

The dissection course - a psychological burden or an opportunity to teach core medical competencies: A narrative review of the literature

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SUMMARY

Historically, dissecting a human body has been a major component of learning anatomy. During recent decades, constraints on financial and human resources have led to profound and universal reductions in classroom instruction. The emergence of other innovative teaching methods, coupled with the chance to avoid disadvantages such as the risk of infection or unnecessary emotional stress, supported this trend. To counter this last argument in particular, this review describes national and international strategies for helping students cope while learning effectively in the dissection course, with the aim of protecting students from unnecessary emotional stress. Some of the strategies presented impart medical competencies previously part of the “hidden curriculum” but now explicit components of the new National Competency-based Catalogue of Learning Objectives in Medicine, Germany.

Key words: Medical education – Gross anatomy – Dissection – Mental stress – Emotional stress – Professional competence – Professionalism – Ethics in Anatomy

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INTRODUCTION

Ever since the Renaissance, dissection, in the form of anatomical demonstrations, has been a central component of medical education (Malomo, 2006). Over the past decades, as study programs have been reformed or model study programs implemented, the time allotted for teaching anatomy has been dramatically reduced at virtually all universities in Germany and abroad (Collins and Given, 1994; Drake and McBride, 2009; Ramsey-Stewart et al., 2010). On its part, dissection has been viewed as superfluous or dispensable (McLachlan and Patten, 2006). As a result, students have to master anatomy learning content in even shorter times. The increased pressure students face can leave them acquiring only minimal, if not inadequate, knowledge of anatomy. This can explain medical malpractice in the treatment of patients (McKeown et al., 2003; Prince et al., 2005; Fitzgerald and White, 2008; Ahmed et al., 2010; Bergman, 2011). In response, the German Society of Surgery (Deutsche Gesellschaft für Chirurgie) has called for more well-founded training in anatomy (press conference held by the Germany Society of Surgery, 2009).

Despite curricular changes, medical students and graduates, as well as practicing physicians, consider the dissection course to be an important or even the most important phase in their education (Pabst and Rothkötter, 1997; Hofer 2006; Moxham and Plaisant, 2007; Korf et al., 2008; Boeckers et al., 2010).

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EMOTIONAL STRESS DURING THE DISSECTION COURSE

Along with rising pressure to perform well, students also face the mental and emotional stress associated with confronting a cadaver for the first time and the process of dissection. Madill and Latchford assert that breaking the taboo on human dissection leads to a change in identity from lay person to physician-to-be and represents a sensitive phase for students (Madill and Latchford, 2005).

The stress of the dissection course can manifest itself in various symptoms such as sleeplessness, nausea or revulsion (Nnodim, 1996; Dinsmore et al., 2001; Snelling et al., 2003; Arráez-Aybar, 2004; Cahill and Ettarh, 2009), which in rare cases were compared to the symptoms of post-traumatic stress syndrome (Finkelstein and Mathers, 1990). The most severe emotional reactions in respect to dissection occur before initial contact with the donor body, and thus most likely represent anticipatory phobic reactions (Horne et al., 1990; Druce and Johnson, 1994; Nnodim, 1996; Arráez-Aybar, 2004; Boeckers et al., 2010; Limbrecht et al., 2013). In the past, numerous studies have demonstrated that immediately following the first encounter most students undergo a process of adjustment and their fears subside significantly (Evans and Fitzgibbon, 1992; Druce and Johnson, 1994; Nnodim, 1996; Dickinson et al., 1997; Hancock et al., 2004; Boeckers et al., 2010; Limbrecht et al., 2013).

Over the course of dissection, students become conscious of the emotional stress each time they are required to work on parts of the body that are decisively intimate or embody the personality of the deceased, such as the face, hands, or the still intact donor corpse (Durán et al., 2012; Robbins et al., 2008). During the course, fears and concerns subside very quickly, often making room for professional curiosity and a positive experience of the situation (Dinsmore et al., 2001; McGarvey et al., 2001; O'Carroll et al., 2002; Quince et al., 2011), while other stressors such as those related to learning and taking exams increase (Evans and Fitzgibbon, 1992). Only a small percentage (4-6%) of students suffer chronic adjustment difficulties during the course. This can manifest itself in the form of nightmares, loss of appetite, sleeplessness or difficulties for learning and concentrating (Dinsmore et al., 2001; Hancock et al., 2004; Escobar-Poni and Poni, 2006; Limbrecht et al., 2013; Nnodim, 1996).

Normally, students become aware again of the role of the donor only after all examinations or the course are done (Boeckers et al., 2010).

In the past, different methods have been described as to how students handle this emotional strain. Coping mechanisms such as humor, intellectualization, scientific interest, and assuming

philosophical or religious attitudes are used (Boeckers et al., 2010; McGarvey et al., 2001; Robbins et al., 2008; Snelling et al., 2003). However, it has been shown that it is imperative to guide students as they reconcile the image of the donor as a learning object and as a unique and unforgotten human being. The aim is to care for the donor—who can be viewed in a figurative sense as the first patient of the future physician (Bohl et al., 2011)—and at the same time maintain a professional distance. This idea of “caring for the body and yet not getting too close” has been described as “detached concern” by Dickinson et al., 1997. Montross (2007) documented this idea by keeping a journal documenting her own experiences in the lab: „We must learn not to be frozen in place by the sight of death, [...] We must begin to individually shape how we will cope with the impact of these extraordinary moments of urgency and whether these coping mechanisms take a healthy or unhealthy form.“ It is a duty of anatomy educators to accompany and support students in this process of balancing detachment and empathy and to establish the general premises for an ethical anatomical education (Hildebrandt, 2016).

Previous studies hypothesize that already the pre-clinical phase of study can exert influence on the prevalence of burn-out among medical students (Mazurkiewicz et al., 2012) and that stress correlates negatively with empathetic behavior (Thomas et al., 2007). Concordantly, it can be presumed that, if students are unsuccessful in acquiring the professional competency of “detached concern” or other appropriate coping strategies, there is a danger of adopting inappropriate or wrong strategies. This could over time impair the learning process or the future doctor-patient relationship in terms of less empathetic interaction with patients (Brazeau et al., 2010; Druce and Johnson, 1994; Dunn et al., 2008; Hojat et al., 2002; Rosenthal et al., 2011; Thomas et al., 2007). Regardless of the actual cause, chronic stress can foster the emergence of cynicism, frustration or burn-out (Cohen et al., 2009; Dahlin et al., 2005; Dyrbye et al., 2011). A state that, alongside depression, can promote not only the abuse of drugs and medications, but also suicidal thoughts in medical students (Dyrbye et al., 2006; Voigt et al., 2009; Santen et al., 2010).

INDICATORS OF EMOTIONAL STRESS

It is important for anatomy instructors to be able to identify early on those students who could very possibly have difficulties upon first contact with a cadaver or during dissection (Hildebrandt, 2016). The following indicators have already been identified:

Prior experience: Generally, about half of the medical students in Western countries have never seen a dead body prior to beginning the dissection (Boeckers et al., 2010; Horne et al., 1990; Lebou-

langer, 2011). For this group, the first day of the course is particularly stressful and can be a very intense ordeal if a death has occurred in their family or among their close circle of friends. The effect of previous medical training or experience is assessed less consistently across the board: on the one hand, students who have no previous medical training or prior experience need more emotional support and more time to develop adequate coping strategies (Boeckers et al., 2010), but reverse effects or an absence of any differences are also described (Evans and Fitzgibbon, 1992; Bernhardt et al., 2012).

Gender: Multiple studies have been able to show that female students feel emotionally more strongly affected than their male counterparts, particularly before dissection begins (Charlton et al., 1994; Abu-Hijleh et al., 1997; Dickinson et al., 1997; Boeckers et al., 2010; Pearson and Hoagland, 2010; Plaisant et al., 2011; Bernhardt et al., 2012). At this juncture, women think more about their own mortality and are afraid of dissecting a human body for the first time. A possible explanation for this gender-specific difference could possibly lie in the different body-perception or consciousness between the sexes (Hughes and Black, 2006). As a consequence, women adapt less quickly to the new situation of the dissection course than men, and voice more frequently a desire for an introductory course (Hancock et al., 2004; Boeckers et al., 2010).

Personality: Objective measures, such as analyzing personality according to the Big Five personality traits (extraversion-introversion, openness, agreeableness, neuroticism, conscientiousness), have been able to demonstrate a correlation between the personality of a student and the subjective feeling of fear (Pawlina et al., 2006), but are too time-consuming and expensive for routine use in the university setting. To date, no connection has been clearly demonstrated between the subjective perception of emotional stress and the age of a student, their identification with an ethnic group, or the degree program (Evans and Fitzgibbon, 1992; Bernhardt et al., 2012; Bati et al., 2013). Accordingly, female students, students without prior medical experience, and students who are confronted with death personally should be given special attention, particularly at the beginning of the course.

It must be noted, however, that although the emotional stress arising from the initial confrontation with the cadaver can be viewed as a disadvantage to teaching anatomy and thus can be raised as an argument against the very resource-demanding teaching method of dissection (McLachlan and Patten, 2006), it continues to be favored by the majority of anatomy faculty (69%) (Patel and Moxham, 2006) and students (Bhangu et al., 2010) as the best learning and teaching method.

IMPARTING COMPETENCY BY DEALING WITH EMOTIONAL STRESS

Dissection poses not just a particular challenge, but also an extraordinary opportunity for contemporary anatomy and the representatives of the field. It has been repeatedly asserted that the work in the dissection course and the personal reflections of students on the dissection of a human body impart medical competencies (Hafferty, 1991) that up to now were identified—if at all—in the hidden curriculum of the dissection course. Often these competencies are subsumed under the term “professionalism” (Escobar-Poni and Poni, 2006; Lachman and Pawlina, 2006; Pawlina, 2006; Pawlina et al., 2006; Swartz, 2006; Chaudhuri, 2007; Pearson and Hoagland, 2010; Wittich et al., 2013). These competencies encompass imparting the ability to work in teams, manage stress and time (Boeckers et al., 2010), develop coping strategies (Dickinson et al., 1997; Lempp and Seale, 2006; Netterstrøm and Kayser, 2008), professionalism (Escobar-Poni and Poni, 2006; Swartz, 2006; Gregory et al., 2009; Pearson and Hoagland, 2010), responsibility and leadership (Pawlina et al., 2006), altruistic attitudes (Pearson and Hoagland, 2010) and respect for the donor and the miracle of life. It was even possible to show that the acquisition of competencies of medical professionalism in the dissection course possibly leads to improved test scores (Saylam and Coskunol, 2005; Shapiro et al., 2009).

Interestingly, it is precisely these core medical competencies that are represented in the CanMeds 2005 of the Canadian Royal College of Physicians and Surgeons (Canadian Physicians Competency Framework) and recently in the National Competency-based Catalogue of Learning Objectives in Medicine (NKLM 2015) published by the Medizinischer Fakultätentag, Germany (Gregory et al., 2009; CanMeds 2005; NKLM 2015). According to Gregory et al., there are six core competencies: (1) compassionate, appropriate and effective patient care, (2) demonstration and application of medical knowledge, (3) practice-based learning and improvement based on constant self-evaluation and life-long learning, (4) interpersonal and communication skills, (5) a commitment to carry out professional responsibilities adherent to ethical principles and (6) system-based practice.

In summary, the experience of dissection may cause mental distress on the one side, but on the other side might support the development of the above mentioned medical competencies.

Therefore, this review wants to draw recommendations from the literature as to how to manage emotional stress in the dissection course in a helpful manner. In addition, results of previous studies

on teaching medical competencies in the dissection course are summarized. Both, the authors' expertise and a current (15 March 2016) internet-based research of the US National Library of Medicine (PubMed) and the database of the American Psychological Association (PsycINFO) form the basis of this narrative review:

The search terms "medical education," "gross anatomy," "dissection," "professionalism," "mental stress" and "competency" were entered into the PubMed and PsycINFO databases. Each search term was combined with the other terms as pairs and in groups of up to six terms using the function [AND] or [OR]. The queries were restricted to articles in English on human anatomy in peer-reviewed journals published between 1990 and 2016.

The search in PubMed yielded n=168,973 results. The combination of the terms "medical education" AND "gross anatomy" OR "dissection" AND "professionalism" OR "mental stress" OR "competency" reduced this number to n=58 results. This query was supplemented with the results from combining "mental stress" AND the rest of the terms (n=25).

Analogously, the search in PsycINFO yielded

n=20,717 results. Combining the five terms above with AND but without the search term "mental stress" showed only n=7 publications, so the search was expanded to a four-term AND combination (n=110) ("medical education," "gross anatomy," "dissection," "professionalism" or "competency"). The results of the combination of "mental stress" AND the rest of the terms were supplemented as above (n=8). During the first step, doubled search results, book publications, case reports, commentaries and publications on studies about students of non-medical fields outside of medicine or dental medicine were excluded. In a second step, the remaining results of both searches were reviewed independently by both authors based on the abstracts, and publications which did not focus specifically on teaching gross anatomy or which focused on isolated aspects of the dissection course that were not of direct pertinence were excluded. The quantitative results of the search and review process are presented in Fig. 1. Overall, n=8 publications were found in both PubMed and PsycINFO and are listed in Table 1.

Table 1. Publications found in both databases (PubMed and PsycINFO)

Title	Authors	Journal
1. The gross anatomy course: an analysis of its importance.	Böckers A, Jerg-Bretzke L, Lamp C, Brinkmann A, Traue HC, Böckers TM.	<i>Anat Sci Educ</i> 3 (1): 3-11 (2010)
2. Comparative efficacy of group and individual feedback in gross anatomy for promoting medical student professionalism.	Camp CL, Gregory JK, Lachman N, Chen LP, Juskewitch JE, Pawlina W	<i>Anat Sci Educ</i> 3 (2): 64-72 (2010)
3. Human structure in six and one-half weeks: one approach to providing foundational anatomical competency in an era of compressed	Halliday N, O'Donoghue D, Klump KE, Thompson B	<i>Anat Sci Educ</i> 8 (2): 149-57 (2015)
4. Creating a longitudinal environment of awareness: teaching professionalism outside the anatomy laboratory.	Jones TW	<i>Acad Med</i> 88 (3): 304-8 (2013)
5. Identity change and the human dissection experience	Madill A, Latchford G	<i>Soc Sci Med</i> 60 (7): 1637-47 (2005)
6. "Safe Harbor": evaluation of a professionalism case discussion intervention for the gross anatomy course.	Spampinato CM, Wittich CM, Beckman TJ, Cha SS, Pawlina W	<i>Anat Sci Educ</i> 7 (3): 191-8 (2014)
7. Peer assessment among first year medical students in anatomy.	Spandorfer J, Puklus T, Rose V, Vahedi M, Collins L, Giordano C, Schmidt R.	<i>Anat Sci Educ</i> 7 (2): 144-52 (2014)
8. Medical students' reactions to anatomic dissection and the phenomenon of cadaver naming.	Williams AD, Greenwald EE, Soricelli RL, De Pace DM	<i>Anat Sci Educ</i> 7 (3): 169-80 (2014)

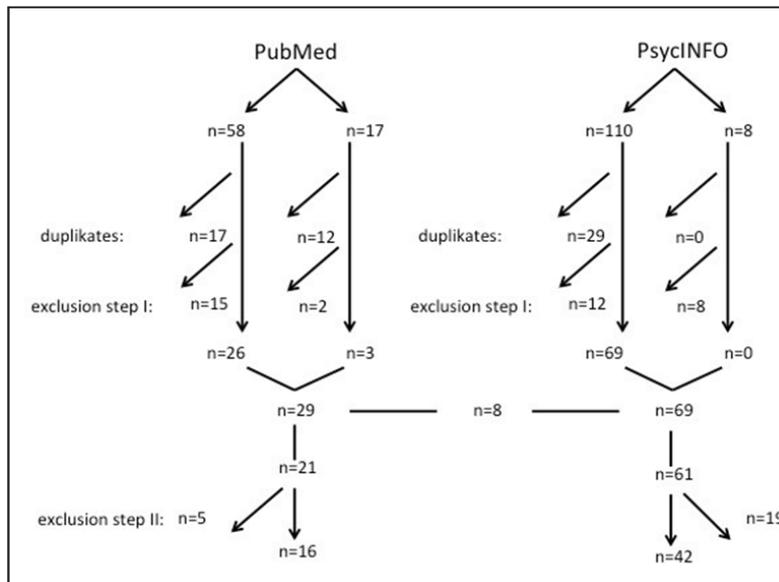


Fig. 1. Presentation of the quantitative results of the literature search in the PubMed and PsycINFO databases using the terms “medical education,” “gross anatomy,” “dissection,” “competency,” “professionalism” and “mental stress” (each represented by the right arm of the flow chart).

CONCEPTS FOR COPING WITH EMOTIONAL STRESS IN THE DISSECTION COURSE

The strategies presented in the past for handling mental and emotional stress can be classified into three groups according to when they are employed in relation to the dissection course: measures that are offered as preparation for the course, in parallel to it, or afterwards as assistance in processing the experience of the dissection course.

Preparatory measures before initial contact with the cadaver:

Mentioned only briefly here, the following practical aspects of pre-course preparation to avoid unnecessary emotional stress should be self-evident for all institutions: Transparent information (e.g. course organization and structure, donation program, conservation techniques, contact persons, etc.) is needed not only for students, but also for the team of instructors. A standard approach to the initial encounter with the cadaver has to be set down and defined as a learning objective. It is recommended that student groups be made up of men and women since they show different stress scales and coping strategies.

The donor body should be presented in the most aesthetic manner possible; this includes thorough shaving and washing and respectful handling in that the face and genitals remain covered whenever possible.

If students are directly surveyed, the majority indicates that they particularly desire improved preparation for the first contact with the donor and the method of dissection. Students would like to see this preparation offered in small groups, most preferably with their future dissection teams, directly prior to the first encounter with the donor (Boeckers et al., 2010). Alongside preparatory lec-

tures (Saylam and Coskunol, 2005; Kotzé and Mole, 2013), related projects have been described where students have been given the opportunity to see the classroom space (personal communication with colleague anatomists), meet the instructors and staff, and become acquainted with the instruments and equipment.

Another possibility to aid the adjustment process is integrating audio-visual material that demonstrates dissection, prepared specimens, and/or supplemental learning materials (Arráez-Aybar, 2004; Kruschinski et al., 2006; Casado et al., 2012; Dosani and Neuberger, 2015). The audio-visual material can be shown once as part of a lecture or made available to students online to use on their own. Preferably, this material should be pertinent to all students as part of the curriculum, for instance in the form of obligatory preparatory assignments. In a similar manner, step-by-step preparation can take place in the form of demonstrations of already prepared anatomical specimens (Boeckers et al., 2012). If possible pre-course meetings of dissections teams or encounter for at risk-students should be established to offer an official timeslot for students to express and discuss their fears and expectations (Hildebrandt, 2016). If this wish for extensive preparation prior to the dissection course is fulfilled, the students feel themselves to be well prepared, and this leads to a significant reduction in fears and emotional stress (Nnodim, 1996; Tschernig et al., 2000; Arráez-Aybar, 2004; Arráez-Aybar et al., 2008; Boeckers et al., 2012; Casado et al., 2012).

Accompanying measures for dissection and contact with the cadaver:

The majority of students are more likely to reject the idea of structured measures parallel to the course (Boeckers et al., 2010; Bernhardt et al., 2012), probably because they wish to concentrate

on learning and preparing for exams. Apart from this, most students at this point have assumed a distanced attitude toward the donor and prefer to view the body as a learning object.

For the 4-6% of students who display chronic adjustment difficulties, voluntary psychological counseling parallel to the course is indispensable. For this reason, information about contact persons and university resources (e.g. psychosocial counseling for students) must be communicated transparently and made easily available to students by instructors.

On the one hand, students do not want to have the fears felt before the course brought up again during the course after they have successfully gone through a distancing process and adopted a stance of "detached concern", since this would be disadvantageous for the learning process and possibly the development of a professional attitude. However, some authors assume that the distance students have achieved is only a temporary, superficial solution to the emotional conflict that should be given sufficient time and space for more substantial processing and the conveyance of humanistic values during the course (Rizzolo, 2002). As a result, reflection on feelings – possibly the feeling of guilt, because of breaking the taboo of dissecting a deceased human being – makes supporting measures parallel to the dissection course meaningful for all course participants (Robbins et al., 2008). Peer discussions can be employed as a valuable coping mechanism during the course (Kotzé and Mole, 2013).

Newer developments in the Anglo-American countries focus on this aspect by increasingly integrating medical ethics projects into teaching anatomy and view this as a valuable addition to encourage student self-reflection (Stewart and Charon, 2002; Lachman and Pawlina, 2006; Shapiro et al., 2009), a competency that over time assists the student or future physician to remain "grounded" (Hammer et al., 2010). Earlier studies have shown that students are more willing to speak about their feelings and fears about the topics of death and dissection if they have been given the opportunity to express themselves in writing, for instance through reflective journaling (Wagoner and Romero-O'Connell, 2009). Hammer et al. (2010) speak of "narrative medicine" and "attitude learning," for which multimodal instruments for self-reflection such as songs, poetry, painting or poster presentations, can be used (Canby and Bush, 2010; Hammer et al., 2010; Charon, 2013).

Another recognized strategy employed internationally to reduce student fears and anxieties and to create a positive learning environment during the dissection course is the use of peer teachers – experienced students who are deployed as tutors in the gross anatomy course.

These tutors can serve as role models and confidantes during the process of dissection and learn-

ing. While students prefer not to approach anatomy instructors with personal matters or concerns, they are distinctly more willing to confide in a more advanced student. If these peer teachers are properly trained, the effectiveness of this strategy has been repeatedly demonstrated in regard to reducing emotional stress and promoting in-depth learning (Nnodim, 1997; Houwink et al., 2004; Krych et al., 2005; Evans and Cuffe, 2009; Durán et al., 2012; Kotzé and Mole, 2013; Horneffer et al., 2016).

Post-course measures for dissection and the contact with the cadaver:

After completing the necessary exams, students experience a rapid drop in school- and test-related stress. At this point in time, students are able to relinquish the view of the donor as only being a learning object and abandon coping strategies such as depersonalization and distancing in order to re-approach the donor as an individual with a unique biography.

Guidance by instructors has particular significance in this process. At this time – and of course at any other time during the dissection course – anatomy faculty members should act as role models for respectful handling of the donors. They should offer an opportunity for students to engage in self-reflection by making the experiences and impressions gathered during the dissection a central topic. It is also at this point that student interest about the donor's life, cause of death and family situation increases to the point that they wish to know more (Bohl et al., 2011; Druce and Johnson, 1994; Williams et al., 2014). To do justice to this need, non-identifying information from the death certificate can be given to the former dissection groups (date of birth, date of death, cause of death, underlying illnesses). This allows students to conduct a reflective autopsy report in the form of a comparison of dissection findings during the course (Lachman and Pawlina, 2006). At most universities it is common to hold a memorial service to express gratitude to the donors after the gross anatomy course (Pabst and Pabst, 2006; Elansary et al., 2009; Jones et al., 2014). With such a ceremony, time for reflection and paying respects are institutionalized. A necessary ritual for students to say farewell to a person they never met personally, but who is nonetheless central to their acquisition of knowledge about human anatomy and their personal and professional development (Weeks et al., 1995; Rizzolo, 2002; Talarico, 2013). In Germany, these ceremonies and the interaction with donors and death are usually Christian in nature, while in the US mostly nondenominational or secular (Hildebrandt, 2016). The anonymization of the donor often represents an essential condition, while donors in Eastern cultures are honored through explicit personalization: reading their names out loud at the beginning of the course

to give thanks to the donors and honoring them as esteemed teachers (Winkelmann and Gldner, 2004). A trend that is increasingly spreading in the form of innovative projects in Anglo-American countries also aims at personalization of the donors. Bohl et al. describe that the perception of the donor as a teacher in comparison to a learning object fosters respect and the development of empathy (Bohl et al., 2011). In some instances, the dogma requiring anonymization of donors has been given up to train empathetic skills via identification and personalization. Explicitly, before the course has even begun, contact is established between the donor – the first patient – or his or her family and the medical students through video sequences or joint meetings (Vannatta and Crow, 2007; Crow et al., 2012; Talarico, 2013). A majority of students and donors seem to be in favor of such programs, but a considerable number of students and donors felt that this experiences could be traumatic as well (Bohl et al., 2013). Maintaining the anonymity of cadavers in medical education is an issue currently under discussion and deserves serious debating among anatomists (Jones and King, 2016).

IMPARTING MEDICAL COMPETENCIES (PROFESSIONALISM) IN THE DISSECTION COURSE

Professionalism includes characteristics such as altruism, empathy, respect, honesty/integrity, responsibility, desire for excellence, and self-reflection (Pawlina, 2006; Gregory et al., 2009). If the anatomy course follows the recommendations for best practice (Johnson et al., 2012) and is based on active dissection (Rizzolo and Stewart, 2006; Korf et al., 2008; Sugand et al., 2010), the experience of the dissection course will not be a negative one, but rather a chance to develop professional traits (Escobar-Poni et Poni, 2006; Swartz, 2006, Pearson, 2010; Pawlina 2011; Jones et al., 2014; Halliday et al., 2015).

This review shows that the dissection course can be seen as the first major challenge in teaching medical competencies (Jones, 2013, compare Table 1). The confrontation with mortality is an opportunity to promote and foster appropriate interaction and the ability to reflect on death and dying, for example within the scope of accompanying humanistic projects (Canby and Bush, 2010), so that students come to possess the emotional controls important for practicing medicine (Rizzolo, 2002; Arrez-Aybar et al., 2008). Students learn to maintain respect for the donor, exhibit professional medical conduct, such as observing confidentiality, and to acquire first-hand knowledge about human anatomy through the scientific process of dissection. Ideally, anatomy instructors create an "environment of awareness." (Jones, 2013).

Boeckers et al. (2010) arrive at the conclusion

that the perception of whether or not professional competencies were learned can influence how students rate the importance of the course (compare Table 1).

Validated instruments to measure professionalism are available and can be applied for primarily formative but also summative assessments. Results of our literature review revealed instruments for self- and peer evaluation that can be used to assess the effect of feedback on the development of professionalism (Cottrell et al., 2006; Chen et al., 2009; Camp et al., 2010; Spandorfer et al., 2014 (compare Table 1). The studies have shown that individual feedback is more effective than group feedback in improving professional attitudes and conduct (Camp et al., 2010). Spandorfer et al. (2014) were also able to demonstrate that feedback and peer evaluations are effective methods for exerting influence on the development of professionalism during the dissection course, although these require both time and personnel. Course participants viewed peer evaluations positively, since students had the opportunity to express their desire to have peers who conducted themselves in a professional manner and demonstrated core medical competencies. In this context, professionalism specifically means: fellow students who take initiative and show a willingness to assume responsibility are not aggressive in their interactions, demonstrate patience, can communicate and listen well, are well prepared in terms of medical knowledge and are prepared to share that knowledge, and show mutual respect. Another validated instrument found in the literature search has been introduced by Wittich et al. (Wittich et al., 2013) and employed to analyze the effect of critical reflection in small groups on the experience of dissection (Spampinato et al., 2014 (compare Table 1)). Although the authors were unable to identify an increase in scores for professionalism, students rated the program as being very satisfactory.

Medical education is supposed to enable students to deliver compassionate, appropriate and effective patient care (Core Competence (1)). A special need exists here when it is noted that student's empathy over the course of their studies (Chen et al., 2007; Hojat et al., 2004) and during the dissection course (Boeckers et al., 2010) are more likely to decrease. To bolster empathy, many universities have integrated new measures into the teaching of anatomy (Wagoner and Romero-O'Connell, 2009; Canby and Bush, 2010; Hammer et al., 2010; Charon, 2013). A trend such as the one seen in the Anglo-American countries to de-anonymize the donor in order to promote the ability to respond empathetically, for instance through naming (Williams et al., 2014) (compare Table 1), a brief documentary about the donor (Dosani and Neuberger, 2015), or through the measures described above (Canby and Bush, 2010; Hammer et al., 2010; Crow et al., 2012), would require a para-

digm shift in the German-speaking countries. This could, however, be an opportunity for innovation, interdisciplinary cooperation and heightened learning motivation. As this unfolds, the potential strengthening of empathy in students should be measured with standardized instruments such as the JSPE-MS (Jefferson Scale of Physician Empathy - Medical Student Version) (Hemmerdinger et al., 2007; Rosenthal et al., 2011). In summary, the measures mentioned above have not yet been investigated sufficiently concerning their effectiveness or any possible disadvantages, such as an increase in mental or emotional stress, or even a potential traumatization among students (Bohl et al., 2013).

CONCLUSION AND OUTLOOK

A comprehensive overview has been given of the various aspects related to psychological stress arising from participating in dissection. The studies presented elucidate how this sensitive phase in the development of medical students should be guided and used to foster core medical competencies. The accompanying reflection on the feelings associated with the dissection promotes the process of “maturing into young professionals” (Robbins et al., 2008). In the process, self-reflection and emotion-based coping mechanisms encourage the development of professionalism and core medical competencies. The recommendations above should be taken into account when restructuring existing curricula or designing new ones.

When implementing curricula that do not include dissection in human anatomy, it must be clear to those responsible that they are also passing up the chance to teach the medical competencies listed and described here. In the future, the effectiveness of teaching medical competencies and the degree of emotional stress in different anatomy course formats, e.g. traditional gross anatomy with dissection versus modular teaching without dissection, should be more closely compared with each other (Kiessling et al., 2004). The social developments of the past showed an increasing percentage of students with a migration background. Accordingly, it might be necessary to take this group of students, their religious understandings of death and dying and their manners of interaction with donors more into account. This aspect has received too little attention to date (Abu-Hijleh et al., 1997; Snelling et al., 2003; Notzer et al., 2006; Winkelmann and Güldner, 2004), although European universities might profit from the experiences of countries with a longer history of ethnic diversity.

The results distinctly show that the teaching of anatomy responds to emotional stress in students in a manner appropriate to our times and follows the endeavor of an ethical anatomical education. Teaching anatomy assumes a pioneering position

in gathering data on professionalism and the respective medical competencies according to CanMed and NKLM. The dissection course is an important phase of medical socialization, a process that begins during the pre-clinical phase and must be continued in the clinical phase of medical education.

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