite for the use of diagnostic imaging. A number of authors noted a current trend in medical education towards a cell-based understanding of disease and care; however, research on the molecular level is wasted without an understanding of how microscopic biology relates to the human machine.

Like all areas of higher education, medical schools are faced with political and financial pressures. Financial constraints are often cited as a reason to discontinue the use of cadaver dissection. However, some authors claim that anatomy learned through dissection can actually lead to reduced costs in the long run. Paalman (2000) claimed that a base knowledge of anatomy is a cost-saving strategy as it reduces the likelihood of relying on more expensive diagnostic techniques.

Negative and Neutral Views of Dissection

Despite the many benefits that cadaver dissection is believed to offer, there are plenty of drawbacks as well. In the article supporting the use of cadavers, Aziz and colleagues (2002) listed nine reasons to do away with cadaver dissection: the amount of time needed for dissection; the labor-intensive nature of dissection, complicated by a shortage of anatomists; the requirement of excessive rote memorization; a shortage of cadavers; the misleading nature of cadavers due to postmortem change; the cost to obtain, embalm, store, maintain, and dispose of cadavers; the unaesthetic nature of cadavers; the archaic technology used in dissection; and the potential health hazards to dissectors.

Topp (2004) responded on a point-by-point basis to the positive attributes of dissection noted in Granger's 2004 article. She began by considering the

multidimensional understanding of the human body, postulating that it may be easier for students to grasp a three-dimensional understanding of the body structures by beginning with a simplified prosected model rather than the more complex structures in dissection that must be reduced to simple form. She punctuated the argument with the opinion that prosection is much less time consuming for students. This view has been supported by students who have been educated using plastinated prosections rather than dissection (Fruhstorfer et al., 2011). In response to Granger's argument about touch-mediated perception, Topp suggested that prosections may also be used and that, for certain tissues, embalmed cadavers may give an unrealistic understanding; so unpreserved cadavers or video should be used. Topp agreed that understanding anatomical variation is important but felt that prosections may once again provide a greater benefit, as students are likely to miss variation in dissection, but that instructors preparing prosections may be more likely to detect and preserve variation. In regard to learning basic medical language and team building, these can be done just as well with prosection as with dissection. Practical skills (such as the use of some instruments) may not be learned in using prosection, but other skills such as manual palpation can be taught and can be used in both prosection and dissection.

McLachlan (2004) made an argument for the use of living anatomy in the education of medical students. McLachlan used the program at the Peninsula Medical School, UK, as a basis for his claim. This newly opened medical school decided to rely on living anatomy instead of cadaver dissection. The curriculum consists of 40 class sessions dedicated to living anatomy, using peer examination and life models supplemented by plastic and 3D computer models. Visualization with the life models is

made possible through image projection, “high-verisimilitude body painting,” and ultrasound. McLachlan addressed the concern that students learn 3D mapping of the body more effectively using dissection. He postulated that extensive use of living models and modern 3D reconstruction and imaging are equivalent if not superior to dissection in developing a three-dimensional understanding of the body, also saying that a cadaver’s color, texture, and smell are nothing like those of a living human being. He disagreed with the belief that cadaver dissection enhances humanistic values and an understanding of death because it may actually traumatize or desensitize some students.

Collett, Kirvell, Nakorn, and McLachlan (2009) recently published an ethnographic study of the living anatomy classes McLachlan referred to in his 2004 article. The results of the study indicated that using living models when teaching anatomy fosters increased humanitarian thinking. An unexpected benefit was the communication among the life model, students, and tutors. However, the study focused solely on the benefits of using living anatomy for teaching structure, function, and surface anatomy and did not provide a comparison to the use of full cadaver dissection. As a result, the weaknesses of cadaver dissection suggested by McLachlan could not be confirmed.

Other opinion articles regarding the use of cadavers have remained generally neutral or focused on a small aspect of cadaver use. One example is Bay Boon Huat’s (2007) short opinion piece comparing dissection to Computer Aided Learning (CAL). The author is a full professor of anatomy at the National University of Singapore. He repeated many of the supporting and contrary arguments for and against the use of cadavers found in other opinion articles. Bay noted that some of the specific reasons against the use of cadavers in Asia include a worldwide shortage of qualified anatomists

and the low rate of body donation in Asia. Most cadavers used in Asia still come from unclaimed bodies. In a similar piece, published in a less academic medium, Bay incorporated a more personal voice (2007). The tone of that paper implied that Bay's personal experience with dissection made him a supporter of cadaver-based learning. He closes the paper by saying, "... I certainly would not relish the thought that my attending surgeon has learnt his or her human anatomy entirely from a computer!" (p. 7).

Despite the fact that the majority of the previous articles were based on opinion and not empirical research, the views expressed should not be taken lightly. These opinions are based on personal experiences of individuals considered experts in the fields of anatomy and medical education. As such, these statements contain a wealth of knowledge that can be used to inform the direction of future research. The benefits and drawbacks expressed in these articles provide a foundation from which future research questions and hypotheses may be explored.

One common factor among much of the research and conceptual literature is that the assertions are based on recall of the experiences of cadaver dissection. In the empirical studies, the time between experience and recall varied from a few moments (e.g., Cahill & Ettarh, 2009) to years (e.g., Bohl & Gest, 2011). The opinions expressed in the conceptual literature frequently reflect the authors' recalled experiences of dissection or what they recall observing of others' experience of dissection. As such, memory has thus far played a significant role in the literature on dissection as a learning tool. Therefore, it is prudent to understand the literature on memory and recall.

Literature on Memory

As noted above, many of the empirical studies examined students' recalled experience of their time in the lab, and much of the conceptual literature is based on the remembered experiences of experts in the field of anatomy. Yet, it is not just the anatomists and medical educators who have chosen to share publicly their memories of what they consider a valuable learning experience. Many physicians have contributed to the literature by expressing their opinions based on personal experience with dissection during training (Amadio, 1996; Chen, 2008; Montross, 2008). Before we can explore the recalled experience of cadaver dissection, we must first gain a clear understanding of the concept of memory and the role that it plays in examining this experience.

Defining Memory

At its most basic level, memory is defined as "the records that we form of our experiences. Or, more broadly, the processes involved in coding, storing, and retrieving those experiences" (Lieberman, 2004, p. 41). This definition illustrates that there are, in fact, two distinct ways of looking at memory. One is to consider memory from the vantage point of the biological, that is, the physical processes that occur when creating, storing, and retrieving memories. It is generally understood that memory is distributed throughout the brain and reconstructed when recalled (Lieberman, 2004; Rubin & Greenberg, 2003). This is a complex physiological process and an active area of study.

Yet, it is a second way of looking at memory that is of primary concern to the present study: the subjective process of the internal records we keep of our experiences. This is often referred to as autobiographical memory. Autobiographical memory is the conscious recall of events in one's own life (Baddeley, 1992). It is accompanied by a

sense of reliving actual events that occurred at a specific time and place in one's life (Brewer, 1999). When a researcher asks students whether or not they experienced a sense of anxiety in the dissection laboratory, the researcher is asking the participants to access autobiographical memory. However, autobiographical memories are a broad category that can refer to memories about single moments in time as well as memories encompassing multiple experiences over a long period of time. Regardless of the time period they encompass, these memories are all considered episodic memory. There is also a general sense of knowing that is known as semantic memory (Tulving, 1983). Semantic memory is not attached to memories of specific events, but rather knowledge of concepts. Tulving (1983) added further specificity by referring to auto-noetic and noetic consciousness. The former refers to consciousness in the present moment of a past conscious state, and the latter describes consciousness of semantic memory that leads to the awareness of knowing. The term auto-noetic consciousness captures an additional layer of knowing: It describes memories as they relate to knowing one's self (Gardiner, 2002). We are more than simple machines retrieving stored data; we are aware beings that use memories to build a sense of self (Beike, Lampinen, & Behrend, 2004). For example, the participants in Skinner's 2010 study used memory of their dissection experience to build a sense of themselves as future doctors able to balance the notion of respect for the human body with the invasive tasks required of them as physicians.

The critical link between autobiographical memories and the self are narratives (Fivush & Haden, 2003). The term narrative should not be confused with the same term used in the field of literature. Recollection in autobiographical memories differs from simple story telling, even though both are considered narrative. Recollection involves a

sense of reliving one's own past (Rubin & Greenberg, 2003), whereas autobiographical memories do not necessarily produce coherent narratives. A person may be able to vividly recollect an isolated event from the past without the presence of narrative structure (Rubin & Greenberg, 2003). As such, the term autobiographical narratives will be used in the present study to refer to the structured integration of multiple episodic, self-defining memories used to create a sense of coherence and meaning within an individual's life.

Some authors have suggest that autobiographical narrative is perceived as inevitability false because it is processed through the analytical mind, and the telling of memory in essence destroys it; words are doomed to inaccurate portrayal of the image (Ludwig, 1997). Gazzaniga (1998) voiced this commonly held philosophy that our minds or, as he put it, a portion of our minds that he names "the interpreter," are constantly forming a running narrative of the multiple processes that occur in our brains each moment. However, he says, this narrative is riddled with errors in perception, memory, and judgment. As such, he states that "Biography is fiction. Autobiography is hopelessly invented." (p. 2).

Freeman (2003) offered an alternative to this philosophy, stating that memory is flawed because it forces a bifurcation of truth into historical truth—the realm of reality—and narrative truth—the realm of the fictive. He posited that this is because the term *reality* "is equated with the allegedly raw and pristine, the uninterpreted and unconstructed, the 'real stuff'" (p. 115), but also because the term *reality* is tied to the concept of time, as a string of sequential unalterable events that become *fiction* as soon as a biographer looks back and attempts to impose some order. He asked, instead, that these

terms be reconsidered: “By rethinking the notion of the fictive, there is the possibility not only of “reclaiming” the real—by which I mean restoring to a fuller and more comprehensive range of meaning—but also of establishing a more adequate rendition of what truth might mean in the human realm” (p. 115). Truth in the human realm differs from truth in the material realm, because human truth is infused with meaning. It cannot be weighed on the bifurcated scales of fiction and reality.

Memory is not a dichotomy of true and false. It is a sand dune of ever shifting meaning. Each new event, like grains of sand, builds, settles, and reshapes our awareness of ourselves (Freeman, 2003; Schacter, 1996). In essence, the ground rules of analysis are shifted when one approaches the end goal not as what is remembered, but, rather, how it is interpreted. “Psychic reality is as important as historical truths” (Pillemer, 1998, p. 9). The purpose of the current study is to explore this interpreted reality as it relates to the experience of dissection.

Development of Autobiographical Narratives

Uncovering this psychic reality requires an understanding of its development and subsequent features. The literature surrounding the development of autobiographical narratives is limited. Cognitive psychologists have neglected research on specific life episodes because the outcome of interest in most memory studies is accuracy of recall. Research surrounding autobiographical narrative lacks the quantifiable variables that are often assumed necessary for “true scientific study” (Pillemer, 1998). Pillemer (1998) went further in postulating that study of autobiographical memory has also been neglected because it threatens the notion that “life is thematic, continuous, and predictable,” by giving evidence to the contrary. He stated, ““When we arrive at the

historical truth, our description of a prior event is based on ‘facts;’ when we arrive at narrative truth, our explanation carries ‘conviction’” (p. 10). Yet some empirical evidence examines the factors that contribute to these convictions.

As noted above, autobiographical narratives are a component of auto-noetic consciousness formed from episodic memories (Gardiner, 2002). Episodic memories differ from general memory in that they are personal event memories that are perceived as momentous. They are delimited by a specific place and particular moment in time (Pillemer, 1998) and create a relatively strong life impact despite their short duration.

Imagery also is an important aspect of autobiographical memory because it plays a role in increasing the specific, relived, personally experienced aspect of autobiographical memory (Rubin & Greenberg, 2003). Although vivid images do not guarantee accuracy, people act as if memory for details implies that the central points are remembered correctly. In fact, strong imagery may not necessarily equate to a coherent narrative. For example, dreams may have strong imagery and a strong sense of a lived experience, but they are not coherent narratives.

However, episodic memories that form an autobiographical narrative do not necessarily need to include such specific detail. “The criterion we use to decide when a certain experience has been captured to our satisfaction... depends on continuity and closure and the extent to which the fit of the pieces takes on an aesthetic finality” (Spence, 1982, p. 31). In other words, one knows when a memory is complete not based on an arbitrary level of detail, but rather on an intuitive sense that the memory appropriately captures our experience.

Habermas and Bluck (2000) examined the process of capturing that experience. They noted that individuals are “able to understand and present themselves in biographical terms by coherently organizing recollective memories and other self-relevant information into a life story” (p. 750). This process is broken into four types of global coherence. These are: *temporal coherence*, which involves the sequencing of events in time; *causal coherence*, which is used to explain changes in one’s values or personality as well as to link events among life phases; *thematic coherence*, which involves an analysis of common themes among many different memories; and the *cultural concept of biography*, which examines the cultural norms that dictate which events are incorporated and to what extent they are incorporated into a life story. Inclusion and exclusion of the details that are incorporated into a memory are impacted by all of these factors. If information is not central to the narrative structure, it is less likely to be remembered (Rubin & Greenberg, 2003).

Autobiographical memories are idiosyncratic. While many people may experience an event, it may turn into a vivid memory only for a very few of them (Pillemer, 1998). Events that might seem inconsequential to one person may play a central role in forming a coherent life narrative for another person. In her book, *Too Scared to Cry*, Lenore Terr (1992) recounted her own early childhood experience of sitting in a crowded movie theater watching a newsreel of the Hiroshima bombing. The images that she saw on that screen were so impactful that she credits that moment as a turning point for her that led her down the path of becoming an expert treating childhood trauma. Yet, that moment may have passed without notice to the dozens of other people experiencing the same newsreel.

The final step in incorporating an experienced episode into a coherent narrative is the recall of that memory, but recollection of autobiographical memory differs from the simple recall of general knowledge. Conscious recollection of autobiographical memory is a relatively slow process. Young adults can pronounce a word in 1/4 second, whereas it takes 10 seconds to retrieve an autobiographical memory from a similar word (Rubin & Schulkind, 1997). This phenomenon is intensified when the same task is given to older adults (Rubin & Schulkind, 1997). Age has also been shown to significantly reduce the amount of detail in autobiographical memories (Piolino et al., 2010). Levels of stress may also impact memory recall. In general, high levels of stress impair both working memory and memory retrieval (Oei, Everaerd, Elzinga, van Well, & Bermond, 2006; Tollenaar, Elzinga, Spinhoven, & Everaerd, 2008). However, Tollenaar and colleagues (2009) found no effect on autobiographical memory specificity or subjective experience of the memories when they induced stress through cortisol injections in healthy young men. This indicates that autobiographical memory may work off of different memory processes than general working memory.

Research indicates that the development of autobiographical memories peaks during early adulthood (Berntsen & Rubin, 2002; Elnick, Margrett, Fitzgerald, & Labouvie-Vief, 1999; Rubin & Schulkind, 1997). Early studies indicated that autobiographical memories are most numerous in the immediate past and steadily decline as participants were asked to recall further into their past (e.g., Crovitz & Schiffman, 1974). However, these studies used college aged subjects. When asked to recall vivid or important memories, older adults (i.e., those 35 years of age and older) consistently show stronger recall of events that occurred between the ages of 15 and 30 (Berntsen & Rubin,

2002; Fitzgerald, 1996). This is referred to as the reminiscence bump (Thomsen, Pillemer, & Ivcevic, 2011). This phenomenon has been repeated consistently (Thomsen et al., 2011), and the effect is as strong in the old-old (those over 85) as in middle-aged adults (Rubin & Schulkind, 1997; Webster & Gould, 2007). Consequently, memories of medical school would be expected to be strong regardless of the age of the physician reminiscing about the experience because the events would have occurred during the ages associated with the reminiscence bump.

Additionally, specific memories are over-represented around the beginning points in a life story in which a transition occurs. Research indicates that this is most strongly representative of changes in family and relationship, followed by transitions related to education and work (Elnick et al., 1999). Pillemer (1998) theorized that this occurs at the beginning of life chapters because scripts do not yet exist for the actions that must occur during that point in life. Therefore, vivid memories are created because the information received in that experience assumes greater than normal importance. Pillemer and colleagues demonstrated that, when asked to recall memories about their freshman year, college students were significantly more likely to produce memories of events that took place during the 1st month of college (Pillemer, Rhinehart, & White, 1986). A follow-up study of alumni 2, 12, and 22 years out of college showed same the effect (Pillemer, Goldsmith, Panter, & White, 1988). This remained true regardless of whether they were asked about “influential” as well as first memories (Pillemer et al., 1988). Likewise, the dissection experience occurs during the 1st year of medical school at the site of interest for the current study. These memories would, therefore, constitute the beginning of a life chapter.

Directive Function of Memory

The existence of the reminiscence bump indicates a directive function of autobiographical memory. Pillemer (1998) referred to these clusters of memories reflected in the reminiscence bump as “episodic nodes” and stated that “memorable episodes provide an organizational skeleton for the production of extended autobiographical memory narratives; they guide or ‘direct’ the reconstruction and retelling of life histories.” (p. 96). Mackavey, Malley, and Stewart (1991) echoed this theory and stated that memories of consequential experiences play a pivotal role in explaining Erickson’s theory of personality development. Empirical research further supports this assertion that memories from late adolescence and early adulthood play an active role in personality development as individuals were more likely to relate memories of activities involved in establishing normative adult social roles (Elnick et al., 1999).

Individuals react to stimuli in the present moment, but “the meaning and significance of experience often emerge or are transformed in retrospect, when that experience assumes its place as an episode in an evolving narrative” (Freeman, 2003, p. 123). Thus, future reactions to stimuli are impacted by the meaning one makes of an event. Memorable events become influential through a constructive process in which the individual interprets the events as they apply to his or her own life. It is the memory, not the event, that is influential. Memories are not simply passive records, but rather active agents in directing future actions (Pillemer, 1998, 2003).

Individual differences impact the directive functions of memories. Webster and Gould (2007) demonstrated that reminiscence plays a different role depending on the age of the individual. Older adults tended to reminisce as a social function that teaches and

informs others and maintains intimacy, whereas younger adults used reminiscence as a vehicle for self-exploration. Gender also has been shown to impact the style of autobiographical memories. While men and women tend to reminisce about the same types of past events (Elnick et al., 1999), women tend to include more specific episodic details in describing their memories and retrieve these memories more frequently in daily life (Pillemer, Wink, DiDonato, & Sanborn, 2003).

Across gender and age, individuals tend to reminisce about primarily positive memories. Berntsen and Rubin (2002) demonstrated that individuals were twice as likely to spontaneously produce happy memories than unhappy or traumatic memories when cued to reminisce about the past. They also found that the reminiscence bump was only present for happy memories when cued to reminisce about the past. They hypothesized that this is due to reduced rehearsal of these memories due to life changes or social censure.

Further research supports the notion that social cues impact which directive messages an individual attends to within a set of memories (Van Swol, 2008). Van Swol (2008) demonstrated that, even though groups in general have better memory because they can pool memories, involvement in a group significantly increases the number of false memories endorsed by participants. Once a false memory is vocalized by one or more members of a group, it induces doubt into the validity of other memories. While it has been noted previously that the value in autobiographical narrative is not in recounting historical truths, but rather in identifying meaning, the impact of group interactions demonstrated by Van Swol is important to note because it highlights the impact that social groups have on which memories are attended to. Furthermore, Verberg and Davis

(2011) demonstrated the impact of social groups on the construction of autobiographical narrative. Their qualitative study examined how the relatives mining disaster victims unintentionally formed cooperative narratives of the events. As such, shared experiences not only form narratives that inform future individual actions, but also impact the social mores of the group from that point forward.

In summary, memories of dissection are likely to play a significant role in the formation of autobiographical narrative. These memories would have a directive function for future actions as a physician, but the way in which the narrative is recalled would change depending on the current life context. Social groups (e.g., physicians' area of specialization or cohort) would impact which memories are attended to in recall.

As noted above, previous research on dissection has relied heavily on memories of the experience. However, memory has not been an explicit variable in those studies. Exploring memory as a part of the experience of dissection as a learning process has allowed for a deeper understanding of the experience of dissection as a whole.

Purpose of This Study

The empirical research surrounding cadaver dissection has added to the general knowledge regarding the emotional impact, utility, and academic benefits of cadaver dissection in medical education. Students' perspectives have been examined, as well as their reactions to different teaching modalities. The purpose of the gross anatomy labs is to prepare future physicians for the many diverse roles they will take on once they leave medical school. The impact that the dissection experience has on these future roles has been thoroughly debated in the conceptual literature. Experts in the field describe the dissection process as a rich and complex experience. Yet these experts are made up

primarily of anatomists, biologists, and physiologists who have a vested interest in maintaining dissection's traditional role in medical education, but the physicians who experience the training are the true holders of knowledge about dissection's level of richness, complexity, and utility.

In order to understand the learning process, it is important to understand the meaning that is made of that learning experience. Yet, as the literature on memory demonstrates, meaning is often made only through retrospective analysis once an event can be placed within a broader autobiographical narrative. Therefore, it is reasonable to expect that the best way to understand the learning that occurs during the dissection process is to first explore the meaning that physicians have made of that process by examining the ways in which they recollect and reconstruct memories of their cadaver dissection experience. Who better to answer the question of what students learn during dissection than the students who have grown from that experience into active health care providers?

The purpose of the current study was to expand on the preexisting research by developing a conceptual model based in grounded theory methodology. This model was developed through an examination of the autobiographical narratives of physicians who had experienced cadaver dissection as medical students and the meanings they have subsequently made of that experience. The questions guiding this research were:

- 1) What impact do physicians believe that cadaver dissection has had on their development as medical professionals?
- 2) What aspects of the dissection process remain salient following the transition from medical student to medical professional?

CHAPTER II

METHOD

In order to explore the research question of what students learn during dissection, I utilized qualitative methodologies as outlined in this chapter to develop a conceptual model of the salient learning experiences associated with dissection. In this chapter I will define the paradigm underpinning my research, including the ontology, epistemology, axiology, and rhetorical structure supporting my paradigm of choice. I will then explain the particular methodological approach I used in the research. This will be followed by an explanation of my place within the research and how I approached subjectivity. The chapter will close with sections describing the participants, sources of data, and the methods of data analysis.

Paradigm Underpinning the Research

In this research I used an interpretivist paradigm to gain a greater understanding of the learning process that occurs during dissection. This understanding came from exploring the subjective meanings that medical professionals make of their prior dissection experience and how this experience is incorporated into their identities as health care providers. My decision to use an interpretivist paradigm was based on the belief that each person's experience defines a separate, unique personal reality. As noted earlier, previous research has indicated that the learning process in the gross anatomy

laboratory is a multifaceted experience. Additionally, event memories, such as those associated with dissection, are idiosyncratic; even though all alumni from a particular school participate in the same general laboratory experience, each individual recollects the experience from a unique perspective that acts as a framework for the meaning they make of the experience. These meanings may be negotiated within the social context of medical school, particular fields of specialization within medicine, and the medical profession at large. This research was inductive in nature and was not based on a preexisting theory. The research mentioned previously was taken into account when developing interview questions, but the participants' perceptions of their experiences guided the development of a conceptual model of the learning process.

In order to gain a greater understanding of participants' worldviews, I attempted to minimize my distance from the dissection process. However, I valued maintaining some level of objectivity. As such, I remained cognizant of the fact that it was my status as an outside observer that originally brought me into the gross anatomy laboratory. This position allowed me to observe medical students as they performed dissection and to study the experience of 1st-year medical students in the gross anatomy laboratory. This combination of forced objectivity and a desire for inclusive subjectivity is compatible with qualitative research. The interpretivist paradigm allows researchers to strive for an inclusive understanding of the multiple realities encapsulating a concept, while also remaining aware of their own beliefs and values (Creswell, 2007; Ponterotto, 2005).

From this standpoint, it is assumed that researchers' values exist in tandem with those of the participants (Morrow, 2007). Because the information gleaned from the participants is filtered through the researcher's subjective understanding of reality, full

neutrality and objectivity cannot be achieved. Given this understanding, I attempted to bracket my preexisting biases, assumptions, and beliefs in order to achieve the purest possible understanding of the participants' points of view. The specific methods for this bracketing will be discussed in greater detail below.

Research Design

This study used a grounded theory design in order to build a conceptual model of the learning process in the gross anatomy laboratory. This conceptual model was based on the laboratory's place within the autobiographical narratives of physicians who trained using cadaver dissection. Grounded theory employs a technique of constant comparison between information gathered from the participants and the theory that emerges from those data. In this way, the physicians themselves can answer the question noted earlier that is plaguing the field of anatomical education: "What do medical students really learn during cadaver dissection?" I believe that the most efficient way to address this question is to build the model from the ground up. The bulk of the research found in the literature works from theories of learning based on deductive reasoning. Although these certainly have their benefits, I feel that they miss a large swath of valuable information and do not address potentially valuable variables that an in-depth, data-rich qualitative study would bring to the forefront.

One major concept underpinning grounded theory is the ultimate intention of inductively producing innovative theory that is "grounded" in the data (Fassinger, 2005). The basis behind this intention can be either that there is no theory that explains a particular phenomenon or that the theories that do exist only partially capture the phenomenon in question. The latter is the basis of the current study. The review of the

literature indicates a discrepancy between the current research regarding cadaver dissection in medical education and the opinions expressed by experts in the field. However, pure grounded theory methodologies are aimed at theory generation (Glaser, 2002; Strauss & Corbin, 1997). That is, the intent of creating a theory is to predict behavior or events. Rather, the intent of the current study was to produce a conceptual understanding. This conceptualization will still be grounded in the data but is not intended to create a substantive theory. As such it is appropriate to define this study as building a conceptual model based on grounded theory methodologies (Jabareen, 2009).

The variables often missed in research that uses deductive theory are more readily identified when the multiple perspectives of participants are taken into account. Many qualitative research designs are emic in nature, incorporating the views of the participants; grounded theory is no exception. Charmaz (2006) highlighted the importance of learning about the experiences of individuals who are embedded within hidden networks, situations, and relationships. Thus, taking into account the full experience of the anatomy laboratory as recalled by the alumni, embedded within the social constructs of the field of medicine, I was able to capture those variables that traditional quantitative methods might miss.

This process lends itself naturally to the use of grounded theory methodology because this methodology is rooted in sociology. Incorporating the meanings that form through the fluid and dynamic processes of interpersonal relationships is a keystone of grounded theory (Fassinger, 2005). Grounded theorists attempt to discover how people define their reality on the basis of the individual's interpersonal interactions by thoroughly exploring the meanings created in those interactions (Cutcliffe, 2000). Those

meanings form, mature, and solidify as additional experiences over time are combined to form a narrative context. An intrinsic understanding of one's relative reality is formed through the process of recollection. I explored meanings physicians create through their recollection of interactions tied to the dissection process, both during and subsequent to their time in the gross anatomy laboratory.

Researcher as Instrument

In qualitative methods, the researcher can take on varying forms of inclusion within the research (Patton, 1990). The level of inclusion falls somewhere on a continuum of no inclusion, as is the goal in positivist research, to full and complete inclusion as is often seen in research based in critical theory. Although it is my goal to minimize the amount of influence I exert in the outcome of the research, the interpretivist paradigm from which I am working allows me to acknowledge that I will be an active influence in this research. Therefore, I will exercise the reflexivity that is expected in qualitative research and present the context in which I approach this research.

My formal training is in psychology and educational psychology. Beginning in the fall of 2008 I began focusing my research on pedagogy in medical education. At that time I was invited to act as a research assistant in the Department of Neurobiology and Anatomy at the University of Utah and to perform an extensive review of the literature concerning the use of cadaver dissection in medical education. Subsequent to the literature review, I completed a qualitative study examining the experience of 1st-year medical students in cadaver dissection. However, I still possess no formal training in medical pedagogy. Presently, I am acting as intern for the University Counseling Center at Virginia Commonwealth University. As a function of this role, a portion of my time is

spent providing individual and couples therapy to 1st-through-4th-year medical students at the Medical College of Virginia. Additionally, my primary focus for outreach services is on medical student wellness. In this role I teach a course on mindfulness training for medical students and provide wellness workshops to the student body at the School of Medicine. These multiple roles give me general knowledge about the process of completing medical school and specific knowledge about the processes involved in the gross anatomy course. I hold the position of both insider and outsider in the process of medical education.

The theories underpinning qualitative research also allowed me to acknowledge my subjectivity. I accepted that it was unfeasible for me to maintain complete objectivity in my research. However, this acceptance allowed me to take steps to manage my subjectivity (Moustakas, 1994). These steps included bracketing my preconceived notions of the topic at hand by keeping a self-reflective audio journal. I used this journal to express my thoughts and feelings about the research as I moved through the process. I also used my peer research team as a tool in managing subjectivity. I met with this team of qualitative researchers every other week throughout the process of data collection and analysis. In these meetings I discussed my progress, goals, and concerns and remained open to any feedback my peers were able to provide.

Participants

Setting

This study was conducted at the University of Utah School of Medicine, which is housed within the University of Utah. The University is a level-one research university (Carnegie RU/VH) located in Salt Lake City, Utah, a metropolitan area in the western

United States. The School of Medicine is responsible for the predoctoral, graduate, and continuing education of physicians, as well as the graduate and undergraduate training of other health professionals. The mission statement of the School of Medicine asserts that the size and type of educational programs implemented by the school are guided primarily by the needs of the State of Utah and surrounding states. The incoming class size using cadaver dissection has ranged from 49 in 1950 to 102 in 2010.

Participants

Participants for this study were drawn from the alumni of the University of Utah School of Medicine classes of 1954 through 2006 (i.e., those who participated in the human gross anatomy course between the years 1950 and 2002). The demographic make-up of this group is slightly disproportionate by sex, race, and ethnicity compared to most medical schools in the United States, with a higher than average percentage of males of non-Hispanic European-American descent (Association of American Medical Colleges, 2008). However, because the intent of qualitative research is an elucidation of the particular and specific rather than generalizability, the demographic discrepancy did not negatively impact the study (Pinnegar & Daynes, 2006).

The following is a summary of the demographic information of the participants. The demographic data provided are intentionally limited in order to preserve the anonymity of the participants. Due to the historically heterogeneous nature of the population of medical students at the University of Utah School of Medicine, students from minorities can be easily identified. As a result, the demographics revealed in this study are limited to the decade of graduation and area of medical specialization of the participant. However the cultural diversity of the participants in the individual interviews

and focus group are reflective of the historical demographic makeup of the school of medicine as a whole. Table 2.1 presents the participants for each data source distributed by year of graduation, the pseudonyms chosen the participants, and each participant's area of medical specialization. The total number of participants and number of participants by gender are also provided. Additional information about the pseudonyms will be presented in the section regarding ethical considerations of the study.

The sample size for this research was gauged by redundancy and saturation of the data. First, it was based on the amount of data needed to saturate the categories that emerged from analysis of the data. In other words, I found as many incidents, events, or statements as possible to provide support for the categories (Creswell, 2007). I also looked for redundancy in the data, where additional interviews failed to provide either new themes or disconfirming evidence of existing themes. Redundancy and saturation were achieved with 27 individual interviews, 1 focus group, and archival data consisting of 236 images from medical class yearbooks.

Selection Procedures

Qualitative research differs from quantitative research in its process of selecting participants. The purpose of qualitative research is to gain an in-depth understanding of a particular event or phenomenon (Patton, 1990). As a result, the selection process is purposeful rather than random. As was noted above, the participants for this research were drawn from the alumni who participated in the Human Gross Anatomy course between the years 1954 and 2002. Thus, the selection procedure was also criterion-based, with the criteria for selection being participation in the aforementioned course and a minimum of 5 years' experience as a practicing physician. This limitation was based

Table 2.1

Summary of Demographic Information of Study Participants

Data Source	Year	Pseudonym	Area of medical specialization
Focus group	1960-1969	Dr. Juniper	Family Practice/ Aviation Medicine
		Dr. Pulver	General Surgery/Emergency Medicine
		Dr. Les	Family Practice
	1980-1989	Dr. Gold	Psychiatry
	1990-1999	Dr. Silver	Pediatrics
Individual interview	1954-1959	Dr. Hickory	Internal Medicine
		Dr. Pine	Pediatrics
		Dr. Blue	Preventive Med/Aerospace Medicine
		Dr. Iron	Public Health/Preventive Medicine
	1960-1969	Dr. Beige	Surgery
		Dr. Nickel	Internal Medicine
		Dr. Sunny	Family Practice
		Dr. Tin	General Surgery/ Transplantation
		Dr. Spruce	Pediatrics
	1970-1979	Dr. Azure	Hematology-Oncology
		Dr. Cerulean	Internal Medicine
		Dr. Mahogany	Family Practice
		Dr. Cyan	Radiation Oncology
		Dr. Brown	Internal Medicine/Geriatric Medicine
	1980-1989	Dr. Oak	Ophthalmology
Dr. Chestnut		Medical Informatics	
Dr. Cedar		Dermatology	
Dr. Tungsten		Psychiatry	

Table 2.1 continued

Data Source	Year	Pseudonym	Area of medical specialization
		Dr. Zinc	Pediatric Ophthalmology
		Dr. Teal	Neurology
		Dr. Cypress	Pediatrics
		Dr. Maple	Pediatrics
	1990-1999	Dr. Indigo	General Surgery
		Dr. Hemlock	Urology
		Dr. Birch	Urgent Care
	2000-2006	Dr. Olive	Pediatric Pathology
		Dr. Coral	Pediatrics
		Dr. Palm	Family Practice
		Dr. Maroon	Emergency Medicine
Written Response	1954-1959	Dr. Elm	Thoracic Surgery/Critical Care
	1960-1969	Dr. Bronze	Family Practice
	1990-1999	Dr. Moss	General Surgery
	1990-1999	Dr. Magenta	General Surgery
Total participants: $n=38$; Males: $n=30$; Females: $n=8$			

on the understanding that meaning is made within an autobiographical narrative based on the context in which it is placed. The context in question is the personal identification as a practiced physician. In addition, the sampling was stratified as well as purposeful. This sampling strategy allowed me to illustrate subgroups, for example by age, gender, or area of specialization, and will facilitate comparisons between these groups (Creswell, 2007).

Recruitment

Participants were recruited via the e-mail address they provided to the Alumni Association of the University of Utah School of Medicine (Appendix). The e-mail was sent on two occasions; the first was sent to alumni registered to attend the Continuing Medical Education (CME) session during the 2011 University of Utah School of Medicine Alumni Weekend with the intent of recruiting participants for the focus group. The second email was sent to all alumni of the University of Utah School of Medicine who graduated between 1950 and 2002. Both e-mails were sent to the alumni by the director of the University of Utah School of Medicine Alumni Association. The e-mail informed the potential participants that I was investigating alumni's experiences of cadaver dissection and the role it has played in their subsequent professional development. They were asked to volunteer to share their experience of the gross anatomy laboratory in either a small-group discussion with other alumni, an individual interview, or both. The potential participants were also informed that the information gathered in this research may be used to inform future curriculum decisions within the School of Medicine. Finally, the e-mail informed the potential participants that, in order to promote open and honest discussion about this topic, every effort would be made to

ensure confidentiality. This included allowing the participants to choose pseudonyms and to decline participation in either focus groups or individual interviews.

Taking Leave

Guided by the protocols outlined by Marshall and Rossman (2006), I remained respectful of the participants and the relationships that formed between the participants and me. Once participants agreed to be part of the study, I informed them that I expected the project to take approximately 4 months for the data collection and an additional 6 months for data analysis and writing the final thesis. During the data collection process contact with the participants was maintained by e-mail, phone, individual interviews, and the small-group discussion. Following the completion of the data collection, contact between the participants and me was limited to e-mail. Each of the participants was informed that I would like to offer them a copy of the final written report of my findings.

Sources of Data

In order to strengthen the rigor and transferability of this study, I triangulated a number of data sources. Triangulation is the attempt to gain an in-depth understanding of a phenomenon by using multiple methods of data collection (Denzin & Lincoln, 2008). Through triangulation I was able to illuminate the research question to a greater degree by bringing more than one data source to bear on a single point (Marshall & Rossman, 2006). These sources of data included demographic data, individual interviews, focus groups, written responses, and archival data.

Demographic Data

Each participant was asked to provide a limited amount of demographic information. Focus group participants were given the option to fill out a paper-and-pencil survey, and participants in the individual interviews were given the option to fill out a web-based version of the survey or were asked the demographic questions as a portion of the interview. Personal data collected included participants' first and last names, ages, genders, races/ethnicities, the years that they graduated from the University of Utah School of Medicine, and their areas of medical specialization. Participants also identified the names of their instructors of the Human Gross Anatomy Course from a list of possible instructors. Finally, participants were presented with a list of colors, trees, and types of metals as potential pseudonyms and were asked to choose the pseudonyms they wished to be used when their responses were coded. Their responses were recorded in an electronic spreadsheet and used for analysis.

Focus Group Interviews

Alumni were asked to join a small group discussion about cadaver dissection in medical education and its impact on their careers as medical professionals. Focus groups are an appropriate data source under the interpretivist paradigm that guided the research (Morgan, 1996). I hold the belief that individuals' attitudes and beliefs about a particular phenomenon do not form in a vacuum. By listening to others' opinions, people are often able to more clearly articulate their own opinions and beliefs (Marshall & Rossman, 2006).

The focus group was used to identify initial themes that were then further explored in the individual interviews. Questions asked during the focus group were guided by two

overarching research themes. These themes were: (1) What impact do physicians believe that cadaver dissection has had on their development as medical professionals? and (2) What aspects of the dissection process remain salient following the transition from medical student to medical professional? Each theme could be clarified with additional questions, a sample of which is noted below:

- What do you remember about your experience in the gross anatomy lab as a whole?
- In retrospect, what aspects of the lab experience have had the greatest impact on your medical career?
- In what ways have your experiences in the lab impacted your connections with others (e.g., patients, patients' families, colleagues, etc.)?
- What do you remember about the cadaver(s) you worked with?
- Please share with us the single most important event, either positive or negative, that you remember from the gross anatomy lab.
- What made this event memorable?
- What emotions do you associate with the gross anatomy lab? Please describe an event that embodies that emotion.
- How frequently do you think about your experience in the lab/recount that memory to others?

The focus group was offered to alumni attending the CME session during the 2011 University of Utah School of Medicine Alumni Weekend and held immediately after the CME session. Five alumni participated in the group (4 men and 1 woman). Each of the 5 participants had a separate area of medical specialization. The group lasted 1/2

hour. Throughout the group meeting, I remained aware of power dynamics that formed in the group and facilitated the discussion so that everyone's voice was heard. My role in the group was primarily to act as a moderator and to introduce topics of discussion. The focus group was recorded using a video and audio recorder so that all participants' contributions to the discussion could be easily identified. I also kept handwritten notes of any observations or analytic memos that emerged during the discussion.

Individual Interviews

Following the focus group, I offered alumni the opportunity to participate in in-depth individual interviews. Because this research was couched in the notion that it is the students' perception of cadaver dissection and the way in which it is recalled, reconstructed, and placed within the autobiographical narrative that is truly valuable, individual interviews with the participants played a key role in this research. Individual interviews have the benefit of quickly providing a large quantity of data (Marshall & Rossman, 2006). Additionally, these interviews provided me with a deeper understanding of the alumni's experiences with dissection and the meanings they made from those experiences.

Individual interviews were conducted with 29 participants (22 men and 7 women) from 12 areas of medical specialization. The interviews were one-on-one and semistructured in nature. To begin the interview, each participant was simply asked to talk about her or his experience in the cadaver laboratory. As guidance was needed, I drew interview questions from the research guide listed above, themes that emerged from the focus groups, and themes from previous interviews with other participants. The individual interviews lasted between 35 minutes and 1 ½ hours, with most lasting

approximately 1 hour. Ten alumni participated in in-person interviews. In-person interview locations were chosen based on participant convenience. Ideally, interviews for research should take place in a quiet location free of distraction (Creswell, 2007). I provided such a location for one interview. The remaining participants preferred to meet at a location of their choosing, generally their home or office. I also offered the option of phone interviews for those individuals who live outside of the greater Salt Lake area, and 17 interviews were conducted by phone. No compensation was offered for participating in the research, but all participants were thanked for their assistance. All interviews were recorded using a digital voice recorder and were fully transcribed into an electronic typed document to be used for analysis. During the interview I also took short, hand-written notes documenting any nonverbal communication or observations.

Written Responses

A number of alumni expressed interest in participating in this research, but noted that the time required for a full interview was prohibitive for them. As such, I offered these individuals the opportunity to respond in writing to the research questions listed above. Four participants responded to the questions in writing. Their written responses were between 1 and 2 ½ pages in length. Their responses were recorded in an electronic document.

Archival Data

Archival data were retrieved from University of Utah School of Medicine yearbooks from 1950 through 2002. Archival data are an appropriate supplement to direct source data such as the interviews and written responses (Charmaz, 2006; Clarke, 2005).

Although grounded theory methodologies are not commonly associated with the extensive use of visual data (Konecki, 2011), visual images can “reveal some sociological insight that is not accessible by any other means” (Banks, 2007, p. 4). Each yearbook was reviewed for images or written statements referring to dissection or the Gross Anatomy course. Each occurrence was photographed and digitally recorded. There were a total of 236 occurrences recorded from 52 yearbooks.

Data Analysis and Writing

Data Management

The data corpus for this research was comprised of all four data sources noted previously. Data from the demographic survey were entered into an electronic spreadsheet, which was encrypted and kept on a password-protected computer.

The focus group data were not transcribed in their entirety. In order to immerse myself in these data, I watched and listened to the entire recording of the focus group three times and listened to sections of the recording as many as five times. I created an encrypted electronic typed document for the focus group that contained verbatim excerpts of the group discussion that highlighted new or emerging themes, supported previously identified themes, or provided disconfirming evidence. The document also contained dated analytic memos and was kept on a computer secured with password protection.

The data from the individual interviews were converted to typed electronic documents transcribed verbatim from the voice recordings. These were also kept on a computer secured with password protection. I transcribed approximately half of the interviews personally, and the remaining interviews were transcribed by a professional transcriptionist. I reviewed all transcripts for accuracy. This facilitated my immersion in

the data and allowed me to incorporate analytic memos as I reviewed. I compared the transcription to the voice recording a minimum of two times to check for accuracy and to further enhance my immersion into the data. Additional analytic memos may be added during the data checks. Each memo will be dated for ease of identification and to enhance the audit trail. I further facilitated my immersion into the data by listening to the recordings, either in part or in whole, as many as five times.

Written responses were recorded in an electronic document and reviewed a total of three times. Analytical memos were added to each document as I reviewed them. Archival data retrieved from yearbooks were stored as digital images. These images are in the form of digital photographs. Analytical memos, as outlined by Clarke (2005), were added as digital captions to the images. The images were kept on a computer secured with password protection.

Data Analysis

Data analysis was based in grounded theory as outlined by Strauss and Corbin (1997) and Fassinger (2005). The guiding principle behind grounded theory is the intent to produce innovative theory that is “grounded” in the data (Fassinger, 2005). Grounded theory is an appropriate method of data analysis when there is no preexisting theory regarding a particular phenomenon or when the existing theory does not fully capture the phenomenon in question (Strauss & Corbin, 1997). Grounded theory methodologies allowed me to explore the question of what is learned from cadaver dissection by concurrently collecting data from the alumni, coding those data, conceptualizing, and theorizing while continually comparing the information I gathered (Fassinger, 2005).

In grounded theory, data analysis occurs in three steps: 1) Open coding. This step is used to identify emerging units of meaning that are referred to as concepts. Each concept is identified and labeled. I attempted to label the concepts using the participants' language. The size of the concepts varied from a few words to entire paragraphs (Morrow & Smith, 2000). As they emerged, the concepts were compared to each other, and related concepts were grouped together into larger categories. Each category was sufficiently abstract in order to encompass the variation of the concepts listed in it (Fassinger, 2005).

2) Axial coding. This step occurs when multiple categories are encompassed within a key category (Strauss & Corbin, 1997). Each category's properties and dimensions were identified in relation to the key category. Fassinger noted that identifying properties and dimensions is "critical in helping the researcher to consider what the categories actually mean in terms of individual participants" (p. 161). I perceive this step in analysis as crucial in creating a multidimensional view of the key concepts. By locating each concept in relation to other concepts within the key categories, I will be able to identify the interrelationships that form among these categories. The ultimate intent of the previous process is to formulate a substantive theory that fits the experiences described by the participants (Fassinger, 2005). However, this study was intended to develop a deeper understanding of the process in question and not to develop a predictive model. Yet the final step in the data analysis, selective coding, is still relevant to this research.

3) Selective coding. From the information gathered during axial coding, I was able to identify a core concept that encompassed all of the previous key categories, thus building a model of the role of dissection in the development of the autobiographical narrative of physicians.

Although this step-by-step description of the data analysis may give the impression that it is a linear process, the actual procedure is more cyclical in nature. One of the fundamental concepts of grounded theory is the notion of constant comparison. This process began as I analyzed the information collected from the focus group. I immersed myself in the recordings and notes by reviewing them multiple times and identifying units of meaning and themes. These emerging themes were then used to inform the questions asked of the participants in the individual interviews. Similar scrutiny was applied to the notes and recordings of the individual interviews. The themes that emerge from the interviews were then used to inform future interviews with other participants. Throughout the process, I reviewed information provided in the demographic surveys to identify connections and patterns within units of meaning. I also returned to each source of data multiple times to look for additional evidence supporting identified themes, to highlight new or emerging themes, and to look for disconfirming evidence.

Additionally, I continued to meet with my peer research group throughout the research process. I asked the members of the group to help me identify any themes and categories that I may have missed. These meetings helped me remain aware of any blind spots in how I perceived the experiences expressed by the participants. During this time, I also continued to maintain a self-reflective audio journal of my thoughts and experiences of the research process. This journal was distinct from the analytic memos added to the data.

Through this extensive data analysis, the ultimate goal was to produce a conceptual model describing the experiences of medical students in cadaver dissection.

The hope is that this model will be used to inform future research in the area of anatomical education of medical professionals. My intent throughout the process has been to maintain a caliber of research that would substantially contribute to the existing knowledge of the role of cadaver dissection in medical education.

Ethical Considerations

As my training is in the field of psychology, the ethical codes outlined in the Ethical Principles of Psychologists and Code of Conduct published by the American Psychological Association (APA, 2002) have guided my work with participants. Throughout the research process I upheld the principals of beneficence and nonmalificence by remaining cognizant that the ultimate beneficiaries of this research should be medical students. I attempted to safeguard the well-being of the participants by minimizing the risks of any potential harm that I was able to identify and by being vigilant against unforeseen risks that arose during the research process. Due to the nature of the participant population, the risk of harm associated with participating in this study was minimal, but there were a few areas of risk to consider.

One area of risk was the possibility of negatively impacting the alumnus/alumna's relationship with the University of Utah School of Medicine. Alumni who were targeted as potential participants had maintained an ongoing connection with the School of Medicine through the Medical Alumni Association. Many considered this relationship to be personally valuable to them and might have felt conflicted about making negative comments about their experience in the School of Medicine. Additionally, the participants' public reputations were important resources that must be guarded. Because of these factors, I offered participants the opportunity to choose a pseudonym to protect

their anonymity. In this way, the information they provided in the individual interviews could not be connected to them. Participants were asked to choose a last name other than their own to use as a pseudonym from a list. All but 3 of the participants chose pseudonyms from the list. Those three requested pseudonyms of their own choosing for personal reasons. Information the participant's provide for the study was coded under this pseudonym.

During the focus group, I reminded all participants of the importance of creating a safe space for everyone to speak about their experiences in the gross anatomy laboratory. I asked that the participants agree to keep the identities of the individuals in the group confidential.

Another area of risk for the participants was the possibility of reexperiencing trauma or discomfort that occurred during their time in the gross anatomy laboratory. There is some evidence that a small percentage of students find the dissection process upsetting enough to be considered traumatic (Dinsmore et al., 2001). In order to help protect participants from additional trauma, I began both individual interviews and the focus group session by acknowledging that this subject can be emotionally charged and by normalizing the fact that each person approaches the experience of dissection in a unique way. Participants were reminded that it is exactly these unique experiences that I am interested in understanding. However, participants were also assured that they would not be forced to talk about any subject that they found too distressing. My training as a mental health provider also assisted me in remaining sensitive to the emotional needs of the participants. However, I was also aware of my role in this process as researcher, and I remained cognizant of the fact that I could not act as a therapist for the participants but

could only be prepared to provide references to places where they might seek counseling. No participants expressed distress or requested such resources during the research process.

Other common ethical concerns were addressed in the research. These included verbally providing the participants with full informed consent. This consisted of informing the participants of the purpose of the research, their right to decline to participate at any time, any foreseeable consequences or benefits to participation, and whom to contact if they had questions about the research. Furthermore, I obtained the participants' approval to record the interviews using both voice and video recorders. Finally, I made every effort to be as transparent in the research process as possible. It was not my intent to involve deception in this research in any way. I fully and honestly answered any questions that the research participants had.

Summary

Beginning within an interpretivist paradigm, this study used a grounded theory design to build a conceptual model of the process in the gross anatomy laboratory. This conceptual model was based on the laboratory's place within the autobiographical narratives of physicians who trained using cadaver dissection. Participants in the research were drawn from alumni of the University of Utah School of Medicine who graduated between 1954 and 2006. Sample size was gauged by redundancy and saturation of the data. Multiple sources of data were triangulated in order to strengthen the rigor and transferability of this study. These sources of data included a focus group interviews, in-depth individual interviews, written responses, and archival data. Data from the interviews were transcribed and all data were digitally recorded. Data analysis was based

in grounded theory using a three-step cyclical process of open, axial, and selective coding. In the following chapter I will present the results of the data analysis and the various aspects of the experience of cadaver dissection and its impact on the development of physicians as described by the participants and reflected in the archival data.

CHAPTER III

RESULTS

The cadaver training gave you a foundation of humanity and of basic buildings of a body. And it was something you touched. And it wasn't plastic, it was you know, actual muscle, tendons, nerves, fat, and you know, sort of the relationship that you had with the cadaver I don't know that you would have with a piece of plastic. (Dr. Tin)

In this Chapter I will present the various aspects of the experience of cadaver dissection and its implications for the development of physicians as described by the alumni who participated in this study and the review of contents of the yearbooks from 1950 through 2002. These sources of data provided a wealth of information in response to the two primary questions guiding this research: (1) What impact do physicians believe that cadaver dissection has had on their development as medical professionals? (2) What aspects of the dissection process remain salient following the transition from medical student to medical professional? Whenever possible I will use participants' own words or direct quotes and images from the yearbooks to provide depth to the description of each emergent theme. Brackets (i.e., []) indicate changes made to quotes for clarification. Italicized words within the quotes indicate clarifying questions that I asked.

Four interconnected themes emerged from the data. They are (a) Working with Peers, (b) Future Learning, (c) Patient Care, and (d) Confidence. Foundational learning for the future was the overarching core concept that connected the multitude of experiences within the dissection laboratory, and each of the four themes played a

specific role within that concept. Table 3.1 summarizes the core concept, themes, and categorical families that will be discussed in this chapter. The interactions among these themes will be reviewed thoroughly at the end of this chapter. However, before those interactions can be fully understood, each individual theme will be described in depth.

Foundation for Working with Peers

There was a huge team spirit to gross anatomy that wouldn't [happen in the lecture hall where] it was hard to interact with everyone when you're sitting in those chairs and trying to be quiet and listen and pay attention, but anatomy lab was much, much more interactive. And there was also more silliness and joking, and confession of your concerns to each other. Yeah, that was a huge part of it. Almost an "in the trenches" type of experience, for the entire class, not just the four people at the table. And you can't really, you can't really reproduce that after that! Because you can't all go into the same OR suite or go into the same patient's room. (Dr. Cypress)

The process of dissection provided participants with a foundation for working with their peers, not only in medical school but throughout their careers as physicians. Participants talked of the trials of working together as well as the benefits. There were connections made in the anatomy laboratory that created friendships that are still strong decades later. In all, five unique familial categories were reflective of the theme of a foundation for working with peers: (a) teamwork, (b) initiation, (c) looking to others, (d) lifetime connections, and (e) humor.

Teamwork

As Dr. Brown stated, "There was teamwork in dissection. Medicine is completely teamwork now." All participants who dissected did so as part of a team. Throughout the years, team size varied from two to four members. While some participants remembered working collaboratively in other points in the first few years of their medical education,

Table 3.1

List of Themes and Categorical Families

Core concept	Themes	Families
	Working with peers	Teamwork
		Initiation
		Looking to others
		Lifetime connections
		Humor
	Future learning	Picture: Seeing the body inside, outside, taken apart
		Giving order to disorder
		Firsthand knowledge: The hands of experience
		Connects you with medicine
		Time
Foundation	Patient care	Picture: Knowing what's inside the patient
		Beyond theoretical to the actual
		Variation
		Physical contact
		Seeing the person in the body
		Objectification of the cadaver
	Confidence	Self-determination: We're ready
		Strength in the eyes of others
		Puzzling it out
		Humility from awe
		Humility from mistakes
		The shocking becomes normal
		Death

they noted that those experiences felt less like a team effort. “We'd sort of form groups in Physiology and, uh, you'd have, you know, two's or three's and stick your arm in ice water and see what would happen to blood pressure, but it wasn't the same. It didn't seem like a team effort at all.” (Dr. Hickory).

The act of negotiation seemed to differentiate the teamwork in the gross anatomy laboratory from other collaborative learning experiences. Many participants noted that they had to learn how to communicate effectively with the members of their dissection team. This included negotiating who would dissect, who would read instructions from the dissector manual, and at times, who would step back and watch. This was not always an easy process. Dr. Tungsten explained, “Well, learning to cooperate in a, you know, a small group like that. Because we all had, you know, dominant personalities, but you have to learn to work together.” While dominant personalities clashed at times, participants talked about the benefit of learning not only when to step up but also learning when to take a step back and let others do the work.

Others spoke to the unity created by the team environment in the lab. “I thought our groups worked very well together, we were very competitive, but it was in a competitive ‘everybody is going to win this game’ way, instead of the ‘I’m going to see how much better I can be than you guys’” (Dr. Indigo). A number of participants made a point to note the cooperative rather than competitive atmosphere in the gross anatomy laboratory. Dr. Palm noted how, for her as a woman, the cooperative environment created connections with her male peers that she might not have otherwise. When asked if the level of cooperation was unique to the lab, participants noted that the competitiveness was fairly uncommon throughout their medical school experience. Some mused that the

high level of cooperativeness was a reflection of the general culture in Utah, but all agreed that cooperation was clearly present during the dissection experience.

For some, this strong sense of cooperation reemerged as they began their clinical years and on into their years in practice.

When I went into practice I had four, three other associates, and, you know, that was, it was good when you first start out to have that. You get to see how other people would practice medicine, and choose the best ways. Everybody it seemed had a different way of doing it, and there wasn't any one way that was better, but, uh, it might have seemed better. (Dr. Hickory)

Participants noted how this ability to work as part of a team is invaluable in their work as physicians. Some participants noted how, even as a physician working in rural parts of the country, they have to be able to work as part of a team. This is because patients often have to travel to see a specialist. They noted that because much of the team work is done over long distance, the ability to communicate clearly is important. Even without the challenge of communicating over a great distance, working with other specialists as part of a team is important.

The medical school yearbooks also reflected the value of teamwork in dissection. There were a total of 43 images focusing on the working dissection. Figure 3.1 is one example of such an image. The majority of these images (84%) were found in the yearbooks from 1954-1979. It's unclear what led to the shift away from those images beginning in the 1980s, but tenor of the yearbooks changed throughout to focus on individuals rather than experiences. Even after the global shift, most of the yearbook images of the anatomy laboratory continued to show students in their dissection teams.

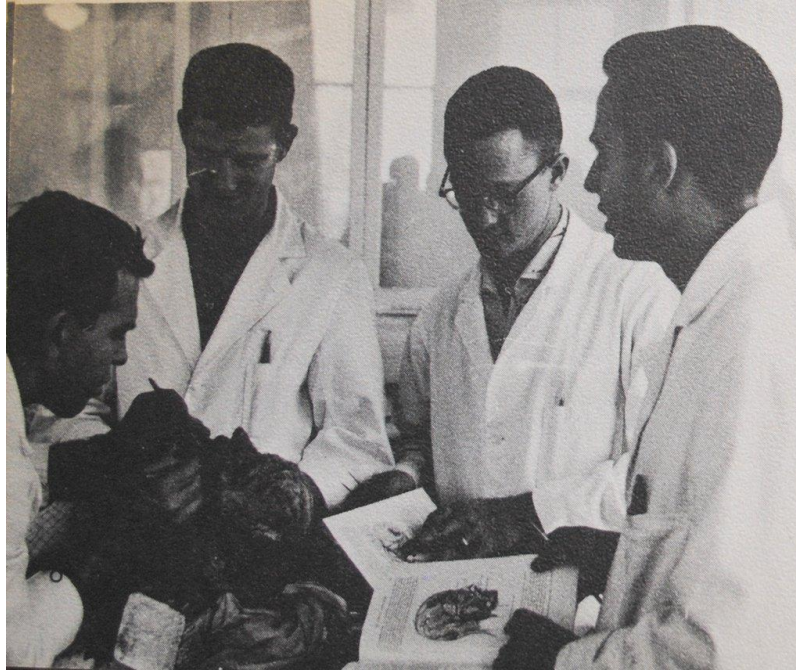


Figure 3.1: 1960 Teamwork

Initiation

A second piece to developing a foundation of working with their peers was building an identity as a member of the medical community. Participants spoke to the role of the gross anatomy laboratory in initiating them into the world of medicine. Dr. Brown noted, “I would have been disappointed as a med student if I didn't have the ability to have a cadaver to work on. That was part of traditional medical education that I knew that I would be exposed to as part of applying to medical school and going through medical training.” There was an expectation that in order to join the medical community, they must first dissect. Figure 3.2 from the 1958 yearbook shows the “White Line” into the gross anatomy laboratory.

Dr. Azure did not dissect, as he was a member of an experimental group that learned anatomy by studying prosected (professionally dissected) cadavers. Yet he



Figure 3.2: 1958 Initiation – the White Line

expressed the sense that those in the group who didn't dissect would have to do well in order to be acceptable candidates for initiation. As he said, "I remember sort of a feeling that we need to prove that we can do as well as the people who dissect. I don't recall any formal sort of, you know, 'Here we are. We've got to prove it.' It was more of like, you know, 'This is what we've chosen. We better make sure we do as well.'" He went on to add, "I mean, successfully completing the class. Everybody knows that medical students have to know anatomy."

Others spoke to the fact that dissection not only brought them together, but it also set them apart.

It also seems to me that it was one of those experiences that I couldn't really or didn't feel comfortable discussing with my wife. Um, I mean it was just, it was one of those things that was hard to, um, oh I don't know, share. I mean it really seemed to isolate us, this small group of, you know, medical students, were doing

something to people that, maybe others just didn't want to hear about, certainly not around the dinner table. (Dr. Cerulean)

The process of dissecting brought the participants into a group that others cannot or do not wish to understand. Dissecting a human cadaver is only socially normative for a select group of people, and the same is true for many of the procedures physicians are required to perform. As a result, there was a sense of unity amongst those who performed the act of dissection. Dr. Tungsten summed it up, “You're all in it together, and it's like you're a member of a secret club or organization. It's just part of your initiation.”

Participants reflected that this continues to be the case in their work as physicians; that there are pieces of the work that they do that one cannot understand unless he or she has been in their shoes. As Dr. Azure said, “When I'm with some of my long time colleagues, I mean we know; we've been doing this for 20 years. We know that only we can really understand what it is we've done or gone through.”

Looking to Others

One piece of building a foundation for working with peers was learning to look to others for information, support, and as examples. Participants noted the presence of instructors in the gross anatomy laboratory, but remembered the majority of interactions as being with their peers. Dr. Hickory noted this process starting on the 1st day in the laboratory:

Well, you kind of have a little bit of fear, maybe. A little bit of surprise, uh, a little wanting to back out of the whole situation, you know? Where you wonder what did I get into? And uh, you're looking around at your colleagues to see if they're, how, if they're accepting it, or, you know, how they're accepting it.

This moment of looking to his peers for guidance set a precedent for future interactions.

Dr. Hickory and others went on to talk about looking to members of their class with more

life experience to model responses for them. This ranged from following the example of peers who had military experience and had worked as field medics when confronting the shock of death to simply looking to peers with previous dissection experience for practical advice. Dr. Hemlock spoke at length about how his previous experience dissecting helped him in the process, but also allowed him to help his peers. This practice of providing consultation to others continues into his practice today.

Looking to others for help with the dissection was about more than just consultation. Dr. Spruce stated, “There was an interactive education process, and it’s a process about interactively educating each other.” This interactive education happened both within and between groups. Within groups, group members used their strengths to balance each other’s weaknesses.

Some of us caught a concept and remembered some concepts better than others and other areas based on our background We learned other things better and we could share and explain it in another way that made sense to help get through so we could all grasp the huge volume of knowledge there is to acquire. (Dr. Oak)

Between-group sharing was sometimes a matter of convenience and other times a necessity. Many participants noted the benefits of having numerous different cadavers to look at but also noted the benefit of watching other peers dissect. Dr. Cypress explained, “You could see someone who did a better job technically, and how well the nerve, muscle, and blood vessels were in, it sort of urged or inspired you to be more careful and to handle the tissues differently than you did.” Beyond inspiration, looking to others dissect was at times a necessity as some members noted that they could not find structures in their cadaver either because they had made a mistake, the cadaver had been poorly preserved, or the structure didn’t exist in their cadaver (as in the case of a hysterectomy).

A parallel familial category within the yearbook photographs depicted students in the gross anatomy laboratory looking to the viewer through the camera. Figure 3.3 shows a student in a moment between looking at his peer and the camera. With the direct eye contact into the camera, the students in the image invite the viewer into the dissection process as an equal member of the experience. In these images the work in the lab continues and the viewer became part of the work. There were a total of 23 photos in this category, and they spanned all decades.

Lifetime Connections

Many participants spoke about how they felt a strong connection with the other members of their group from the dissection experience. Most did not know the other

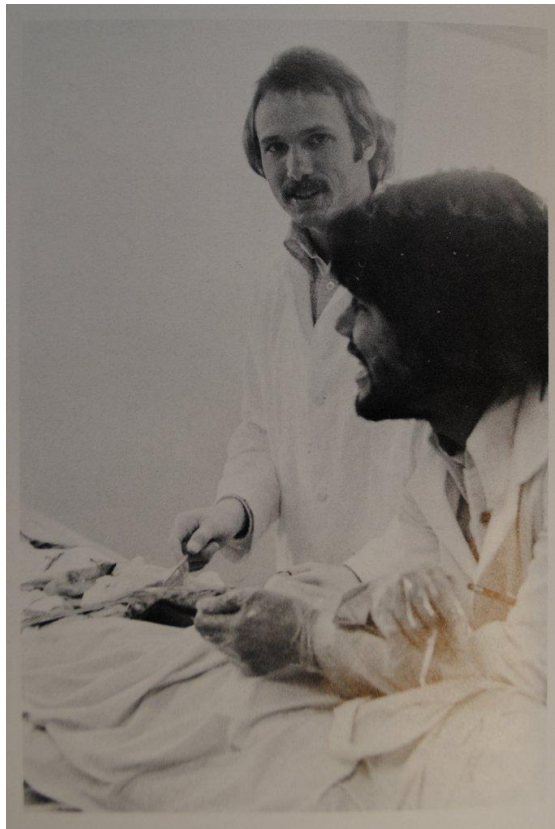


Figure 3.3: 1980 Looking to others

members of the group before they were assigned to work together. However, many of them continued to work together on projects in other classes even after they were done with the gross anatomy laboratory. “The students that I shared the cadaver with became some of my best friends in medical school” (Dr. Moss).

The group work was not exclusive to the gross anatomy lab, but participants noted how the longevity of the relationships they formed was unique to that class. For example, Dr. Hickory whose dissection experience occurred in 1950 stated, “Well, we [our group of four] got a quite a close attachment. I'm still pretty closely attached to one.” Other participants noted that they actively work to maintain those attachments made during the dissection experience and socialize with one another on a regular basis. For some the socialization occurs during the annual alumni gathering, for others it was more frequent (e.g., having lunch with each other monthly). Two of the physicians who participated in the focus group noted that they had been members of the same dissection group and stay in contact on a regular basis.

These strong connections between group members were more heavily weighted towards the more senior participants. Those participants who graduated in the 1950s and 1960s tended to place more emphasis on the connection between group members and maintaining that connections after medical school. Participants who graduated more recently also spoke about their group members and the friendships they formed. An example of this connection forming can be seen in Figure 3.4. However, less emphasis was given to the fact and few talked about making efforts to maintain the relationship. It is unclear if this difference was an artifact of a change in culture over that time or simply a theme that forms more clearly as time passes.



Figure 3.4: 1987 Lifetime connections

Within the yearbook photos there were a group of images that focused solely on the dissection team without the presence of the cadaver. This was one of the smaller categories with only seven images. Those images appeared in yearbooks between the years 1960-1995. These images often depicted the dissection teams laughing or playing.

Humor

The topic of humor came up frequently when participants spoke about their experience with dissection. Participants spoke about using humor as a way to cope and connect. Humor was a protective factor when dealing with the emotionally heavy nature of dissection. Participants referred to the “black,” “irreverent,” or “gallows” humor in the lab as a way to process what could have been a very somber and overwhelming experience. Dr. Chestnut reflected on the use of humor: “If you're gonna really, sort of, get psychological about it, you could say that, you know, you're using humor a little bit as a shield from your own mortality. From, you know, your own uncertainties about gender and sex and you know, other things.”

When asked to identify skills that they associated with the gross anatomy lab, many participants pointed to humor.

Humor for sure. Especially to try to diffuse a little bit of a tense situation if it's appropriate to use a little humor, then that's definitely a skill we learned in gross anatomy lab, or used, not learned, used. You know I don't know if we can go too far with that, but it did created a sense of getting to know everyone in the class and getting through something together and that happens in different medical settings too. (Dr. Cypress)

Humor was identified as a skill because participants continued to use it as a diffusion technique throughout their work as physicians. Dr. Tungsten explained:

There was a lot of black humor in the anatomy lab. That carries over because there's a lot of black humor in psychiatry and internal medicine and surgery. Joking and statements that you would never make openly to people outside of medicine who would be appalled by what you were saying, and yet that seems to make it easier. It's a way of dealing with these otherwise very bizarre situations.

The humor is shared among peers and not necessarily with patients. It connected the participants with their fellow dissectors and later their fellow medical providers.

Participants who graduated in the 1950s through the 1970s noted that much of humor was modeled by Dr. Edward Hashimoto. Participants spoke with great respect about Dr. Hashimoto's ability to teach anatomy, but also reflected fondly on his sense of humor. Many participants recounted the story of Dr. Hashimoto, of Japanese descent, walking into the lecture hall the day after the bombing of Pearl Harbor and quipping that he was Irish and had no idea what all the buzz was about. He was also remembered for his focus on breasts. Photos of Dr. Hashimoto in the yearbooks, such as the one in Figure 3.5, most frequently depicted him drawing breasts and occasionally sitting surrounded by pin-up images of topless women. It was in part this irreverent humor that endeared Dr. Hashimoto to the students. The 1965 yearbook reflects thus on the dissection experience:

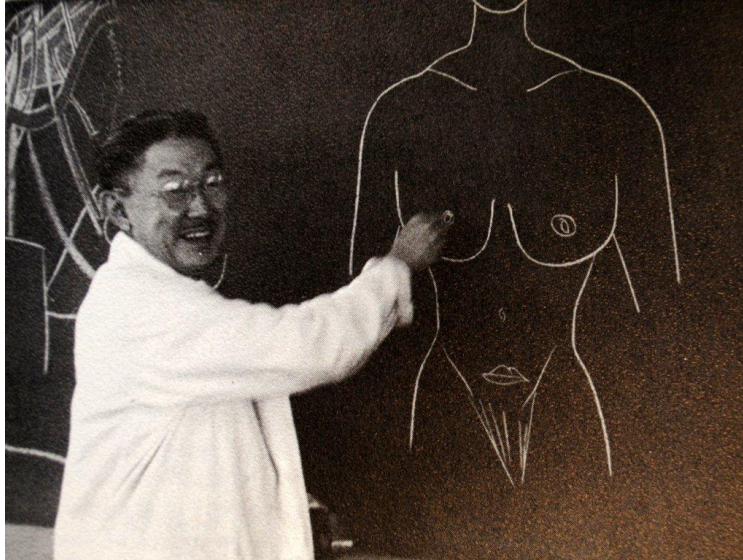


Figure 3.5: 1961 Humor - Dr. Hashimoto

Little did we know that our 5% retention would leave us with only a clear understanding of the lymph drainage of the breast, so vividly explained by the colorful Dr. Hashimoto. His humor, wit and stories kept the experience from becoming completely “Franconized” and reminded us that worse than being timid in class was being trapped into “circumcision with pinking shears.”

For participants from later cohorts, talk of balancing the irreverent humor with respect was more common. Dr. Indigo spoke of keeping things light-hearted in the gross anatomy laboratory by tie-dying their lab coats, but noted that there were still times of irreverent humor.

We did try to treat the bodies very respectfully, and for the most part that happened. There were some things that you just couldn’t be respectful about. Like, one of the cadavers had a penile implant and we had to make fun of that. So there were some things that we found that we were just like, “really?” (Dr. Indigo)

The irreverent humor was also more notable in the yearbooks from earlier years. This was most pronounced in the captions that were placed under the photos, but it was present in the photos as well. Figure 3.6, in which the original caption reads “Don’t hit him again Vern.” provides an example of both. Many of the captions were incongruent

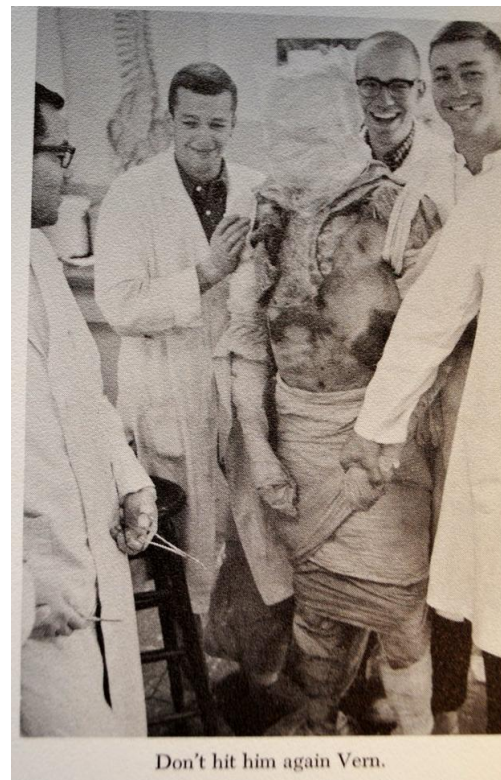


Figure 3.6: 1967 Humor - "Don't hit him again Vern."

with the photo they accompanied and implied an “inside joke” that only those who had been in the gross anatomy lab would understand.

Foundations for Future Learning

“I think it made it more memorable to take the human body apart in a coherent educational manner that helped us put things together and provided the framework for piecing together all the various bits of knowledge that we would then subsequently gain.” (Dr. Oak).

Participants talked about the ways in which dissection provided a foundation for the future learning they would acquire as they moved through medical school, their residency, and on into practice. As Dr. Olive stated, “I think it’s a necessary building

block that students springboard off of, and gain some initial knowledge and build more off of it.” The body of the cadaver became a virtual repository space in one form or another for not just anatomical knowledge, but medical knowledge as a whole.

It sort of put it all together and so if you really are going to understand a functioning human being, the anatomy was just one of the at least four corners that include biochemistry, physiology and histology. See, I just think it was that they are all important, and if any one of those had been missing I would have missed something that I think I would have needed in the practice of medicine.
(Dr. Iron)

This theme of future learning encompassed five separate familial categories: (a) Picture: Seeing the body inside, outside, taken apart, (b) Giving order to disorder, (c) Firsthand knowledge: The hands of experience, (d) Connects you with medicine, and (e) Time.

Picture: Seeing the Body Inside, Outside, Taken Apart

Participants talked about using the dissection to form a complex image of the human body in their mind, using that image when learning new information, and then accessing that image as they begin applying their knowledge in clinical work.

When you're out as an intern and you have somebody who codes, to have, and it's your first time, uh, to be there, having had that gross anatomy experience being familiar with the body and all its parts, it just, it's all right there. You don't have to think in terms of textbook and try to remember, it's just part of you now because you've seen it inside, outside, taken apart. (Dr. Oak)

A number of the surgeons talked about how important it was for them to have a dissected view of the body in their mind before learning surgical techniques. In surgery, the goal is to be minimally invasive, to open the smallest window possible into the body. However, the goal in dissection is full and complete exposure, to open up all of the doors and windows so to speak. By opening the body up fully, the participants were then able to create a mental road map of the interior of the body in order to know what to expect.

Then, when they enter the surgical residency they were able to focus on the information being presented in the moment rather than feeling lost in the body. Dr. Beige, who has been a surgeon for over 40 years and spent many of those years training surgical residents, stated:

In the active surgical situation, um, because of the other things you're dealing with like potential bleeding, or the fact that things are moving a little bit and not staying put, um you can't always totally appreciate the true relationship of where things are... but there are some things that I think you understand better in a cadaver that allows you to transfer that information to living situation. It makes the living situation, uh, something that you can deal with more safely.

The notion that cadaver dissection is important to future learning for surgeons was never disputed by any of the participants. However, the majority of participants made a point to note how important that visual road map was for all areas of specialization. The cadaver provided a holistic view of the body, and even if an area of specialization focuses on a narrow portion of the whole, that area cannot be seen as independent of the body as a whole:

Anatomy is the bedrock of medicine. The body is a whole. It does not survive well separated from, you know, you don't do very well without kidneys. The body, as an evolutionary product of nature is a, um; the sum is greater than the whole of the parts. And so you have to understand the physiology that operates the whole and that's, and so anatomy is the structural basis of the organ system. (Dr. Teal)

Use of scans was another area of future learning that was impacted by being able to see the body from the inside through the dissection experience. A number of participants talked about how they referred back to the image of the dissected cadaver when looking at a body scan. Dr. Zinc was one of the participants who gave voice to this aspect of dissection:

Without having had the opportunity to dissect the human brain the structures on an MRI, the structures in the human brain, the spinal column, anywhere in your

thoracic cavity, your abdominal cavity, all of those images that we see, whether it's an x-ray, a CT Scan, an MRI, or an angiogram or any of those things, all of that, um, structures that now we see, whether it's in a two dimensional image or a three dimensional reconstruction, all of those things, they're, you can recognize them because of what you saw during your experience in the anatomy lab in my mind.

It is important to note that for many of the participants, the scanning technology used in practice today was not used regularly or in some cases didn't even exist when they were in medical school. The image of the cadaver was the only internal visualization that they had. However, participants noted that even when the technology emerged and became a regular part of practice, the scans were still two-dimensional and detached in nature. "Even when you're looking at an x-ray you see, you're not just looking at black and white things, you're trying to picture what these lungs look like, you know?" (Dr. Hickory). Having had the dissection experience gave the participants a basis on which to build an understanding of what they were seeing; to make a connection between the image they were looking at and the human body they were treating.

Participants noted that dissection provided them with more than just a two-dimensional image as they might get from a textbook. Participants talked about the benefit of understanding the depth and relationships between structures. Dr. Cerulean discussed the value of having a three-dimensional object to learn from saying:

The anatomy books that I had back then, when I went through medical school 35 years or so ago, um, you don't have the depth of feel. You don't have the relationship of nerves to arteries. Um, you can say where they are in the, this particular plane, but deep to one another, you lose that unless you do have some 3-D.

Participants also noted how important it was for them to be able to identify and differentiate the structures they saw as they dissected in order to form an accurate picture in their mind. In that area, the instructors and teaching assistants in the gross anatomy lab

played a major role. Participants noted that they would turn to the instructors when they needed help with identification. This piece was reflected in the yearbooks with images of the faculty, primarily Dr. Hashimoto, teaching directly from the dissection. Figure 3.7 is one example of those images.

Giving Order to Disorder

Participants noted the incredible complexity of the human body and the vast amount of knowledge they had to acquire in medical school in order to become a competent physician. At times that complexity and volume seemed overwhelming. Participants used their experience in dissection to provide some sense of order to the disorder, both in terms of chaos and disease.



Figure 3.7: 1978 Seeing the body

Participants spoke with admiration about the complexity of the human body, and how the dissection process allowed them to see that complexity in a holistic manner. They compared this to learning from a textbook where the body was broken down into sections on pages. “You’re not just memorizing, you know, ‘Ok this is the saphenous vein,’ and looking at it in a picture. You’re realizing, ‘We can follow it back up. I see where it branches off.’ ... You see the plumbing, you know, you actually see the plumbing” (Dr. Olive). A number of participants used examples similar to Dr. Olive’s, describing in great detail the complex route that a nerve or vein would take through the body.

In the first 2 years of medical school students learn both anatomy and physiology. In general, anatomy teaches structure whereas physiology teaches function. Participants talked about needing one to understand the other. Dr. Spruce, who worked for much of his career as a medical toxicologist/clinical pharmacologist said of anatomy:

I think you have to hang one idea on another idea in your brain for it to stick ... everything we talk about in that realm [of biochemistry] has an anatomical component to it, so being comfortable with anatomy is important so that you can be comfortable with the rest of these concepts.

It came down to understanding how the mechanisms of the body, both anatomical and physiological work as one. “It’s understanding how, what the parts are and how the parts fit together and how it, uh, how it all works together” (Dr. Chestnut).

Other participants spoke to how understanding anatomy helped them better understand the disease process. Dr. Oak stated, “It’s a part of the whole, and the whole being has disease, disease entities, and problems, all of which relate.” Ultimately this also led to a greater understanding of death.

And you know, when you die, there's a reason for it. Not just "old age" for example. Some process that is actually responsible, whether it be heart failure or lung disease, or you know, even with cancer, the tumor itself does not cause the death. It's the down the road effect of the tumor that does. And so, that all seems to come together in an anatomy lab. (Dr. Tungsten)

As with forming a picture of the body in their mind, participants talked about the role that the faculty played in helping give order to disorder. Again, Dr. Hashimoto was frequently referred to, in this case for his abilities in the lecture hall. Participants recalled his unique ability to draw detailed anatomical diagrams simultaneously with both hands. That skill was more than just entertaining. With that ability, Dr. Hashimoto was able to create a space where students could toggle between examining the complex reality of the cadaver in the gross anatomy laboratory and digest the concepts and relationships within the lecture hall.

A number of photos in the yearbooks capture images of Dr. Hashimoto lecturing to students and drawing his notable diagrams on the blackboard. Figure 3.8 shows him

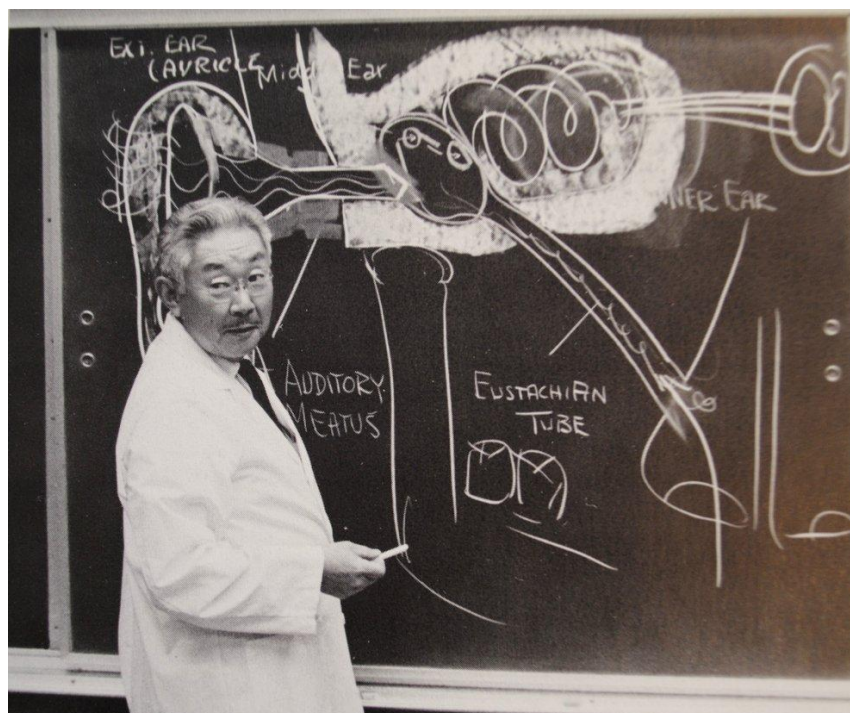


Figure 3.8: 1973 Giving order to disorder

illustrating the structures of the ear. While there were portraits of other anatomy instructors in yearbooks over time, none were captured in images as they lectured.

Firsthand Knowledge: The Hands of Experience

Many participants talked about the active component of dissection, and how that action produced firsthand knowledge of the body. Participants noted a greater value and longevity to the knowledge they had acquired through their own actions. Some of these actions are illustrated in Figure 3.9. As Dr. Tungsten said:

The problem with book learning is that you can read about it, you can intellectually understand it, but until you actually see it in front of you, it's hard to fully understand that, and also retain it. If you see something in front of you, like with a dissection you're actively participating in, you're much more likely to remember it.

In the focus group, Dr. Juniper questioned whether students could learn anatomy just as well through new technology:

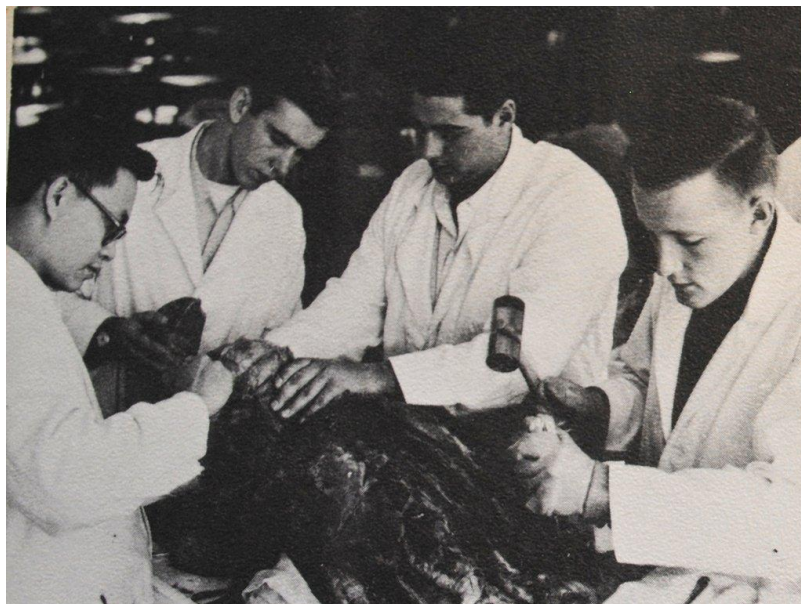


Figure 3.9: 1960 Hands of experience

It may be possible through our modern technology in developing programs that are available visually to the students in discussing particular parts of the body that are important and by doing anatomical dissection through a telemedicine type of thing. That's an important thing for you to consider. That leaves out, however, the hands of experience. The hands of experience, doing all of the things that are necessary there.

Dr. Gold concurred, stating that even though as a psychiatrist she rarely puts a hand on her patients, "There is something about my having touched that cadaver, had my elbows deep in that person." She noted that firsthand experience helps her to visualize what a person looks like on the inside, and appreciate the biological systems and physiological experiences.

In talking about the hands-on experience, many participants noted the tactile learning that occurs through dissection.

By being able to touch tissue you, you get a whole different sense of what that tissue is. If you think about the heart, it feels very different from how the skin feels or the lungs feel, or a muscle feels, even regular muscle. It's just different. Having touched it, you know it. Otherwise I can't think of any way you would know it. (Dr. Spruce)

Other participants talked about being able to differentiate nerves, veins, and arteries, not by how they looked, but by their tensile strength. They began to understand the delicacy of some tissues and the hardness of others. As Dr. Pine stated, "I'm all for teaching aids, but I must say that there is no substitute or a picture, a photograph, a drawing, a rubber or plastic model, there's no way that can give the student the sense of the delicacy of tissues."

A number of participants tried to capture the importance of the first hand knowledge through the use of metaphor. Dr. Olive stated, "It's just an experience that you couldn't get from looking at a picture in a book. It would be like reading recipes, but never cooking, and then saying, 'Oh yes, I know how to cook.'" Others compared it to

putting a roof on a house, fixing a car, or building a bridge. All of the metaphors shared the idea of active participation as a necessary component to knowledge.

Within the yearbooks, images of hands-on dissection with a focus on the work made up a substantial portion of the sections dedicated to anatomy; the second largest number of images behind those focused on teamwork. Many of these images capture the intense concentration of the students as they dissected. Figure 3.10 shows one such highly focused team as they work.

Connects You with Medicine

For many participants the act of dissection rooted them within a medical lineage. They experienced part of medical history because they were aware that dissection had played a role in medical training for centuries. With that knowledge they could move forward through the rigors of medical training. Dr. Zinc stated, “I kind of equated that rudimentary kind of understanding of the human body as the basis that medicine began



Figure 3.10: 1980 Firsthand experience

with, so I kind of, I kind of jumped into it all the way.”

Although there was a sense of initiation that connected them to their peers in the gross anatomy laboratory, participants who spoke to this topic were discussing something more than just tradition. Dr. Tungsten said of the dissection process, “It connects you with medicine. It's your first real exposure to a body.” He was speaking of the body of the cadaver and the living bodies of his future patients. However, within his statement it can also be said that the dissection process was also the students' first real exposure to the medical body of knowledge.

Participants noted the long and complex history of dissection of cadavers as a training tool in medicine. That history seemed to flow through time into the gross anatomy laboratory. Dr. Teal stated, “That is a hollowed chamber in there, but as a freshman medical student I didn't appreciate it.” He went on to note that learning the history of dissection made a great impact on him and he now looks back on his experience in the gross anatomy lab with more respect.

This notion of connection with medicine was also reflected in the yearbooks. The yearbook for the class of 1956 declared, “The inner sanctum of medical science is entered through the doors of the Gross Anatomy Lab.” Two decades later in the 1975 yearbook, the authors introduced their experience in medical school with side-by side images of dissection “Then and Now” shown in Figure 3.11.

A portion of the text that accompanied the photos spoke to the historical connection with medicine:

We inherited the vast resources developed by medical investigators and were presented with this knowledge during the major part of our training. In subtle ways, from gifted teachers and through continuing study, we too began to

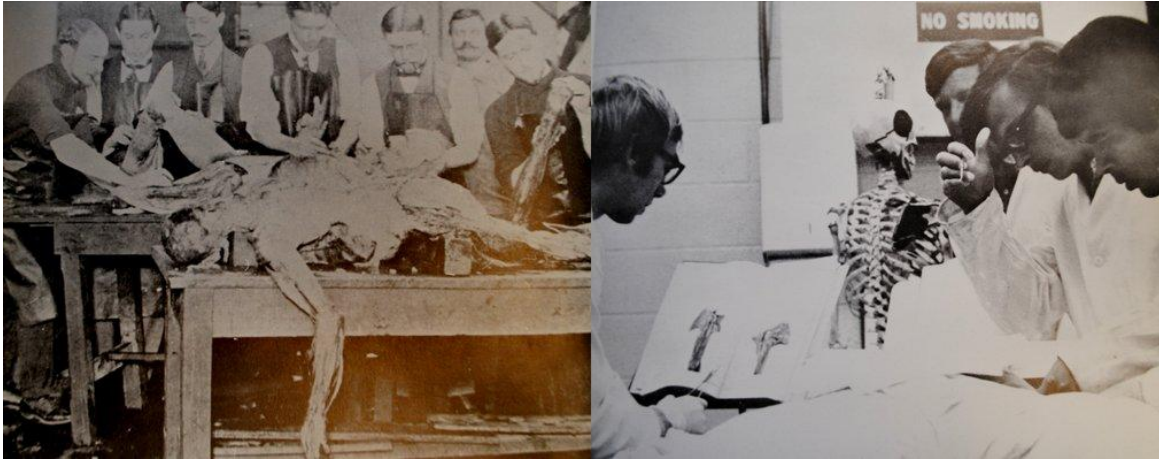


Figure 3.11: 1975 Then and Now

assimilate the traditions of medicine and frequently, in unwitting manner, made them a part of our character.

Other yearbooks also superimposed modern images onto images that harkened back to dissection in the renaissance. The faces of the yearbook staff for 1989 are depicted with their faces superimposed into the 1617 painting entitled *Anatomy Lesson of Dr. Willem van der Meer*. Similarly, the entire class of 1995 is shown with their faces pasted into the engraving of *Public Dissection in an Anatomy Theatre* by Jan Wandelaar. It seems the gross anatomy lab connected the students to their future as physicians by connecting them to the past.

Time

Participants agreed that dissection was a time intensive process. However, there were mixed responses from the participants as to whether the amount of time spent in the lab was worth the knowledge they received for their efforts. For some there was no question that dissection was not worth the time. Dr. Azure explained why, when given the choice of whether or not to dissect he opted to forgo dissection. He stated, “I thought

it was a waste of time. I figured if somebody else is going to prosect it for me, why not (laughter) when I could be studying other stuff?” However, others felt the time was necessary and even spent additional time in the lab. “It was a set aside time every day that we were all up there, but lots of times you'd go up outside of that because you wanted to make sure you knew something” (Dr. Cypress).

Not only did responses vary among participants, but individual participants expressed mixed views on the matter. When learning in the gross anatomy laboratory was framed solely as memorizing anatomical structures, participants spoke of wasted time and a need for greater efficiency. Many stated that they could see the benefit of reducing the amount of time required in the lab so that there was more time for studying other things. However, participants often followed such statements by noting that they felt they would lose other intangible aspects of their educational experience without that time in gross anatomy. “I will say, sometimes it was pretty laborious and tedious dissecting, and maybe there are some ways to shorten that, but I’m not sure it would have been the same for me if I hadn’t done it” (Dr. Spruce). Following up on these statements led to discussions about the many other topics noted in this research.

Many of the yearbooks also made mention of the amount of time spent in the gross anatomy laboratory, and the views on the value of that time were just as mixed as those of the participants. Some resorted to the use of hyperbole to capture the tedium. In describing the 1st-year of medical school, the 1952 yearbook stated that “patients” (i.e., students) were subjected to “exposure to 7647 Hashimoto-hours of total dissection.” While the extreme in this entry is clearly made in jest, other yearbooks expressed genuine frustration with gross anatomy laboratory. The 1966 yearbook stated, “Unfortunately,

however, The Old Irishman [Dr. Hashimoto] was the only bright spot in a course that should have been important to us but instead was too frequently a drudge.” However, the following year the 1967 yearbook stated. “We shall always treasure the very long hours consumed in snipping, slicing, scraping, and trepanning.” It is unclear whether this statement was made in earnest, but the results of this research indicate that there are more than a few who look back fondly on their time spent snipping and slicing.

Foundation for Patient Care

Dissection provided a foundation from which participants grew an understanding of how to care for their future patients. Participants spoke about how dissection impacted the clinical work they would do as well as the interpersonal aspects of patient care. This theme was the least represented in the yearbooks. This is understandable as many of the topics discussed in the theme required participants to first experience time in clinical practice. Six familial categories emerged within this theme: (a) Picture: Knowing what’s inside the patient, (b) Beyond theoretical to the actual, (c) Variation, (d) Physical contact, (e) Seeing the person in the body, and (f) Objectification of the cadaver.

Picture: Knowing What’s Inside the Patient

That was the very basis of when I saw a patient later or I was looking at their, examining their abdomen or their chest or the elbow or whatever, I would sort of flash back to not only what I saw on the surface, but knew in detail what was underneath in all of my patients after that because I had that experience. I knew not only where the deeper organs were, but where veins, arteries, nerves, you know, tendons, things like that. It was just tremendously important to me to have that experience because if I hadn't seen it, I wouldn't know what was inside the patient! (Dr. Iron)

Similar to the *Picture: Seeing the body inside, outside, taken apart* as a foundation for future learning, participants talked about the visual image of the cadaver they held in their minds, but in this case the focus was on how that image was used in patient care.

However, the terms “image” or “picture,” while used frequently by participants, are incomplete. Participants were often physically active when discussing this topic, pointing to areas on their own bodies when describing an example. For example, when Dr. Hickory stated, “If you have somebody with some symptom like a cough or a rattle or wheeze, you'd like to picture what's happening in those lungs or the main bronchial tubes, trachea,” he placed his fingers on his throat and chest. There was an embodied sense to the image he was referring to.

Participants talked about the benefit of having this internalized image when it came to making a diagnosis. They referred to it even when using diagnostic imaging technology in patient care. “I still use my visual images of the dissection when I'm looking at an MRI” (Dr. Zinc). Others talked about the benefit of being able to refer back to their anatomical knowledge when diagnostic imaging technology was not in the best interest of the patient or simply not available. Dr. Silver shared that an insurance company had required a colleague’s patient to have an MRI. He stated, “I wrote them a most heartfelt letter saying, ‘Look, you don’t have to spend the \$1200. In this guy’s hands, his anatomy training is so good, his exams are better than your MRI, hands down.’”

Not all participants held an image of the cadaver as they pictured what was going on internally with their patients. Dr. Azure, who learned anatomy through prosection rather than actively being involved in the dissection, stated that that knowing the subtle

nuances of anatomy was interesting but not necessary for his work in oncology. When asked what image he holds in his mind he replied:

I mean, it's based on their scans. We pull up radiographs and look at them. I don't, I probably, when I'm thinking of someone with lung metastases, I don't look at them and see the spots on their lungs, but I can see their x-rays, the images. I know what the images look like.

So when you imagine the internal parts of a person, the image in your head is, is a x-ray image or a scan image?

Yeah, it is. That's good enough.

Dr. Azure went on to clarify that when treating a patient it is more important for him to understand that patient as a person with loved ones, hopes, and dreams rather than an image of a pair of dissected lungs.

Dr. Cerulean spoke about sharing anatomical information with patients in order to help them understand their condition. He noted that he often referred back to his well-worn anatomical manual. However, like Dr. Azure, he did not feel that he needed the image of the cadaver in his mind in order to communicate that information. Nevertheless, most participants who spoke on this topic noted the benefit of having a strong understanding of anatomy based in dissection when it came to helping patients understand what was going on for them. Dr. Spruce explained:

It can allow you to explain it in a way that they can see it in their own mind maybe why it could happen. Unfortunately patients know virtually no anatomy; having a little, a bit. Well they know there's a heart in there and some lungs but they have no idea about relationships, or why you have a pain here, so by explaining it a little bit, it helps a lot. It just helps to explain to a patient if you can explain the anatomy.

Beyond Theoretical to the Actual

“For me [dissection] was one of the backbones of my medical education. It was fundamental to understanding the theory of the text book” (Dr. Magenta). Participants

talked about how they had to have more than just a theoretical understanding of issues when working with patients, and dissection provided learning that went beyond the theoretical. When trying to describe what he liked about the dissection process Dr. Hickory stated, “[It was] the kind of knowledge that I could handle. It wasn't so much abstract or theoretical, it was more pragmatic, you know?” He went on to compare it to Michelangelo learning to sculpt the human body by dissecting cadavers. “He had to do that, and I think, well, you could practice medicine okay with just learning anatomy from pictures. There are great pictures, great picture books. But it wouldn't be quite the same as actually getting your hands dirty.”

Participants used the word “actual” frequently when discussing work with patients. Where information from book, lectures, and slides seemed to reside in a different space from the patients, the cadaver was concrete and tangible like the patients. “I guess it made it more relevant and more memorable than just standard book learning would be. The same way that when you get to your clinical years you learn the most from patients that actually, you know, you're treating rather than just trying to study about something” (Dr. Cypress).

Participants noted that pragmatic learning experiences became more frequent as they moved through medical school and on into residency, but many pointed to the gross anatomy lab as their first experience using applicable skills. Dr. Spruce articulated this point, “When I talk about talking to patients about anatomy that was probably the first experience of that because we had to talk to each other about how this should go.”

Furthermore, participants noted that in the gross anatomy they had the opportunity to see how some things actually worked and they could then draw upon that knowledge

when working with clients. For example, a number of participants talked about gaining understanding about joints and ligaments by dissecting them out and then making the joint in question move by pulling on the ligaments. In the focus group, Dr. Silver stated, “I think the anatomy course in knowing how things attach, how retinaculum cover certain things.... I can’t tell you how many times I’ve been able to piece together an injury just by the mechanism that’s described, you know.” Dr. Juniper agreed, stating, “I think that’s extremely key. Because you can oftentimes make a diagnosis simply by what happened and you can oftentimes make an accurate assessment.”

Variation

When discussing their time in the gross anatomy laboratory the topic of variation came up frequently as an important piece of the dissection experience. Dr. Oak explained, “Not everyone is exactly the same, so [dissection] provides the framework of variance to keep it all together.” Gross anatomy is intended to be an introduction to normal anatomy, and variation is a part of normal anatomy. As Dr. Brown put it, “there’s a bell shaped curve in terms of anatomical structures.”

Variation can be seen in prosected cadavers as well, but participants noted some benefits of uncovering variation through dissection. To begin with, there was a greater sense of remembering variation when the person was responsible for discovering it. Anomalies that were discussed in the lecture or books were viewed as an interesting bit of trivia, but when actively uncovered through dissection, either by themselves or a peer, there was a sense of excitement. Dr. Tungsten likened dissection to a “treasure hunt,” and variants were bits of unexpected treasure.

On the other hand, participants talked about the frustration that arose from the variability amongst the many cadavers in the lab. This frustration centered mainly on the difficulty this caused in the practical exams for the course. Dr. Mahogany described these tests with a positive spin, “these practical tests that we had to go around and dig in everybody else's body was always an unusual and interesting experience, but it also gave us a broader depth of gross anatomy and knowledge by learning the differences by one to another.” However, others remembered a sense of exasperation at having to try to identify structures in one cadaver when they looked very different in the cadaver they had dissected.

Still, participants expressed appreciation for the ability to see these variations in real life. “A real body that doesn't have everything where the plastic parts say they're supposed to be is an invaluable experience.” Some participants contemplated what it would have been different for them if they had not been exposed to the variability in the room full of real bodies.

When you're cutting on a human body it's, things are different and they're not always where you think they should be. The visual images are not identical. I mean, I don't know. I've never seen a program that could reproduce the visual experience identically to what actually occurs in an operating room. (Dr. Zinc)

Dr. Olive stated, “Everyone has variant anatomy too, so if you go just by the book, you could come across a patient with situs inversus or anomalous veins or arteries, or something.” She noted that she has seen many more examples of variability in her work as a pathologist performing autopsies, but the experience in the gross anatomy laboratory set the stage so she was not surprised by, or in some cases, even sought out those variations.

Being prepared for surprises was the main benefit noted about seeing variability through dissection. Dr. Oak noted the clinical benefit of remaining aware of variability, “So you have to be prepared for all the variations. It helps you to be a better surgeon if you're cautiously proceeding, recognizing this may not be the same, or this could present with a different problem or a different complication if you're not careful.” Other participants also pointed out how important that awareness was for surgeons, but they also pointed out that the value was not limited to the field of surgery. Dr. Pine noted that variation can impact not only anatomy, but also physiology and how a patient responds to medication. He went on to explain that understanding variability also helps to comprehend why, “You see individuals who were likely liable to sprains, and then there are individuals who are tougher than rawhide.”

Physical Contact

Participants spoke about the importance of physical contact with patients when it came to providing medical care. Dr. Brown stated, “You know, in some part your confidence in terms of touching patients and doing things starts in a gross anatomy lab. That's the first thing that you're touching.” When asked why physical contact was important participants noted that touch plays an important role in diagnostic examination. Understandably, this notion was most often voiced by participants who practiced general internal medicine, as they needed to have the skill to diagnose a wide range of ailments. Yet physicians in other specializations talked about the practical aspects of physical contact in their work with patients. Dr. Pine, a pediatrician by trade, noted how tactile sense is an important aspect of surgery:

The art of dissection, while being gentle with tissues and inflicting the least damage upon the body during surgery. Very little of surgery is done with a knife. Most of the manipulation is a matter of very delicately separating one critical tissue from another. And that requires a contact with those very delicate tissues.

Moreover the touch a doctor uses is unlike the touch we are accustomed to in other social arenas. They recognized that in our culture we don't tend to touch often unless it's someone with whom we are intimately acquainted, and having to touch another person can be intimidating. Dr. Cerulean stated, "You might say that the, that it was our first exposure to touching patients, even though they were dead patients. The idea of touching another body, um, you know, can be startling with some people, uh, rather shocking and take them a good long time before they can do that."

Participants talked about how the dissection experience allowed them to become comfortable with touching others in a way that was intimate yet respectful. As doctors, they are given the power to touch others, and at times that physical contact may even cause physical discomfort:

I mean it never stopped amazing me the sorts of things that does do; the sorts of things that we get away with. I mean you can ask people all different kinds of questions, very, very private questions that, that you can't ask outside of that little room, that little situation. And you do things to people. You touch them in ways, examine them in ways, I mean even when you're examining for like the liver and you're gouging them in the belly, um you're even inflicting a little bit of discomfort to accomplish that adequate examination. So the things that we do, um, it surprises me that people allow us to get away with that, to do that. (Dr. Cerulean)

Because physicians are entrusted with that power by their patients it is important that they are able to approach physical contact from a place of respect. The power in that situation comes from the fact that the touch is not reciprocal. A patient's touch with her or his doctor is limited to a handshake, but it's often necessary for a physician to touch his or her patient in much more intimate ways. Dr. Chestnut reflected on how that experience

relates to dissection, “It’s just very interesting, you know, they’re gonna dissect all of their private parts too along with, you know, the usual arms and legs, it’s a very private sort of (pause) sort of encounter with a cadaver too.” As with the future patients, the cadaver is exposed to the most intimate and invasive of touch but is unable to reciprocate. Figure 3.12 appears to illustrate that point well.

Four images from the yearbooks focused on touch between the students and the cadaver. Each appeared in a yearbook from the 1960s, and three of the four were accompanied with captions that were incongruent with the gentle touch depicted in the photograph. While incongruent captions were fairly common in the yearbooks from that decade, it is interesting given the participants’ reflection on trust, respect, and physical contact.

Seeing the Person in the Body

“I feel that, I don’t know, it’s sort of interesting you know, it wasn’t just a body to

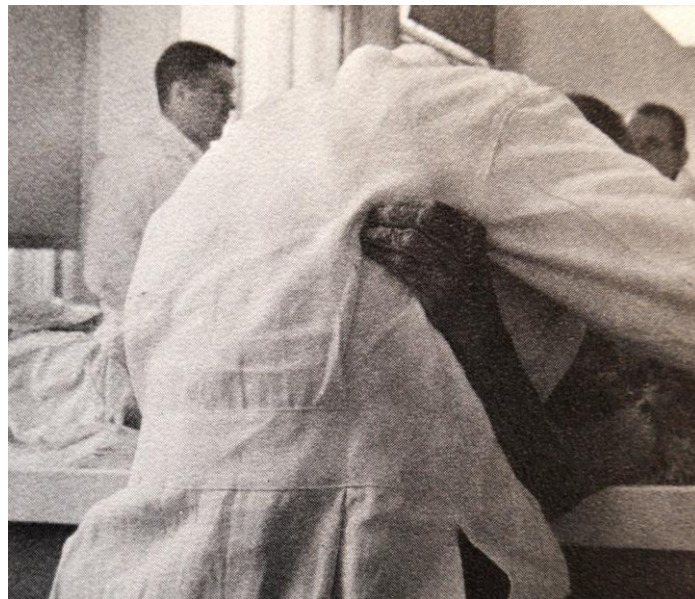


Figure 3.12: 1965 Touch

me, it was a person” (Dr. Iron). When discussing the topic of respect the conversation frequently turned to recognizing the cadaver as a human being. For most participants, they remembered this happening naturally, although participants who graduated in more recent years had more memories of having a formal discussion or lecture on respect for the cadavers as people being part of the introduction to the gross anatomy course.

Many of the participants recalled giving their cadaver a name. When asked why his group chose to name their cadaver, Dr. Pine stated, “We were going to be dealing with him for months. Doesn't seem like something you can just call ‘hey you.’” Others did not name the cadaver, but did refer to the cadaver by pronouns. Dr. Olive recalled that while they chose not to name the cadaver they worked with, they always referred to the cadaver as “her” or “she.” Even the prosection group that Dr. Azure was part of named the prosected cadaver they studied from. Although the name was culturally insensitive Dr. Azure reflected, “I think we thought [the name we gave him] was an endearing term at the time, politically incorrect as it may have been. But, um, we knew he was somebody.”

For some groups they not only knew the cadaver was somebody, they were aware of the cadaver’s actual identity. For some this occurred intentionally and others by accident. Dr. Cypress recalled that her group’s cadaver still had a hospital armband on with her name on it. She noted, “We all felt extra grateful because of that! It was kind of interesting, we appreciated knowing her name. I guess just made it more real that this was actually a person.” Two members of the focus group noted that they also had found out the real name of their cadaver, and that was important to them because they thought of him as an extra member of the group. One noted that, years later, “There was one

Christmas, when three of the four of us who were there got a Christmas card from our cadaver.”

For many, seeing the person in the body meant recognizing that person’s free agency and choice to donate. This awareness seemed more salient in the participants who had graduated more recently because it was general knowledge that the bodies were procured through the gift of donation. However, even the more senior participants who were unsure of how the bodies came to the medical school made note of how important it was that the person had made the decision to donate:

I guess if he had chosen to do this, he was trying to foster medical education or research, and I appreciated the individual, that he was participating in this way, and I think it made me feel more responsible to do the dissection correctly, in a way, you know, I want to use the word “being courteous,” but that's a good term; courtesy to him and his wishes, and almost the sacredness of his body. (Dr. Iron)

Other participants echoed this sense that knowing the cadaver as a person who had made a choice to be there increased their sense of responsibility and respect. “You're not dealing with, with just a piece of meat. You were dealing with a person, whose body has sanctity and respect, and value” (Dr. Mahogany). Some differentiated it from the feeling they had in comparative anatomy courses where they had dissected animals. As Dr. Beige said, “Well I think part of it was again, as you walked in, when I walked in and saw the various cadavers and saw my cadaver, you had these first thoughts about ‘Who was this?’ and that sort of thing. That's obviously different than a shark.” A small number of the images in the yearbooks focused on the body alone, as if to echo the question of “Who was this?” Figure 3.13 is one example of such an image.

For many participants they not only saw the cadaver as a person but as their first patient. As Dr. Cypress explained:



Figure 3.13: 1966 "Who was this?"

That encounter that's a bit uncomfortable and is with an actual person happening right off the bat like that, instead of, you know, going through one or two more years of what you might call "just book learning" and then finally encountering a patient. Gross anatomy made it feel like it was already a patient a little bit.

By seeing the body as a person there was an "actual person" there was a sense of obligation and care afforded to it. Dr. Olive was one of the participants who named the interaction as the "first doctor patient relationship." When asked to expand on that statement she said, "Well I think it's because you're in charge of that cadaver. You're caring for that cadaver, so in the sense of caring for a patient. You're responsible that that cadaver is well taken care of and respected." Others echoed this sentiment and noted that this was significant in their professional development because they believed it was important to have empathy and connectedness to the patients they are treating. If they could see the cadaver as more than "just a piece of meat" they could more easily see their patients as more than just their disease. As Dr. Azure stated, "I think I'm really connected to my patients. I don't think of them as a patient with cancer. I think of them as, I mean

really, I think I have the greatest of all worlds. I can tell you things, all sorts of things about them that has nothing to do with their cancer.”

Objectification of the Cadaver

For other participants, there was less of a sense of seeing the cadaver as a person and more as an object. Even Dr. Azure, who in the previous section noted his connection to his patients, stated that he felt no connection to the prosected cadaver from which he studied. Dr. Cerulean also noted a lack of connection to the cadaver:

They were beyond dead. I mean, they were, they were so dead that it was not real. I mean there wasn't a whole emotion of death, um, somebody, somebody, you know, abandoning and leaving a family and having them distraught and missing their loved one. This was way, way, way beyond that. Um, at this point they are long gone. They're a cold slab.

For both of these participants, the key piece seemed to be that the cadavers were not “real people.” Dr. Cerulean noted that he felt like a “real doc” the first time he examined a patient. He noted taking care in touching the patient gently and talking to them in a way that they could understand what was going on. Likewise, Dr. Azure noted that the difference between the cadavers and the patients he saw on first clinical rotations was that the patients were real, “They had real disease and they were people who had a disease, and I can remember, I can picture, not every patient, but I can picture many patients in specific rooms and specific diseases, and specific things they said.”

For others, detaching themselves from the human aspect of the cadaver was a way of coping in order to focus on the work. The 1973 yearbook made note of this phenomenon, “The formalin-soaked mummies horrified and disgusted us, but when swathed in muslin they lost the appearance of people. We could dissect without feeling as if we were carving up a real person and thus marvel at the intelligent intricacy of our

construction.” Dr. Beige expanded on this concept explaining a metaphorical muslin covering for the mind as well as the body. He stated:

[The distance gave me] the ability to really dive into things and really, you know, kind of tear things all apart and see what made it work. And yet, you know, you still understood, "Well okay, this is a body, does it really represent the person?" And you would get some of the philosophical questions about the soul and all that, and, "Is this simply a physical remnant?", and the person isn't really there anymore. But those are the kinds of things, like I said, at the time, I have to admit, you, at least I didn't think a whole lot about that. I had to put it out of my mind to concentrate on the task at hand.

This ability to detach and focus on the work was noted by some participants as important for them as physicians. They had to be able to see the task that needed to be done rather than focus on the person in pain. None of the participants espoused a view that it was important to be completely detached. Rather, it was a matter of balance in being able to connect to the person but not allow that connection to get in the way of the work they were doing.

Foundation of Confidence

Dissection played an important role in providing a foundation for the confidence participants needed in their work as physicians. Confidence came from knowing what they were capable of, learning their limitations, and facing fears. Figure 3.14 illustrates each of these factors well. Seven familial categories emerged within this theme: (a) Self-determination: We're ready, (b) Strength in the eyes of others, (c) Puzzling it out, (d) Humility from awe, (e) Humility from mistakes, (f) The shocking becomes normal, and (g) Death.

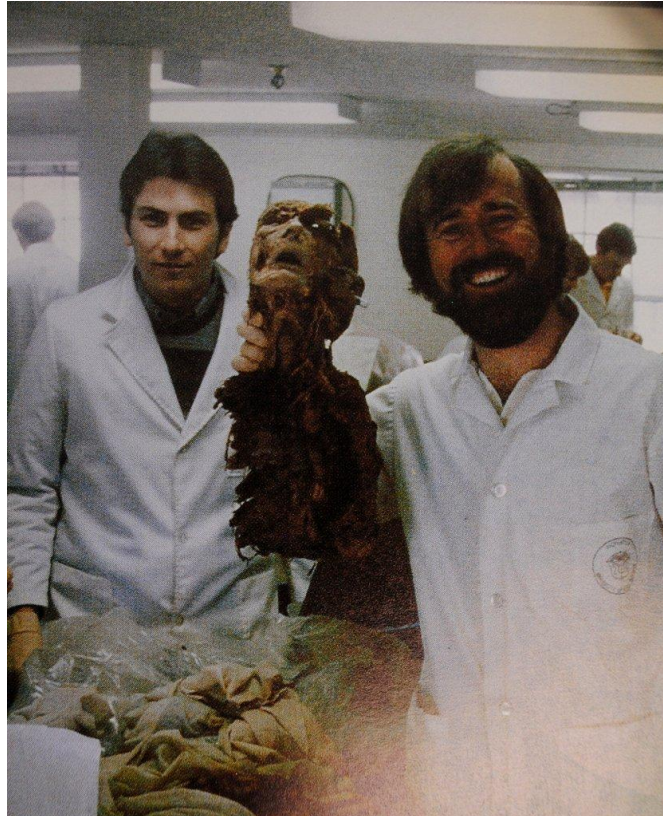


Figure 3.14: 1987 Confidence

Self-determination: We're Ready

“The med students that are not afraid to venture forth learn and acquire knowledge and do, take care of patients better than med students who are timid.... You've got to have confidence in your ability to go forth” (Dr. Brown). Participants shared that the experience in the gross anatomy laboratory provided a building block in their confidence to gather the knowledge they would need as a medical provider, and that much of this confidence came from a sense of autonomy and personal responsibility.

Participants noted that there was a sense of apprehension when first beginning the gross anatomy course. Dr. Oak explained that the nervousness he felt came from the “vastness of the amount of knowledge we were expected to accumulate and remember.”

Throughout the yearbooks, Dr. Hashimoto is often quoted as saying that the students would only remember five percent of the information they learned in gross anatomy. However, gross anatomy differed from other classes that also required that accumulation and memorization of vast amounts of knowledge. The knowledge that the students gained was not just found in a book, the students were required to uncover the knowledge themselves through active participation in dissection. That active component contributed to their sense of self-determination.

That experience was not limited to the gross anatomy laboratory, but for many it seemed to be their first memory in medical school of feeling like, “I can do this!” Dr. Cypress reflected on her time in residence and how the intensity was similar to that of her time in gross anatomy. “In this residency, I don't think the reaction was nearly as strong as that when I was, when you went through gross anatomy. But when you did finish it, boy, everybody looked at each other and said ‘Wow, we got through that and learned a lot from it, so bring it on! We're ready!’”

Being a physician means being actively engaged in care. As Dr. Brown reflected on the relationship between experience with dissection and performing various invasive procedures, “It gives you way more confidence in terms of your ability to do things that you as a med student are always having trepidation to do.” He went on to explain why this was important for patient care. “You've got to have confidence in terms of your skills to do those things. You can't be afraid not to do things. If you're timid and afraid to do things, sometimes there can be patient harm as an outcome.” In summary, Dr. Brown was stating that a good physician take responsible for making the decision, doing the

procedure, and providing the care, and won't shirk his or her responsibility on to someone else and the same was true for the dissection in the gross anatomy laboratory.

Strength in the Eyes of Others

Participants noted that having confidence is important because they are the ones others call when they need someone to be strong. A patient expects that when her or his doctor walks into the exam room that the doctor will be calm and collected. Participants talked about this process beginning in the gross anatomy laboratory.

Participants who graduated in the 1950s and 1960s often recollected that they were introduced to the gross anatomy laboratory on their first days in medical school by more senior students. Their guides would often attempt to rattle their calm with one form or another of hazing in the anatomy laboratory. Dr. Hickory reflected on his reaction:

Well, you kind of have a little bit of fear, maybe. A little bit of surprise, uh, a little wanting to back out of the whole situation, you know? Where you wonder what did I get into? And uh, you're looking around at your colleagues to see if they're, how, if they're accepting it, or, you know, how they're accepting it.

While he and other participants noted looking to their peers to model managing difficult situations, upon reflection there was recognition that they would then become a model for others.

This process continued on through their training. Dr. Cypress shared how she benefited from her experience with dissection during her time as a resident at a pediatric neonatal intensive care unit. Others in her residency expected her to have the confidence to do her job and do it well. She shared a story of one incident in which a newborn had gone into respiratory arrest. As she was performing resuscitation she noted a change in the other staff in the room:

I saw the rest right there, the nurses standing around me, visibly relaxed about one minute into the resuscitation, and I was like, "Ok everybody, come on. You still with me?" What I didn't realize was the attending had come and stood behind me, and was like right there, but I didn't know it. So that if it wasn't going well I could be, you know, gently elbowed aside and, you know, but they didn't want me to know the attending was there. They wanted me to try to handle this even though this was a baby's life.

Dr. Cypress stated that this experience was similar to the dissection experience in that she just had to jump in and do it. She noted in this case the comfort of the others in the room came from knowing that the attending physician was present. Dr. Cypress noted that once one became a physician, she or he was the person others looked to when they needed to be calmed.

Dr. Oak echoed that notion, but added that as the physician he has to remain calm and focused regardless of his own internal reactions. He noted that the experience in the gross anatomy laboratory helped moderate those reactions. As he stated, "Having seen gross stuff we're not as grossed out as easily. [And that's important] so you don't seem shocked. When somebody comes to you with a bad injury, you don't say 'Oh my heck! Somebody call a doctor!'"

Puzzling It Out

For some participants, confidence arose in the gross anatomy laboratory from the pleasure and sense of accomplishment of working through a challenging puzzle. As has been noted previously, dissection is not an easy process and the variation in and complexity of the bodies contributed to the difficulty. As students the participants had to take information from lectures, books, the cadaver, and living anatomy and piece it all together as a coherent picture in their own mind. Figure 3.15 appears to capture that very process in action. Four other images of students in the gross anatomy laboratory making



Figure 3.15: 1997 Puzzling it out

the connection between different sources of knowledge appeared in yearbooks between 1964 and 1997.

Participants talked about how this sense of working through the pieces of a puzzle continued on into their work as a physician. For some, especially those who perform surgery as part of their medical duties, the knowledge gained in the dissection processes is directly applicable to their work. Dr. Beige explained:

When you're doing the dissection, you have to be careful that you're not damaging something while you're taking it apart, so you can actually trace things out and find where they are. And, um, again, just that experience carries over to the early years of surgical training. [In surgery] you may have to take it apart before you put it back together.

Dr. Oak echoed this statement as he credited his dissection experience and knowledge of anatomy in helping him perform surgery effectively. He described surgery as “finding the pieces and putting them back where they belong.”

Even outside of the realm of surgery, participants noted that the ability to draw on anatomical knowledge was important in working through medical uncertainties, particularly when it came to making diagnoses. When asked what he gained from his time in the gross anatomy laboratory, Dr. Nickel stated:

That's where you start learning how to ferret things out, which is what you really do as a doctor all your life. I mean you have to be a self-teacher or you're not going to be any good as a doctor... You have to keep reeducating yourself more all the time, and that's where you start. Anatomy is where you learned a lot of self-reliance and got a lot of self-confidence.

This is not only important for individual physicians but also for those working as specialists as part of a medical team. Dr. Olive stated, "We've all been trained to figure out certain parts of the puzzle and then we have to come together and create a whole picture to create the best plan for the patient."

Humility from Awe

Participants spoke about the importance of having humility as a physician. Rather than being opposed to confidence, humility was actually a contributing factor.

Participants spoke of gaining a sense of humility from the awe they experienced in getting to understand the true complexity of the human body. Dissection gave them insight into the intricacies of the human body, and the recognition that for the most part all of those intricate piece work together without issue. Dr. Pine described it as such:

I think the respect for the human body and its complexity and the marvel of it, I'm sure it accumulates through all of the courses, but the basis is right there in the anatomy lab... The fact that this fits into a whole which over many years may run just beautifully without any problems, without any, you know, what is it, why is it that the body can run like this seemingly autonomously? And then you find out that sometimes it goes haywire...sometimes you can do something about that.

It is that point at which the confidence can arise; that knowledge that as a doctor he can attend to the piece that is faulty as the rest of the incredibly complex system continues to function.

Participants also noted that dissection helped to make clear that, despite the fact that the body is a very complex system, with the right understanding simple actions could have a meaningful impact. Dr. Olive discussed the two realities that exist within the body: one of simplicity and one of complexity. She used the example of understanding how we hear. She noted how very small and simple the bones of the inner ear are, and yet the process of how sound travels to and is interpreted by the brain is so complex.

Others pointed to the humility that comes from accepting that there is a limit to their knowledge. Dr. Chestnut explained:

I think that humility of recognizing that we don't know everything is helpful. We forget that we don't know everything, and if we don't have a name for it, you know, then we start saying "this patient must be a malingerer" or this isn't a real, you know. If it hasn't been something that's been described before and doesn't have a name, then we're likely to say "well it doesn't exist," you know, because we don't have a name for it. And so I think there is something healthy about recognizing that we don't know everything so that we start thinking about, you know, what could this be that we don't know about yet?

Accepting the limits of current knowledge provides a space for courage to explore further. A sense of reverence also helps to dispel the myth that one should know all there is to know about the human body. Accompanying that sense of reverence was a sense of determination. Dr. Teal described his first moments walking into the gross anatomy laboratory:

It was one of awe. You know, "This is real!" There is nothing more real than the cadaver room. You know you can go into histology class and physiology and all that, and the reality of what you're doing and what medicine is all about is still pretty obscure, you know, "How is this going to connect to practicing neurology or O.B. or internal medicine surgery?" But man when you walk into the cadaver

room, you know that this is what medicine is about. This is the human, the stark reality of the human condition when something went wrong, and the objective of that whole experience to kind of figure out what wrong in this patient. It is a slap in the face or shock-and-awe. This is medicine. This is my battle field so to speak.

Humility from Mistakes

In addition to the humility that was gained through experiencing awe for the human body, participants talked about humility that came from making mistakes as they dissected. Few looked back on these moments as fond memories, and participants noted the frustration they felt at the time. Some noted it as a drawback of dissection. Dr. Azure cited it as one of the reasons he chose to be part of the cohort that learned from a professionally prosected cadaver “And [dissection is] not only tedious, but [done] by people who were unskilled at teasing it out. The stuff we looked at, we could wander around and look at other peoples' cadavers, but, you know, the things we had looked at had been, dissected by skilled people.”

However others noted that making mistakes was a natural part of learning through the dissection process. Dr. Beige commented on the frustration as well as the understanding that came from dissection:

It was a very frustrating thing to be dissecting something out and suddenly slip with a knife or scissors and then cut something that then made it very difficult to go back and continue to trace it. So yeah it was something; yeah you had to be careful while you were doing that. You never knew what was coming up next. Until you've done it. Once you've done it, then you understand what's coming up next, then the next time you have to do it, you know when to be careful.

From those mistakes he was able to gain confidence for the next time and continue to build that confidence as he developed into a skilled surgeon.

Making mistakes also provided a platform to build confidence in asking for assistance. Dr. Tungsten recalled, “And so you dig away and you'd have your book there,

and eventually you'd find it, and if you didn't, I can't remember who was roaming around to help us, but, uh, you'd ask that person and they'd help you dig away. And, uh, it was enjoyable.” Other participants noted turning to the other members of their group or class for help.

Oh yeah! And you ruin your dissection because you cut through what you're supposed to dissect out, so you have to look over the next group's shoulder to see what it looks like properly dissected out because you messed up your cadaver. And then five people down the road will come and look over your shoulder because they accidentally cut something they were supposed to dissect out. (Dr. Olive)

When asked why it was important to mess up in the gross anatomy laboratory, Dr. Olive explained, “It's part of being human. It's part of acknowledging that yes you're smart and you're in medical school, but you're not omnipotent. It's humbling.” This points to a parallel process: mistakes increased confidence by reducing hubris, and mistakes were accepted in the gross anatomy lab because they must be avoided in the clinical realm. Dr. Hashimoto was well known for noting in his lectures the consequences of a poorly placed incision. Figure 3.16 is from the 1971 yearbook. The original caption reads “Now if you accidentally clip the pudendal nerve, you had better go wash your hands and call a lawyer.”

In this aspect dissecting the cadavers was helpful because a mistake would not lead to permanent damage, but there was an awareness of the potential damage that could occur in a living person. Dr. Olive explained the benefit of making those mistakes in the gross anatomy lab: “Well, cadavers are forgiving. Because when you're in the other realm in surgery you can't do that. I mean it happens, but you don't want it to.... It gives you forgiveness. It's the training wheels of how to ride the bike, I guess.” And just as training wheels help to boost the confidence of a child learning how to ride a bike, the

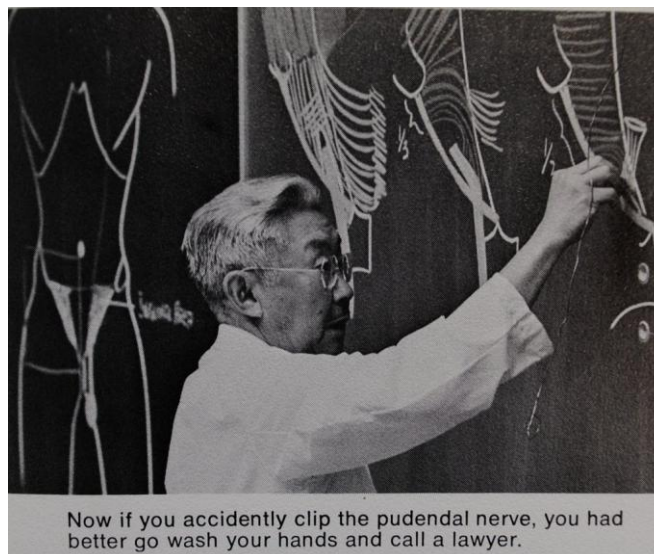


Figure 3.16: 1971 "You had better go wash your hands and call a lawyer."

dissection helps to boost the confidence of medical students learning how to practice medicine.

The Shocking Becomes Normal

Aspects of dissection that were shocking and unpleasant were frequently cited by participants. The one most likely to be mentioned first and most frequently was the smell of the gross anatomy lab. Participants noted how the smell of the laboratory clung to hair and clothes and was nearly impossible to get rid of. Some noted that in their later years in medical school they could always recognize 1st-year students by the smell of formalin. The odor was also frequently referenced in the yearbooks. The 1961 yearbook introduces anatomy with the following sentence: "Anatomy: A never to be forgotten organization, the memory of which (and possibly the aroma) will most certainly remain with us *ad nauseum*." Figure 3.17 captures one individual coping with the respiratory concerns of the lab. Participants noted that being able to handle noxious odors can be very important

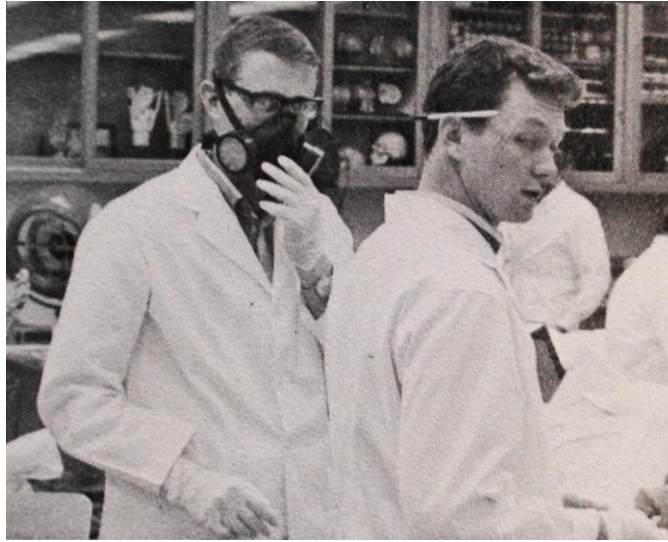


Figure 3.17: 1971 The smell

in their work. They gave examples of working with patients who were unable to control bowel or bladder function, had not been able to bathe, or had infections that were abscessed and odiferous.

Despite the complaints about the smell it was something that most participants noted that they came to be, if not comfortable with, at least accustomed to over time. This was the case for many of the shocking aspects of the dissection. At first, the experience was difficult but as time passed the shock lessened and their comfort and confidence increased. Dr. Mahogany recalled, “I would bet that probably 30 out of the 100 people in my class, at some point or another, during that [first] morning, got nauseated and went outside and vomited. But within two weeks, everyone in the class was dissecting and eating their lunch at the same time.”

When talking about the eventual comfort in the gross anatomy laboratory, the topic of eating in the lab came up frequently for participants who had graduated before

the 1980s. The yearbooks contained both photographs and cartoon illustrations of people eating in the lab. Figure 3.18 is one early photographic example.

Participants reflected that this ability to become comfortable with the shocking aspects of dissection was important in their development as physicians. Dr. Olive reflected:

[Dissection] serves I think also, an emotional and psychological role, because you're going to see a lot of really gross things. You're going to see mutilated bodies. You're going to see that visual, I remember walking in and seeing 50 dead bodies lined up and almost passing out, but you have to learn to steel yourself, and you have to learn to deal with that psychologically and physically to be in medicine.

This was true for participants in all areas of specialization. Dr Oak, and ophthalmologist, shared a story of a patient whose eyelid had been “mangled” in an accident. Dr. Oak credited his time in dissection with helping him not only repair the eyelid but also being able to remain calm in the situation. When reflecting on the shocking aspects of the lab Dr. Tungsten noted, “Oh, it became normal after a period of



Figure 3.18: 1956 Eating while dissecting

time. I think in medicine in general that happens. I mean, my first exposure to mental patients was shocking, but it became second nature to me after a while. And I mean that would be true for pathologists, or you know, surgeons, or anyone.”

Death

Freshman medical students are forever answering inquiries about cadavers, so a word on the subject is in order. The word which springs to mind is “dead.” Until you have shaken hands with some departed stranger’s earthly remains, the concept of death is a pale abstraction which has no substance. One needs to have formed an intimate acquaintance with a corpse in order to animate the concept of death. (Yearbook 1977)

For the majority of participants, the gross anatomy lab was their first personal encounter with death. Some noted that they had some passing contact with death when an elderly relative had passed away, but those memories were usually detached. As Dr. Chestnut noted, “It’s sort of, the first sort of private interaction with a dead body if you will. You know, I mean, you see people at funerals and stuff, but this is a dead body that you are touching and cutting and doing other stuff.”

For some there seemed to be a distinction between the words death and dead. The word dead was more often used when detaching from the humanity of the cadavers. As Dr. Cerulean was previously noted as saying, the cadavers were “beyond dead.” They were “cold slabs.” Figure 3.19 from the 1954 yearbook shows the entrance to the gross anatomy laboratory announcing “Thru these portals pass the deadest people in the world.”

Participants noted that that for many of them, their confidence was shaken when they were first faced with the dead bodies in the gross anatomy laboratory. However, moving past that initial aversion helped them to gain even greater confidence and was

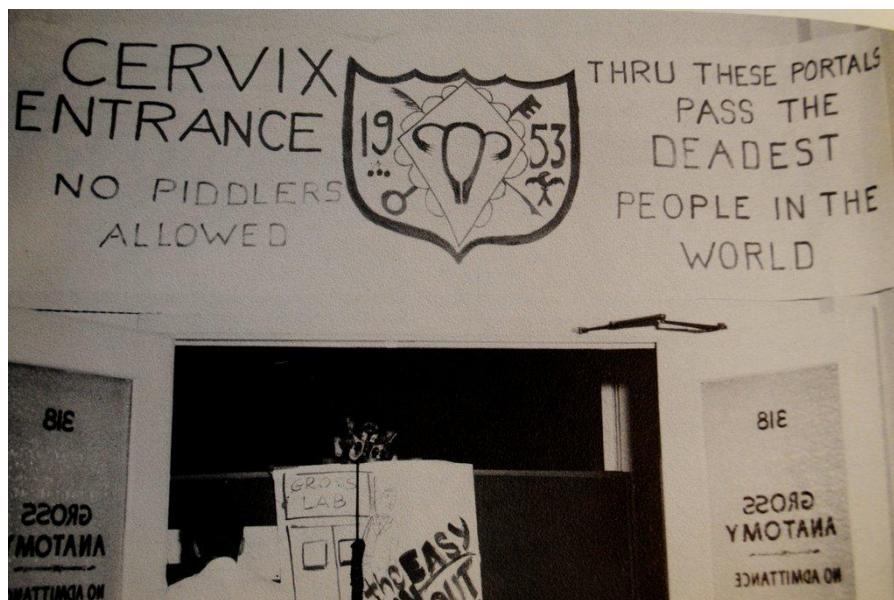


Figure 3.19: 1954 The deadest people in the world

seen by some as a necessary step in their development as physicians. Dr. Indigo shared her first moments in the gross anatomy laboratory, “It was a personal accomplishment for me that I wasn’t repulsed by it. I really didn’t know what I would do with that. You know, I’d been in the room with a dead body before but I was standing in the corner of the room, so it was something I needed to not be repulsed by it.”

Participants talked about how that need to not be repulsed by death was an important part of their work as physicians. As Dr. Nickel explained:

It’s the beginning of what you have to do all of your life. Telling people they’re dying is a lot worse than being in there with a body, but I think being in there with a body is the first step towards that. I never thought about it, but that’s probably an important contributor to what anatomy is good for, actually. Because you don’t learn to be desensitized to that stuff by cutting up a frog, but another human you do.

Participants noted that in their work, regardless of specialization, they will encounter terminal illness and death. They have to have confidence to face the death of a patient and still be able to function. Dr. Cypress reflected:

Making decisions and being responsible maybe for the death, but you're still on duty if your patient dies especially if you're a pediatrician, because the family needs so much information and support, and you can't just collapse into tears and leave the room; you have to still function. So, yeah, so I think being exposed to death in [gross anatomy] was useful.

Summary

The participants spoke at length about their experience dissecting in the gross anatomy laboratory during medical school. Through analysis of focus group discussion, in-depth interviews, written responses to interview questions, and review of yearbook content four unique themes emerged from the data. From these themes the core concept of Foundational Learning for the Future arose as the one theme that was central to them all. Participants used their experience in the gross anatomy laboratory to form lasting friendships and build skills for working with their future colleagues. The experience of dissection laid the groundwork upon which future knowledge was built. Patient care began in the gross anatomy laboratory from learning how to provide care and respect to understanding the human body beyond a theoretical basis. Confidence bloomed through the growth of skills and the facing of fears. Each of these experiences laid a building block that would become the foundation for their future as physicians.

CHAPTER IV

DISCUSSION

Overview

Qualitative research is used to gain an in-depth understanding of a particular event or phenomenon (Patton, 1990). As such, the results of this study are not intended to be generalizable, but to deeply illuminate the experience of cadaver dissection for the alumni of the University of Utah School of Medicine and the impact that experience had on their development as medical professionals. Yet, due to the triangulation of the data used in this study the results are rigorous and transferable. The information gained through this current study can be used to inform medical pedagogy.

The purpose of the research was to explore the meaning that physicians make from their experience with full body cadaver dissection as that experience is viewed within the broader autobiographical narrative of their work as a medical professional. There has been much speculation as to the covert learning that may occur through the process of dissection (Paalman, 2000). The overt purpose of dissection is to teach normal human anatomy. However, many anatomists and those involved in medical pedagogy have asserted that dissection teaches far more than simple anatomy, but the traditional quantitative assessments used in gross anatomy laboratories do not lend themselves to uncovering these covert learning experiences (Lempp, 2005). This has led to the question of what is the full scope of that which students learn during dissection. The current study

was designed to allow the students who have grown from that experience into active health care providers to answer that question.

As is appropriate with qualitative research, this study was designed to preserve the voices of the alumni who volunteered to take part in the study. Grounded theory is a qualitative research design in which the inquirer generates a general explanation of a process grounded in the data from participants who have experienced the process in question (Creswell, 2007). Grounded theory design was utilized in the current study in order to build a conceptual model of the learning process in the gross anatomy laboratory. This conceptual model was based on the laboratory's place within the autobiographical narratives of physicians who trained using cadaver dissection and as reflected in the archival data available in the School of Medicine yearbooks. Through these data a number of unique themes came to light that revolved around meaning-making that came from dissection. Using grounded theory methods as outlined by Strauss and Corbin (1997) and Fassinger (2005), these themes were coded using familial and axial coding. This resulted in one core concept, Foundational Learning for the Future, arising around which gravitated the four themes: (a) Working with Peers, (b) Future Learning, (c) Patient Care, and (d) Confidence.

Conceptual Model

Within the dissection process multiple learning experiences occurred from which participants began building an understanding of their identity as physicians; these included gaining an understanding of the human body in a way in which they were able to refer back to when learning future material, learning how to interact professionally with their peers, learning the basis for patient care on both a physical and emotional level,

and gaining a sense of confidence. The learning that occurred in the gross anatomy laboratory became a foundation that the participants built upon as they continued through medical school and on into practice. Four themes rose within this foundational learning that although interconnected were unique in their contributions to development of the participants' identities as physicians. Figure 4.1 illustrates this concept. The figure is drawn in three dimensions as a representation of the multidimensional aspects of dissection as named by the participants.

Although the four themes rose up as unique within the experience of dissection they are all interconnected. As such, the figure illustrates separate concepts that are encompassed in a larger base. Take for example Dr. Olive's statement, "We've all been trained to figure out certain parts of the puzzle and then we have to come together and create a whole picture to create the best plan for the patient." The statement is used to illustrate the theme of Confidence gained by puzzling through a problem. However, each

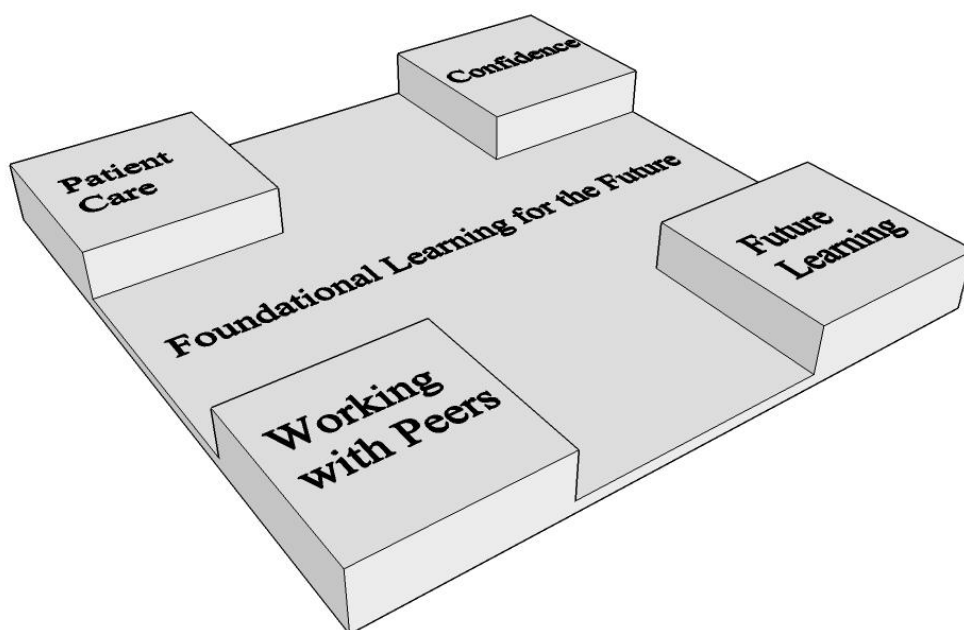


Figure 4.1: Illustration of Conceptual Model

of the other themes are present. Working with Peers comes through in the teamwork necessary to “come together.” Future Learning is reflected in the firsthand knowledge and the ability to form a “whole picture” of the body. Finally, the statement is couched within the notion of creating the best plan for the patient, and that is the basis for the theme of Patient Care.

The themes that arose in this research were not in and of themselves experiences exclusive to the gross anatomy laboratory. Dr. Azure, who elected not to dissect, made note of the connections that he made with peers and patients during clinical rotations in his 3rd year of medical school. These experiences closely mirrored many of those described in the themes of Working with Peers and Patient Care. Other participants noted aspects of the theme of Future Learning when discussing other courses they took such as biochemistry and physiology. Still others discussed their time in residency in ways that reflected the theme of Confidence. However the combination of the four primary themes and all of the familial categories within them was unique to the dissection experience. It is this combination that creates the foundational learning experience within the gross anatomy laboratory. These multidimensional learning experiences occurring simultaneously within the 1st year of medical school create the bedrock from which students begin the process of forming their identity as physicians.

Results as Related to the Literature

Various findings in previous research are reflected in the themes that emerged from the data in the current study. As noted previously, the literature surrounding cadaver dissection in the education of medical professionals falls in one of two categories: research and conceptual literature. The research literature primarily focuses on three

major points: the perception of emotional impact of cadaver dissection, the utility of dissection as an educational tool, and the academic performance of those students utilizing one form of gross anatomy instruction (such as dissection) compared to those using another method. The conceptual literature presents both reasons for and against the use of dissection. In the following section I will explore how the findings of the current study relate to the existing literature. The following sections will review how the current study fits within each of these categories.

Emotional Impact of Dissection

Early research focusing on the emotional impact of dissection indicated that the process of dissection produced adverse psychological effects in nearly one third of the students (Horne et al., 1990). Yet, subsequent studies that have focused on the emotional aspects of the dissection experience have found generally positive outcomes to dissection. Students have been shown to experience initial apprehension when beginning the dissection process, but over time the majority of students view the dissection process as a positive experience (Arráez-Aybar et al., 2008; Bernhardt et al., 2012; Dinsmore et al., 2001; Skinner, 2010). The research indicates that students who experienced high levels of anxiety or recent bereavement prior to entering the gross anatomy laboratory were most likely to express negative sentiments about the dissection process (Quince et al., 2011).

The results from the current study support the notion that over time the perception of the dissection process generally grows more positive. Although there were experiences perceived to be unhelpful or annoying (see *Negative and neutral views of dissection* below), no participants in the current study expressed feeling emotionally harmed by their experience with dissection. Rather, many of the participants endorsed dissection as a

positive emotional experience in which they were able to overcome negative emotions. This experience clustered most strongly in the theme entitled Confidence. Participants spoke of the gross anatomy laboratory as a place to confront feelings of insecurity, shocking experiences, and death. Although these things are often associated with negative emotions, they are not insular to the dissection experience. Rather, they occur throughout the lifetime of a medical practitioner and the dissection process provided a space for participants to develop a schema from which to draw on when confronted with death, shock, and insecurity later in their training and practice.

In the current study participants noted a sense of humility from dissection that came from both a sense of awe and the experience of making mistakes. This balance between the affirming emotion of awe and the disconcerting experience of making a mistake, with both leading to a sense of humility, is similar to the balance between the excitement of discover and the shock of medicine found by Skinner (2010). In both cases the humility or respect surrounding the human body is spurred by a dichotomous experience in which both positive and negative emotions are held simultaneously.

Utility of Dissection

In the existing literature, the utility of dissection refers to the ways in which cadaver dissection is useful in educating future medical professionals. Researchers have examined the perceived utility of cadaver dissection from the viewpoint of medical educators (Arráez-Aybar et al., 2004), medical professionals (Arráez-Aybar et al., 2010), and students (Azer & Eizenberg, 2007; Kerby et al., 2011; Skinner, 2010).

Skinner (2010) found that the concept of utility played a major role in how medical students learned how to balance respect for the human body. By perceiving the

process as useful to their future careers, students were able to work through the uncomfortable aspects of dissection. Similarly, in the current research participants reflected on how recognizing the long-term benefits of dissection helped them deal with difficult tasks within the gross anatomy laboratory. Additionally participants recognized in retrospect that they used knowledge gained through dissection in both future learning in classes as they moved through their medical education and their patient care as they began work as physicians.

The theme of Patient Care and in the current study is highly reflective of the utility of dissection. The theme of Patient Care illustrated that physicians drew on their experience in the gross anatomy laboratory regularly when working with patients. Although it may not be an explicit process of consciously reflecting on the experience of dissection while working with a patient, the dissection process laid the groundwork for everyday actions in medical practice such as physical contact with the patient, or understanding the clinical implications of variation. This is congruent with the findings of Arráez-Aybar et al. (2010) that showed that not only did medical professionals consider gross anatomy the most relevant basic science taught to future surgeons, they also endorsed dissection as a vital component to basic daily medical practices.

Future Learning is also a theme in the current study that is reflective of the utility of dissection. In this area, research surveying students often examines how useful medical students believe the dissection process to be in their overall learning experience (Kerby et al., 2011). Although the current study did not ask participants to compare dissection to others means of learning anatomy, participants did speak of the broad learning opportunities presented through dissection.

Dissection and Academic Performance

Early research on cadaver dissection focused primarily on the academic performance of medical students who used dissection over some other method of learning anatomy (Jones et al., 1978). As noted above, this current study did not seek to compare dissection to other forms of anatomical education. However, the experience of Dr. Azure provided a case example, as he elected to be part of an experimental group that did not dissect but learned from prosected material. Dr. Azure's experience occurred around the same time that Jones, Olafson, and Sutin were completing their research, and his reported experience is congruent with their findings. Dr. Azure expressed no negative impact on his academic performance and has continued on to a very successful career in oncology. However, Dr. Azure did not express many of the positive aspects, such as teamwork, holding a picture of the body in his mind, or gaining confidence through humility that other participants noted having gained in their dissection experience. Rather than gaining them through the singular experience of dissection, they were reflected in other experience throughout his clinical rotations and residency.

Use of time is another area of focus in research on academic performance. Time spent dissecting was a familial category that arose in the current study. As with Winkelmann, Hendrix, and Kiessling's (2007) research, participants' recollection of the amount of time they spent dissecting varied widely. Likewise, Winkelmann, Hendrix, and Kiessling found that student attitude towards dissection was the only positive predictor for involvement in active dissection, and this current study found that participants' views of the objective of dissection impacted the value they placed on the time spent in dissection.

Conceptual Literature: Positive Views of Dissection

The conceptual literature comprised of conceptual, theoretical, editorial, and opinion articles present a number of positive aspects of the dissection process. One frequently cited benefit of the use of cadavers is the notion that dissection offers students a greater understanding of anatomical variability (Aziz et al., 2002; Granger, 2004; Korf et al., 2008; Older, 2004; Pawlina & Lachman, 2004). Some authors postulate that seeing real variation through the process of dissecting buffers against misdiagnosis and malpractice due to an unrealistic view of an idealistic “normal” body (Aziz et al., 2002; Granger, 2004). This view is supported in the theme of Patient Care where the familial category of variation arose. Participants in the current study voiced the belief that having seen real variation has positively impacted their work with patients through increased vigilance for variability in examination and differential diagnosis. Other authors note that the concept of individuality arises through the observation of variability and adds to the humanistic value of medical practice (Korf et al., 2008; Older, 2004). Participants in the current study also reflected this point and noted that seeing the cadaver as a unique human being helped them to view their patients with that same lens.

Introduction to the concept of mortality is seen as another major benefit of cadaver dissection (Aziz et al., 2002; Granger, 2004; Korf et al., 2008; Older, 2004; Rizzolo, 2002). By building the foundation of the doctor-patient relationship with the cadaver, students are forced to contend with their patients’ mortality (Aziz et al., 2002). The emotional responses that students experience as a result of this confrontation with death and dying presents a valuable teaching opportunity (Granger, 2004; Rizzolo, 2002). The current study supports these views as the confrontation of death was a major

category within the theme of Confidence. The participants discussed the notion of confronting mortality through their experience with their cadaver. Participants noted how as physicians they must be able to confront death and still be able to function, and dissection helped them to gain the confidence necessary to do so.

Further supportive arguments for the use of cadavers state that the group work required in dissection encourages learning in peer groups and functioning as part of a team, and the social bonding and communication that comes from group learning is beneficial to students (Aziz et al., 2002; Granger, 2004; Older, 2004). The results of the current research support dissection as a tool for building a foundation of working with their peers, specifically through teamwork and building life-long connections.

Participants in the current study reflected that the teamwork they experienced in the lab paralleled the teamwork they experience in much of their work as physicians.

Other authors in the conceptual literature claim that dissection allows students to learn through active touch and teaches essential skills that are enhanced by the touch-mediated perception of the body (Aziz et al., 2002; Granger, 2004; Korf et al., 2008; Pawlina & Lachman, 2004). This too was supported by the results of the current study. Participants noted the importance of touch in their work as physicians, from simply being comfortable touching others to having the ability to make diagnostic assessments through the use of touch. This was evident in the familial category of physical contact within the theme of Patient Care. Additionally, participants noted that although the preserved tissue of the cadaver differed from living tissue in texture, the experience of dissection gave them an appreciation for the differences between types of tissues in texture, fragility, and resilience.

Still other authors note that the constructive learning present in dissection allows students to test hypotheses actively and learn through deductive reasoning (Korf et al., 2008; Older, 2004). Dissection avoids the “normal education model,” and instead encourages students to hone their observational skills, verify what they have learned, and develop working hypotheses (Pawlina & Lachman, 2004). The theme of Confidence in the current study illustrates this theory through the notion of students puzzling out the human body in the course of dissection. Participants named the deductive reasoning noted in the conceptual literature above. These were skills built up through dissection and used frequently in their clinical work.

Finally the conceptual literature notes that a benefit of dissection is that it allows students to develop a multidimensional understanding of the organization of the human body, which allows them to better conceptualize in vivo anatomy (Granger, 2004; Paalman, 2000). The results of the current research support this notion, as the ability to hold a picture of the three-dimensional anatomy in the mind is important. This was reflected in both the theme of Future Learning and Patient Care. Participants shared that having physically explored the interior of the human body helped them when they were presented with new information throughout their time in medical school and when using diagnostic imaging tools in treating their patients.

Conceptual Literature: Negative and Neutral Views of Dissection

Negative and neutral views of dissection from the conceptual literature that were reflected in this study were limited. That may be due in some part to the fact that many of the views in the conceptual literature deal with the difficult aspects of managing a gross anatomy laboratory that the participants could not address (e.g., the difficulty and cost of

procuring and preserving bodies, the potential health hazards to dissectors). However, participants did note some misgivings about the gross anatomy laboratory.

Although the strong majority of participants expressed the view that the dissection experience was generally a positive one, there were 2 participants who shared the view that dissection was not a necessity within their medical education. Dr. Azure's experience has been discussed previously in this chapter. Dr. Cerulean, who did dissect as part of his gross anatomy experience, echoed the view expressed by McLachlan (2004) that it would be better to learn from palpation of living anatomy supplemented by illustrations and models. Dr. Cerulean espoused the view that the doctor-patient relationship was paramount in his work as a physician and that the dissection process detracted from time that could have been spent building skills necessary for that relationship. It should be noted that many of the other participants stated that dissection did in fact build those relational skills. The difference appears to be in the level of connection that was formed in the lab. Both Drs. Azure and Cerulean expressed deep commitment and connection to their patients, but they both also expressed a disconnect from the cadavers they were exposed to in the gross anatomy laboratory and very little connection with their lab partners. In the research on the use of living anatomy classes (Collett et al., 2009), the authors indicate that using living models when teaching anatomy fosters increased humanitarian thinking because of the communication among the life model, students, and tutors. Drs. Azure and Cerulean note the importance of talking with their patients. Perhaps this was lost in the gross anatomy course because the cadavers could not talk back.

In reviewing the negative and neutral views of dissection it would be amiss to not make mention of the smell of the gross anatomy laboratory. This aspect of the dissection experience is often noted but rarely given much attention (Azer & Eizenberg, 2007; Lempp, 2005; McLachlan, 2004). In the current study nearly every participant mentioned the smell of the gross anatomy laboratory when recalling their experience with dissection, and all referred to it as an unpleasant aspect of the experience. Yet, that unpleasant odor appeared to eventually work into a reframed view of self as one who is able to withstand the shocking until it becomes normal, a concept reflected in the theme of Confidence.

Limitations and Implications for Future Research

The intent of the current study was to examine the meaning that physicians make from their experience with full body cadaver dissection as that experience is viewed within the broader autobiographical narrative of their work as medical professionals. The research met this overall goal. However, there are some areas in which the scope of the study is limited and further research is necessary.

As noted above, it was not the intent of this study to compare one form of anatomical instruction to another. However, 1 participant's experience using prosected materials rather than actively dissecting provided a case example for limited comparison between experiences with the two forms of anatomical instruction. The qualitative nature of this study allowed for valuable data to be gathered from this limited comparison. Yet, a more thorough examination with a greater number of participants who have only experienced learning with prosected materials would certainly provided a deeper understanding of the unique contributions of each method of instruction.

This study was limited in the examination of a number of cultural factors, such as race and ethnicity, gender, and religion, and the relationship between these factors and the experience within the gross anatomy laboratory. Mortality is a universal human factor, yet one's culture plays a role in how an individual approaches issues of death, dying, and respect for the human body. The topic of how the dissection experience impacted participants' views on death was explored within the current study. Yet, the role of cultural factors was not thoroughly incorporated within that exploration. Had more attention been paid to the role of culture and mortality, an even fuller and deeper understanding of the process would likely have emerged. Likewise, additional focus on the role of gender could have been fruitful in creating a broader understanding of the part of dissection in identity development. Gender was noted to some small degree within the study, for example in Dr. Hashimoto's focus on the female breasts. Medicine has traditionally been a primarily male dominated field, yet there has been a significant rise in females within the medical profession. It would be important to further explore the role of gender within the experience of dissection in the gross anatomy laboratory.

As has been noted previously, the themes identified in this study do not easily lend themselves to identification through traditional quantitative measures. However, now that the familial categories within the four primary themes have been identified, it will be easier to develop a quantitative measure to further explore the concept of foundational learning in medicine with a broader population from a larger sample of medical schools in different regions. This would provide generalizability to the findings. Such research could focus on both current medical students and experienced medical professionals. The results of the current study imply that the various familial categories

become salient at different times throughout developing an identity as a physician. Quantitative studies could not only help to clarify when in the process this happens, but also clarify to what degree each of the familial categories influence the identity development process.

Additionally, the current study only focused on the experience of physicians in the recollection of their experience with dissections. However, physicians are not the only professionals who utilize dissection of human cadavers in their training. It would be important to explore the experience of other professionals such as occupational therapists, physical therapists, and dentists.

Clinical Implications

The results of this research indicate that by consolidating the four important aspects of health care ((a) Working with Peers, (b) Future Learning, (c) Patient Care, and (d) Confidence) dissection does in fact provide a multifaceted learning experience as stated in the conceptual literature. Often students' success in learning human anatomy is the only factor examined when weighing the costs and benefits of maintaining a gross anatomy laboratory (Elizondo-Omana, Guzman-Lopez, & Garcia-Rodriguez, 2005). Although anatomical education is indeed the foremost benefit provided by dissection, this research indicates that it is far from the only benefit.

The qualitative nature of this research made it possible to uncover the subjective process of meaning-making within dissection as it was recollected through a lens of identity as a physician. The central concept for meaning-making was the view of dissection as foundational in the development of that very identification as a physician.

This central concept was built upon the four unique themes noted above, but it was the interaction of the four themes that makes the proverbial sum greater than the parts.

This has significant implications for the clinical application of gross anatomy education as the parts in question can be acquired in some form or another at various points through the process of medical education. Working with peers and patient care occur without question in the clinical years of training. Building the groundwork for future learning happens to some extent in each class that medical students take. And confidence is built with each challenge faced along the way through their medical education. However the gross anatomy laboratory provides a situation where it is possible for all of these factors to occur in unison. For participants in the current study who expressed a less than favorable view of dissection one or more of the four primary themes was absent in their dissection experience and occurred later in clinical training.

Instructors of gross anatomy can build from this understanding. Not every student will experience all four of the themes in equal measure but can still experience dissection as a foundational experience. However, when one or more of the themes are notably absent, instructors can then step in to help elevate awareness in the missing theme or themes. For example, an instructor might help a student understand how they will be able to build off of the information learned in the gross anatomy laboratory when they move onto to other courses in the future, or an instructor might help build students' confidence by creating an environment in the lab where students can process their reactions to death or other shocking aspects of the dissection experience. As another example, participants in the current study noted Dr. Hashimoto's ability to bring humor into the room and the role that humor played in creating connections with peers.

Furthermore, the findings of the current study indicate that students' active involvement in dissection is an important part of the learning process and congruent with case-based learning strategies. Case-based learning has gained an important role in the development of instructional strategies for medical students (Ruit, Carr, & Fogarty, 2007; Srinivasan, Wilkes, Stevenson, Nguyen, & Slavin, 2007). In fact, case-based learning is a primary component of the recommendations of the Clinical Skills Task Force of the Association of American Medical Colleges (Corbett Jr, 2009). The first three clinical practice competencies recommended by the task force are: 1) the ability to demonstrate professional behavior, 2) the ability to engage and communicate with a patient to build a physician-patient relationship and the ability to also build relationships with peers, teachers, and other healthcare professionals, and 3) the ability to apply scientific knowledge. The report states:

These first three objectives describe abilities that students have likely begun to develop in their personal and educational experiences prior to medical school. The purpose of the undergraduate medical curriculum is to advance and refine these foundational competencies as they apply to the clinical care of the individual patient. (p. 2)

The results of the current study demonstrate that the experience of dissection in the gross anatomy laboratory does in fact advance and refine each of the aforementioned competencies by building respect, forming strong relationships, and gaining applicable knowledge through exploration.

Conclusion

In conclusion, this study offers a unique insight into how physicians reflect on the impact that full body cadaver dissection had on their development as medical professionals. The results of the study reveal dissection to be a foundational experience,

upon which medical students develop a greater ability to work with their peers, a source from which to refer back to when learning future material, the basis for patient care, and the confidence necessary to perform their duties as physicians. The results of this study support findings previously reported in the literature, as well as benefits of dissection hypothesized in the conceptual literature. The results of this study should also inform future research examining dissection as an educational tool for medical students. There are also significant clinical implications, and the findings of this study should be utilized by individuals designing medical training using cadaver dissection.

APPENDIX

RECRUITMENT EMAILS

Hello Saturday CME attendees,

Below is a letter from Miki Skinner, a doctoral candidate in the U's Department of Education Psychology. She contacted the School of Medicine Alumni Association to see if she could connect with some of our alums after the CME on Saturday to host some group discussions to tie into her doctoral research project: A Qualitative Inquiry Into the Recollection, Reconstruction, and Meaning-Making Process of Cadaver Dissection which she is working on in collaboration with the departments of Ed. Psych, Anatomy and Neurobiology. Dr. Sundwall will be introducing her at the start of the CME and if you are available to stay an hour after the CME to participate with her I know she would greatly appreciate it. If you are not able to stay after the CME but are willing to have her call you or visit you to conduct an interview later please be sure to share your contact information with her at the CME or contact her using the contact information in her letter at a later date! Thanks and see you all soon!-Kristin Wann Gorang,
Director SOM Alumni Relations

Dear University of Utah School of Medicine Alumnus/Alumna,

In an attempt to continually improve the education of medical students, the Departments of Neurobiology and Anatomy and Educational Psychology are jointly studying the role that the gross anatomy course – specifically cadaver dissection – plays in the development of medical students as they transition into medical professionals. Over the past three years I have studied the experience of current medical students as they have completed the gross anatomy course. However, it has been shown that the true meaning of an experience can only be revealed once it is seen within the context of broader life experience. In this case, I am interested in two points:

1) What impact do physicians believe that cadaver dissection has had on their development as medical professionals?

2) What aspects of the dissection process remain salient following the transition from medical student to medical professional?

If you graduated from the University of Utah School of Medicine between 1950 and 2002 I would like to request you to participate in this study. There are two ways in which you can participate (you can choose to take part in one or both options, and participation is completely voluntary):

1) A group discussion with 5-9 fellow alumni (1 - 1 ½ hours) to be held during the School of Medicine's Annual Alumni Weekend after the Saturday morning CME symposium.

and/or

2) An individual interview (1 – 2 hours) held in person or over the phone at a time of your choice.

If you are interested in participating or have any questions about this study, please contact me directly. You will find my contact information below. Thank you very much for considering participation in this project. Your experiences will help us understand the value of cadaver dissection to the learning process of medical students.

Sincerely,

Miki D. Skinner, M.S.

Doctoral Candidate

Department of Educational Psychology

University of Utah

Tel: (208) 703-9404

E-mail: miki.skinner@utah.edu

Dear University of Utah School of Medicine Alumnus and Alumna,

The School of Medicine Alumni Relations office is assisting Miki D. Skinner, M.S., a doctoral candidate at the U, who is working with the Departments of Anatomy, Neurobiology, and Educational Psychology to study of the role that the gross anatomy course, specifically cadaver dissection, plays in the development of medical students as they transition into medical professionals. She is hoping to interview as many of our alumni who graduated from the U medical school between 1950 and 2002 as possible about their anatomy/cadaver dissection experience. Please read the attached letter and then either contact her or reply to this email if you are willing to participate.

Many thanks!!

Good luck and let us know how it goes.

Kristin Wann Gorang

Director

540 Arapeen Drive, Suite 125, Salt Lake City, UT 84108

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Visit our Web site: <http://medicine.utah.edu/alumni>

Join us on Facebook: www.Facebook.com/UofUMedicineAlumni

October 17, 2011

Dear University of Utah School of Medicine Alumnus/Alumna,

In an attempt to continually improve the education of medical students, the Departments of Neurobiology and Anatomy and Educational Psychology are jointly studying the role that the gross anatomy course – specifically cadaver dissection – plays in the development of medical students as they transition into medical professionals. Over the past three years I have studied the experience of current medical students as they have completed the gross anatomy course. However, it has been shown that the true meaning of an experience can only be revealed once it is seen within the context of broader life experience. In this case, I am interested in two points:

- 1) What impact do physicians believe that cadaver dissection has had on their development as medical professionals?
- 2) What aspects of the dissection process remain salient following the transition from medical student to medical professional?

If you graduated from the University of Utah School of Medicine between 1950 and 2002 I would like to request you to participate in an individual interview for this study. The interview is expected to last approximately 1 hour but no longer than 2 hours and can be held in person or over the phone at a time of your choice

If you are interested in participating or have any questions about this study, please contact me directly. You will find my contact information below. Thank you very much for considering participation in this project. Your experiences will help us understand the value of cadaver dissection to the learning process of medical students.

Sincerely,

Miki D. Skinner, M.S.
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