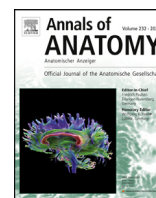




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## RETRAINING REVIEW

# The practice of ethics in the context of human dissection: Setting standards for future physicians<sup>☆</sup>

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## ABSTRACT

It is a much desirable skill among physicians that clinical practice should be guided by ethical norms. The dissection room experience provides an opportunity for nurturing the principles of ethical practice among medical students early in the curriculum. When the exercise of human dissection is followed within the boundaries of ethics it effectively props an ideal example for the young minds to emulate in the future. Hence in every stage of dissection room activity precious human body needs to be handled in an ethical manner so as to set a standard for the students. The present review is an attempt to collate the recommendations documented by researchers as per ethical guidelines in the context of human dissection. The review highlights on the ethical norms which needs to be adhered to while receiving the human body of a donor and during preservation of the same. It reflects on ideal ethical behaviour in the dissection room during the act of dissection and finally emphasize on the respectful disposal of the human remains in an ethical manner. The intended purpose of this article is to support uniform adoption of the recommendations for ethical handling of human bodies used in anatomical dissection.

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## 1. Introduction

In recent times there has been considerable focus on imparting components of professionalism among medical students early in the curriculum, within the premises of anatomy dissection room. The knowledge and practice of medical ethics constitutes an integral element of professionalism within the domain of medical curriculum (Evans et al., 2018; Ghosh and Kumar, 2019; Hildebrandt, 2019). Undoubtedly it is a much desirable skill among the physicians that clinical practice should be guided by ethical norms (Bowman, 2012). In this context the exercise of human dissection, which is universally recognised as an exclusive teaching/learning tool of medical curriculum can possibly be utilized for sowing the seeds of medical ethics at an early stage in the minds of future physicians (Champney, 2019; Ghosh, 2020). It is a well-known fact that we tend to imbibe small nuances that we observe in our everyday life and gradually they become a part of how we present ourselves to the outside world. Accordingly students tend to embrace quite a few practices which they observe or do them-

selves (mostly guided to do under supervision) in the anatomy dissection room (Bellier et al., 2019; Moxham et al., 2019). More so as they come across the dissection room experience very early in their career, hence it becomes imperative that the overall exercise of human dissection is followed within the boundaries of ethics thus setting an ideal example for the young minds to emulate in the future (Jones, 1998; Cornwall and Hildebrandt, 2019). The practice of human dissection begins with availability of human body of a donor, followed by the preservation of the same, eventually utilized for anatomical dissection, which involves the act of dissection as well as daily handling of human body and culminates with the respectful disposal of the mortal remains of the person (Ghosh, 2017a,b). In each of these stages precious human body needs to be handled in an ethical manner so as to set a standard for the students. In other words the practice of human dissection presents an ideal opportunity for anatomists to project a case scenario before the students as to how a physician should adhere to the practice of ethics in professional life.

The above discussion becomes more pertinent in present times as the Covid-19 pandemic has remarkably influenced the manner in which teaching/learning activities are being conducted across the world. In the current scenario, anatomy classes are being taken through virtual/online platforms and dissection based teaching has taken a backseat (Longhurst et al., 2020). However all stakeholders must realize that this arrangement is purely one-time solution and

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it is absolutely imperative to return to dissection based teaching as and when the situation permits (Evans et al., 2020). There is enough evidence available in published literature regarding the benefits of human dissection in imparting values related to professionalism and ethics among medical students. Hence it would not be an overstatement that overlooking the advantages of human dissection as a teaching/ learning medium amidst the ongoing prevalence of online/virtual education methods would have adverse effects in the domain of medical practice in future.

Available literature suggests that researchers have been exploring the ethical dimensions of human dissection and naturally research interest in this domain have increased manifold in the last few years (Hutchinson et al., 2019; Stephens et al., 2019). Recognized anatomical bodies have been coming up with their guidelines in this context and scholars are documenting their perspectives based on practical experiences (FICEM, 2012; Jones and Whitaker, 2012; AACA, 2017; AAA, 2018; Jones, 2019). The present review is an attempt to collate the recommendations documented by researchers as per ethical guidelines in the context of human dissection. Hence an extensive search for literature relevant to the topic under review was undertaken from the following indexed databases: Medline and PubMed (United States National Library of Medicine, Bethesda, MD); Scopus (Elsevier, Amsterdam, The Netherlands); Embase (Ovid Technologies, Inc., New York, NY); CINAHL Plus (EBSCO Information Services, Ipswich, MA); Web of Science (Clarivate Analytics, Philadelphia, PA); and Google Scholar (Google, Inc., Mountain View, CA). During compilation of ethical norms from published literature, care was taken such that recommendations pertaining to all the stages involving human dissection (as detailed previously) are considered and therefore the literature search was limited to only those studies with relevant information. In the present review, reporting of literature was undertaken in accordance with the PRISMA statement and includes adherence to the established guidelines (Liberati et al., 2009; Moher et al., 2009). Accordingly the article highlights on the ethical norms which need to be adhered to while receiving the human body of a donor. It takes into account the ethical measures essential to follow while undertaking the preservation of the human body prior to dissection. It reflects on ideal ethical behaviour in the dissection room during the act of dissection. The article also gives due emphasis on the respectful disposal of the human remains after completion of dissection with dignity and in an ethical manner.

## 2. Ethical aspects of receiving donated human body for anatomical dissection

The practice of human dissection is more than two and half centuries old and this ever evolving learning medium has witnessed multiple changes in the manner in which it is carried out. The most significant among them is regarding the availability of human bodies for dissection. The history of human dissection presents many instances where the ethical norms were flouted to ensure the adequacy of human bodies for dissection (Ghosh, 2015). Even in the last century (during Third Reich) there were serious breaches in the boundaries of ethical practice regarding the use of human remains for the purpose of anatomical dissection (Hildebrandt, 2009). The key area for ethical concern towards the source of human bodies for academic activities is whether the concerned person whose body is being explored has actually consented for the same (Winkelmann, 2016). Historically bodies of executed criminals/ prisoners and unclaimed bodies of individuals who have died in medical facilities have been used for anatomical sciences (Hildebrandt, 2008; Ghosh, 2015). However in all these cases the autonomy of the person concerned was overlooked in favour of scientific advancement thus raising pressing ethical concerns in the entire process (Habicht

et al., 2018). The concept of body donation whereby an individual wilfully during life bequeaths his/her mortal remains for anatomical dissection after death, rose to prominence towards the later part of 20th century and has emerged as the sole source of human bodies for dissection in most medical schools in the 21st century (Garment et al., 2007; Riederer, 2016). The concept of body donation provides an acceptable solution to ethical loopholes that plagued anatomical sciences previously (Gangata et al., 2010; Jones and Whitaker, 2012). Rather the rising popularity of body donation programs among the general population and anatomists as such provides strength to the notion that this is the most acceptable manner through which availability of human remains can be ensured by ethical means (Zhang et al., 2008; Manyacka Ma Nyemb et al., 2014; Jones, 2016). In fact the International Federation of Association of Anatomists (IFAA) in 2012 has recommended that only human bodies through donation programs be used for academic purpose (FICEM, 2012) (Table 1). However the existing scenario is far from ideal as a recent study has documented that medical schools in major parts of Asia, Africa and South America till date depends on mostly unclaimed bodies or even exclusively unclaimed bodies for anatomical dissection (Habicht et al., 2018). Unfortunately this trend is also prevalent in some pockets of Europe and North America (Habicht et al., 2018; Caplan and DeCamp, 2019). However the silver lining is that at least a few of these medical schools have either transitioned to a bequest system or are in the midst of the ongoing process (Habicht et al., 2018; Hutchinson et al., 2019). Elsewhere anatomists are raising serious concerns regarding the improper practice of accepting unclaimed human bodies, which could be indicative of a better future in this regard (Gürses et al., 2018). It may be mentioned here that ethical issues are being raised even on the ongoing body donation programs (Champney, 2011). Recent literature emphasizes on adherence with particular norms for body donation to allay possible ethical concern (Riederer and Bueno-López, 2014). These include obtaining written informed consent from the donors before accepting bequest, abstaining from commercialization in any form with relation to bequest of human remains and existence of institute oversight committee to review the functional program at regular intervals. All these recommendations are included in IFAA guidelines issued in 2012 and are being followed in most medical schools across the globe (FICEM, 2012; Jones, 2016).

### 2.1. Informed consent from donor is mandatory

For all body bequeathal programs it is absolutely essential to have a written informed consent from every potential donor (Table 1). This serves as a vital legal deed which acts as a guarantee that the donation confirms to the existing legislation in place for a country/region. Moreover the consent is a testimony to the wilful act of the person concerned and also provides legal buffer to the concerned institute while utilizing the human remains for teaching and research (Riederer and Bueno-López, 2014). Ideally the consent form should be designed such that the language is simple to understand but at the same time conveys all the essential information in a transparent manner (Winkelmann, 2016). It is to be explicitly stated as to the purpose for which the human remains to be used, details including financial implications (if any) with regards to the transportation and cremation, followed by an estimate regarding the time frame within which the human tissues will be used (FICEM, 2012). Most medical schools avoid accepting donation when written consent cannot be given by the person concerned and one has to rely on proxy consent such as for foetuses and children as well as for person who are mentally ill or in coma (Riederer and Bueno-López, 2014). Another interesting scenario is that of implied consent, which not granted in written form but rather inferred from the actions of a person concerned. Presently

**Table 1**

List of guidelines/recommendations relevant to ethical practice in receiving human remains for anatomical dissection.

Sl. no.	Guidelines/recommendations	Remarks	Reference(s)
01	Human bodies received only through donation programs to be used for academic purpose (guideline)	Core ethical practice in human dissection	IFAA Guidelines (FICEM, 2012)
02	Informed consent in writing from every donor (guideline)	Core ethical practice in human dissection	IFAA Guidelines (FICEM, 2012)
03	No commercialization of human remains received through donation for academic activities (guideline)	Core ethical practice in human dissection	IFAA Guidelines (FICEM, 2012)
04	Regulation of activities (preferably by Institute Oversight Committee) of commercial agencies/farms/companies in case donated bodies/body parts are received through them (recommendation in published literature)	Core ethical practice in human dissection	Jones (2016) (please see references)
05	Remuneration paid to commercial agencies/farms/companies should include only the expenditure incurred by them (suggestion proposed in present review)	Core ethical practice in human dissection	Present review article
06	In case human body/body parts are subjected to plastination then prior consent from donor mandatory (guideline)	Core ethical practice in human dissection	IFAA Guidelines (FICEM, 2018)
07	For public exhibition of plastinated human body/body parts only expenditure incurred to be recovered (suggestion proposed in present review)	Core ethical practice in human dissection	Present review article
08	Donated bodies in case of Physician Assisted Death (PAD) can be used for academic activities in death is legal as per existing laws (recommendation in published literature)	Core ethical practice in human dissection	Jones (2019), Wainman and Cornwall (2019) (please see references)
09	In case of PAD, zero level solicitation towards body donation by personnel involved in process of PAD (recommendation in published literature)	Core ethical practice in human dissection	Jones (2019), Wainman and Cornwall (2019) (please see references)
10	No refusal to receive donated bodies in case there is lack of storage space. Bodies to be sent to other institutions under exchange programs (recommendation in published literature)	Core ethical practice in human dissection	Riederer and Bueno-López (2014) (please see references)

IFAA: International Federation of Association of Anatomists.

FICEM (2012, 2018): please see references.

the legislative framework is not clearly established for whole body donation in these cases in most parts of the world and is handled on the basis of facts and circumstances of the situation at the institutional level (Rajasekhar et al., 2016; Prabhu, 2019). However in some countries such as the United Kingdom implied consent is not accepted with regards to body donation programs (Riederer and Bueno-López, 2014).

## 2.2. Donated bodies are not meant for making financial gains

International organizations in the domain of anatomical sciences have clearly mentioned in their guidelines for ethical practice that there should be no financial gain arising from either the human body or its parts (FICEM, 2012; AACA, 2017; AAA, 2018) (Table 1). As such under the aegis of this broad perspective specific clarifications have been subsequently outlined in the literature. At the onset, there should be no financial remuneration in any form for the act of bequeathal neither to the donor nor to the family members. Likewise there should not be any financial implications either for the donor or the family members towards covering any expenses for the process of donation. Rather it is the beneficiary institute/department which bears the cost of transportation and cremation in most cases (Riederer and Bueno-López, 2014). A major area of concern in this context is the emergence of commercial firms, who are often referred to as 'body brokers' (Goodwin, 2006; Shimazono, 2007). They are operational particularly in the United States (however these farms have been spreading their footprints globally) and are permitted within the legal framework to receive the bodies of altruistic donors followed by distribution to academic institutions (Champney, 2016; Nie and Jones, 2019). These entities are gaining prominence in those regions where body donation programs are either not functional or not been able to ensure adequate number or facing hindrance due to religious/cultural factors (Champney, 2016; Paul et al., 2017). In a way their ongoing activities may possibly be in favour of ethical supply of human remains as these farms are acting as liaison between wilful donors and academic institutions. However lack of regulation both at admin-

istrative level as well as institutional level could lead to serious lacunae in terms of financial connotation thereby channelling these farms into potential profit making bodies (Nie and Jones, 2019). Such a scenario would be a grave deviation from the ethical guidelines and would be no different from the misdeeds of the 'body snatchers/resurrectionists' in the 17th & 18th centuries (Ghosh, 2015). In this context, it may also be mentioned that in the United States (possibly elsewhere also) there are companies which provide human body parts for dissection activities and this constitutes a potential grey zone in terms of practice of ethics (Bard, 2008). Under the prevailing situation it becomes imperative for the institute oversight committee (responsible to oversee that ethical guidelines are followed in every stage of human dissection course) to ensure that these farms/agencies/companies should not make any financial profits from providing donated bodies for academic purpose (Jones, 2016) (Table 1). In other words care should be taken such that the overall process does not degrade to ulterior selling of human body or its parts. This could be achieved through regulation of the remuneration paid to these farms/agencies at regular intervals such that the amount strictly includes only costs regarding transport, preparation (chemicals if any/labour charges if any) and cremation of the bodies (Table 1).

## 2.3. Plastination of donated body needs prior consent

Another aspect which merits discussion in this context is the trend of public exhibitions of plastinated bodies which have been gaining popularity of late (Nie and Jones, 2019). These events are commercially lucrative avenues and are in general profit making for institutions (Jones and Whitaker, 2009; Lantos, 2011; Jones, 2016). In this backdrop two things needs to be addressed to ensure ethical compliance. Firstly since plastinated bodies are subjected to long time preservation, hence if the human remains is to be used for this purpose then this information should be communicated to the donor in the consent form in a transparent manner with a possible upper limit of the time duration for preservation (FICEM, 2018) (Table 1). Moreover the financial connotation should be regulated

whereby the events should be restricted strictly for academic purpose and to be run on a 'no profit no loss' basis whereby only the expenditure pertaining to logistics and other essentials could be recovered through sponsorships or issue of passes (Table 1).

#### 2.4. Regulation obligatory for donated bodies from physician assisted death

A very recent development which justifies argument is the availability of donated human bodies of persons who have opted for medical assistance in dying (MAID) or to put it in a broader perspective physician assisted death (PAD) (Li et al., 2017). In recent times the authorization granted within judicial framework of some countries have meant that persons residing there now have the option to embrace MAID or PAD and subsequently donate their mortal remains for academic activities (Jones, 2019). It is no surprise then that this has opened a novel avenue for ongoing body donation programs to receive donated human bodies (Nuhn et al., 2018; Grant, 2019). However this new horizon has presented anatomists with its very own ethical challenges. Wainman and Cornwall (2019) from McMaster University, Canada have emphasized on two major ethical concerns arising from this situation. First whether the institutions should accept body donations coming through MAID/PAD and the criteria for decision. Second is as to how consent is to be obtained in these cases through transparent communication. Touching this debate, both Wainman and Cornwall (2019) as well as Jones (2019) have documented some core recommendations, whereby the decision to receive or not to receive MAID/PAD donated bodies has been left entirely to the concerned institution with a reiteration that donated bodies coming through MAID/PAD are appropriate for academic activities provided the death is legal in context of the country/region as per existing laws (Table 1). Regarding the second concern it has been noted that for human remains to be accepted through body donation, the potential donor should provide fully informed written consent with absolutely no persuasion from anyone involved in the process from MAID/PAD to body donation. Further it has to be ensured that there should be zero level solicitation from personnel responsible for MAID/PAD towards body donation (Jones, 2019; Wainman and Cornwall, 2019) (Table 1). In other words the two events should be independent of each other. These recommendations should be considered as working guidelines pertaining to these cases and accordingly donated bodies may be accepted at the institutional level.

An ethical dilemma arises when there is lack of storage space for human bodies particularly in case of countries having very popular body bequeathal programs. In such a scenario it is never an option to refuse accepting even a single donation. It has to be realized that the act of donation is a noble deed and it is our duty to respect the last wish of the concerned individual. As noted in one particular published literature, it is better advised to explore options such as developing exchange programs between anatomy departments within a region/country and channelize the precious resource as per availability of incoming donations (Riederer and Bueno-López, 2014) (Table 1).

### 3. Donated human body should be preserved as per ethical norms

Upon receipt of donated human remains in the anatomy department, the same is embalmed for fixation of tissues and subsequently preserved till dissection is undertaken as per requirement. Embalming of the human body, which is a part of its preservation protocol, involves ethical handling of precious human tissues (Bajracharya and Magar, 2006). Hence care should be taken such

that the human body is handled with respect, safeguarded from damage or destruction or harm to any part of the body and above all embalmed properly such that it is preserved for a given time period without undergoing decomposition (Hayashi et al., 2016). Proper management during the preservation of human bodies would ensure that the mortal remains be actually utilized for academic activities when required thereby fulfilling the last wish of the person concerned in true sense (Balta et al., 2015a). In other words, it needs to be ensured that preservation technique strictly adheres to quality standards as outlined in relevant published literature.

#### 3.1. Embalming process should follow quality standards and may be guided by code of ethics

The different embalming techniques followed by medical schools across the globe have been described in an elaborate manner by Brenner (2014). Ideally an appropriately embalmed human body should be able to withstand changes attributed to putrefaction, should not be infested by insects/ maggots at any stage and should be deemed as safe for human handling without fear of infection (Macdonald and MacGregor, 1997). On the dissection table a human body could be judged as properly embalmed if the tissues are fixed to a permissible level, colour and texture of muscles and organs make them readily identifiable, flexibility and colour of arteries maintained to a level such that they easily stand out from the surrounding anatomy (Balta et al., 2015b) (Table 2). Medical schools involved in handling donated human remains may consider to have Institute Code of Ethics (similar to the one adopted by The British Institute of Embalmers/BIE) whereby all personnel involved in the embalming process should strictly abide by the contents (British Institute of Embalmers, 2017) (Table 2). The core idea of such an exercise would be aimed to convey the message that the human body being embalmed is a precious scientific resource, which deserves to be treated respectfully and that giving their best effort would be a worthy contribution towards fulfilment of last wish of the deceased as well as scientific advancement. The Code of Ethics would also be applicable towards maintaining confidentiality regarding any information related to identity of the donor/family or otherwise and that any issue arising during the process of embalming should be dealt with as per guidelines established by the concerned institute.

#### 3.2. Embalming and storage areas to be separate and sovereign

Designated areas used for embalming and storage of human remains should be separate individually and also independent from the area devoted to dissection (Chan and Pawlina, 2015) (Table 2). It may be opined that this is a critical ethical intervention as it would prevent unnecessary breach of privacy with regards to the mortal remains of a person. Nevertheless sanctity of the embalming premises (just like the dissection room) should be maintained at all times. The area should be clean and well ventilated with all necessary chemicals kept in covered containers and instruments arranged in organized manner being washed after every use (Bajracharya and Magar, 2006). While undertaking embalming the personnel involved should be in dress code (as per respective institutions) and should adopt all necessary protective measures as established at institute/department level.

Once embalming of the human body is completed it needs to be shifted to the storage area. Proper storage of human remains is a key component of the preservation chain and is also an avenue to demonstrate respect that sensitive materials such as these should be accorded (Macdonald and MacGregor, 1997). As mentioned storage area should be a sovereign location separated from the rest. Maintenance of segregated working areas at every stage of preservation/conservation is a part of respect shown to the act of body

**Table 2**

List of guidelines/recommendations relevant to ethical practice in preserving human remains for anatomical dissection.

Sl no.	Guidelines/recommendations	Remarks	Reference(s)
01	Embalming process of donated human body should follow quality standards (recommendation in published literature)	Core ethical practice in human dissection	Macdonald and MacGregor (1997), Brenner (2014), Balta et al. (2015b) (please see references)
02	Embalming process of donated human body may follow code of ethics established at institutional level (suggestion proposed in present review)	Measure to promote professionalism (example of high standard <sup>a</sup> )	Present review article
03	Designated areas for embalming and storage of the donated human body should be separate from each other and independent of the dissection area (recommendation in published literature)	Hygiene & safety regulation (example of high standard <sup>a</sup> )	Chan and Pawlina (2015) (please see references)
04	Each embalmed human body should be stored in separate boxes (recommendation in published literature)	Hygiene regulation (example of high standard <sup>a</sup> )	Brady (1998) (please see references)
05	Embalmed human bodies should be subjected to ideal storage conditions standardized as per prevailing weather (suggestion proposed in present review)	Safety regulation (example of high standard <sup>a</sup> )	Present review article
06	Duration of preservation of the embalmed human body should be in accordance with the terms of the donor consent (guideline)	Core ethical practice in human dissection	IFAA Guidelines (FICEM, 2012)
07	Every donated human body post embalming should be used for academic purpose before cremation (suggestion proposed in present review)	Core ethical practice in human dissection	Present review article

IFAA: International Federation of Association of Anatomists.

FICEM (2012, 2018): please see references.

<sup>a</sup> Presenting examples of high standards at multiple levels of human dissection related activities possibly enhances ethical outlook of medical students.

donation and comprise of ethical handling of human remains. Ethical guidelines suggest that each body should be treated as an autonomous entity and thereby needs to be stored in separate boxes or compartments (Brady, 1998) (Table 2). In other words contacts between bodies, wrappings, artefacts and other materials as applicable should be best avoided. Such a measure is in tune with honouring of individual privacy. Under ideal storage conditions, human bodies are best preserved in cool, dark, dry conditions while wrapped in acid-free tissue and packing materials (Pouliot, 2000). As mentioned previously preservation of human body by ethical means should be aimed at preventing any damage/destruction of any parts during the process. Hence unnecessary exposure to light should be avoided to prevent damage to tissues particularly the bones. Moreover the human body being as organic material is adversely influenced by rise in temperature and changes in moisture level of the surroundings (Pouliot, 2000). Overly moist conditions promote fungal growth, whereas low-humidity conditions can cause damage to the protein components resulting in cracks, split and shrinkage of the body (Ghosh and Sharma, 2015). Ideal storage conditions in terms of temperature and humidity may be standardized as per prevailing weather conditions considering the geographical location (Table 2). Subsequently the established parameters should be adhered to round the clock throughout the preservation period.

### 3.3. Duration of preservation should honour terms of consent

A significant aspect of ethical preservation of donated human bodies is the duration for which they are kept in storage (FICEM, 2012) (Table 2). In this context it may be opined that two things should be given priority: one, the time duration (or perhaps a range) which was committed in the consent form should not be violated and two, the remains should not be disposed, cremated or handed over to family members without using the same for teaching or research (Jones et al., 2003). In case of some extraordinary circumstances when the donated body is required to be preserved beyond the committed time duration, the matter should be brought under the purview of institute oversight committee and opinion/views of family members should be solicited and needful be done. It may be reiterated that involving the family members in decision making when opinion cannot be sought from the individual concerned

can be considered as an ethically sound option (Mason and Laurie, 2001). However there should be no compromise policy with regards to the second point and at all cost the human remains is to be used for dissection activities post preservation and before cremation (Table 2). Any deviation in this context would seriously defeat the very purpose of voluntary body donation programs and would be an act of disrespect to the last wish of the donor (Champney, 2011). It may not be an overstatement that such ethical sacrilege is absolutely undesirable and policies regulating preservation and subsequent usage of donated human bodies should essentially be in line with the expectations of the society.

## 4. Ideal ethical behaviour expected in dissection room

Maintenance of ethical standards in the dissection room premises during anatomical dissection sessions and otherwise is a stepping stone towards medical students imbibing principles of ethical practice in their professional career (Ghosh, 2020). As such the dissection room should be designated as a restricted area with strict regulation regarding entry into the premises. Ideally access to the area should be limited to enrolled students and personnel deputed from the department (Ghosh, 2017a) (Table 3). Medical schools which are following ethical guidelines usually permit the students to enter the dissection room only in the presence of faculty/tutor and that too only during designated tutorial/ laboratory class hours. Visitors in any form, general public or relatives/family members/friends of the students or teaching/non-teaching staff are not allowed in the dissection room. Care should be taken that activities in the dissection room should be focussed on academic pursuits and thereby it is necessary that carriage and consumption of food items and drinks should be totally prohibited in the premises (Table 3). Another relevant guideline which very much applies to the present tech-friendly generation is that photography (selfie/ otherwise) and making video clips in the dissection room is an absolute no-no and zero tolerance needs to be adopted in this regard (University of Bristol, 2014–2015; University of Bristol, 2015; University of Bristol, 2014–2015; University of New South Wales, 2015; Semmelweis University, 2016) (Table 3).

**Table 3**  
List of guidelines/recommendations relevant to ethical practice in the human dissection room.

Sl no.	Guidelines/recommendations	Remarks	Reference(s)
01	Dissection room should be designated as a restricted area (recommendation in published literature)	Core ethical practice in human dissection	Ghosh (2017a) (please see references)
02	Consumption of food items and drinks should be prohibited in dissection room (suggestion proposed in present review based on regulations established by Educational Institutions)	Hygiene & Safety Regulation (Example of high standard <sup>a</sup> )	University of Bristol (2014–2015)University of Bristol, 2015University of Bristol (2014–2015), University of New South Wales (2015), Semmelweis University (2016) (please see references)
03	Photography of any kind and video recording should be prohibited in dissection room (suggestion proposed in present review based on regulations established by Educational Institutions)	Core ethical practice in human dissection	University of Bristol (2014–2015)University of Bristol, 2015University of Bristol (2014–2015), University of New South Wales (2015), Semmelweis University (2016), (please see references)
04	Mandatory to follow essential practices (for details please refer to text) during human dissection (suggestion proposed in present review based on regulations established by Educational Institutions)	Hygiene & safety regulation (example of high standard <sup>a</sup> )	University of Bristol (2014–2015)University of Bristol, 2015University of Bristol (2014–2015), University of New South Wales (2015), Semmelweis University (2016) (please see references)
05	Human tissues should always be handled respectfully (for details please refer to text) during human dissection (suggestion proposed in present review based on regulations established by Educational Institutions)	Hygiene & safety regulation (example of high standard <sup>a</sup> )	Daemen College (2014–2015)Daemen College, 2015Daemen College (2014–2015), Charles University (2020), The Institute of Anatomical Sciences (2020) (please see references)
06	All recommendations to be followed in the dissection room should be displayed as signage (suggestion proposed in present review)	Measure to promote professionalism (example of high standard <sup>a</sup> )	Present review article
07	Pictorial/text messages about body donation to be displayed in dissection room (suggestion proposed in present review)	Measure to Promote Professionalism (example of high standard <sup>a</sup> )	Present review article
08	Maintaining anonymity of the donor should be the priority. Exceptions if any should be worked out while receiving donor consent (guideline)	Core ethical practice in human dissection	IFAA Guidelines (FICEM, 2012)
09	Respectful reference to the donor is mandatory for students while communication among themselves and with the staff (recommendation in published literature)	Measure to promote professionalism (example of high standard <sup>a</sup> )	Ghosh (2020) (please see references)
10	Students should be encouraged to express their emotions related to the experience of confronting dead remains of the donor (recommendation in published literature)	Measure to promote professionalism (example of high standard <sup>a</sup> )	Pabst (1993), Babad and Kedar (1999), Tschernig et al. (2000) (please see references)

IFAA: International Federation of Association of Anatomists.  
FICEM (2012): please see references.

<sup>a</sup> Presenting examples of high standards at multiple levels of human dissection related activities possibly enhances ethical outlook of medical students.

#### 4.1. Mandatory practices for dissection room activities

Students should be guided to follow some mandatory practices from the point of entry to the point of exit like putting on the laboratory coat all the time in the dissection room, wearing covered shoes with enclosed heels and latex/vinyl gloves while touching the wet specimens. Similarly, they should also remember to remove the gloves at the end of the dissection session for a particular day and dispose the same in designated bio-waste bins, wash their hands and instruments with soap followed by drying and finally remove their laboratory coats when leaving the dissection room (University of Bristol, 2014–2015; University of Bristol, 2015; University of Bristol, 2014–2015; University of New South Wales, 2015; Semmelweis University, 2016) (Table 3). These small steps when followed on a daily basis will gradually develop as a habit and it is very much likely that the students will follow the same during clinical postings (albeit with some modifications as applied) and later on as a practising physician. The measures as detailed above are not very arduous to follow but contributes a lot towards maintaining an academic environment in the premises with focus on ethical practices (Ghosh, 2017a). It is also pivotal that students be made aware towards basic safety measures early in their medical career as it is a vital cog of ethical practice (Vani, 2020). Hence it would be prudent that during their stay in the dissection room, they should be advised against putting any object like stationary items or as applicable into their mouth. Information regarding potential toxicity of

preservative solutions should be circulated among the students at the very onset of dissection based training. Subsequently they should be instructed properly as to how they could prevent themselves from inhaling toxic fumes from harmful chemicals. As there is possible risk of injuries from sharp objects/needles during human dissection hence it should be mandatory to report such incidents to the staff/faculty for immediate assessment and management as per standard norms (University of Bristol, 2014–2015; University of Bristol, 2015; University of Bristol, 2014–2015; University of New South Wales, 2015; Semmelweis University, 2016) (Table 3). It may be opined that execution of these measures on regular basis essentially prepares them to adopt standard safety measures as per ethical norms later on as a physician.

#### 4.2. Respectful handling of human tissues every time

During the act of dissection priority should be placed on maintaining cleanliness of the dissection area pertaining to the table on which the human body is being explored. It needs to be ensured that only the specific area of the human body that is being dissected remains exposed, whereas the remaining body should be kept covered. Care should be taken such that running count of the instruments used for dissection be maintained so as to ensure that at the end of dissection none of the items are left inside the dissected body (Daemen College, 2014–2015; Daemen College, 2015; Daemen College, 2014–2015; Charles University, 2020; The

Institute of Anatomical Sciences, 2020) (Table 3). While applying incisions, standard protocol as documented in established anatomical texts or as devised at the institute level be followed. This is critical to the maintenance of well-defined skin flaps required to cover the dissected area after a session (Cahill et al., 2002). Students are to be encouraged towards respectful handling of any human tissue removed at the time of dissection. Accordingly, these human tissues should not be allowed to accumulate in the vicinity of the dissection area. Therefore during dissection and definitely at the end of a session it is imperative that the removed tissues should either be preserved (if applicable) or may be disposed into designated bins (preferably colour coded) kept in the premises (Daemen College, 2014–2015; Daemen College, 2015; Charles University, 2020; The Institute of Anatomical Sciences, 2020) (Table 3). It has to be ensured at all cost that at the end of a session none of the removed tissue should be left behind on the dissection table. This ethical practice supports academic discipline and is a mark of respect to the donor whose body is being dissected. Similarly, it is also necessary to ensure that none of the instruments used for dissection be left on the dissection table. At the end of a session the instruments are to be washed, dried and kept in a organized manner at a designated space (University of New South Wales, 2015; The Institute of Anatomical Sciences, 2020) (Table 3). It is advisable that all the recommendations as detailed above (which are actually practiced in most medical schools across the globe) are displayed as signage at different locations of the dissection room and also at the entry point (Table 3). These printed words would eventually be etched on the minds of future physicians thus guiding them to comply with ethical norms (Ghosh, 2017a). Another useful suggestion would be to display popular messages (both pictorial and text) as available in the internet or in published literature which reminds us about the noble act of body donation and how one selfless act of a person kindles the blessing of knowledge in the mind of thousands (Ghosh, 2017a) (Table 3). Conveying such relevant messages through innovative means possibly strikes a chord with the students and contributes to cultivating the basics of medical ethics in their young minds.

#### 4.3. *Decision on anonymity of the human body should be the call of the institute/department*

A very pertinent ethical guideline as applied to dissection room activities is to maintain the anonymity of the donated body. However IFAA itself have documented that this is the normal practice and exceptions to it may be permissible subject to prior consent from donor and/or his/her family and implemented in accordance with institutional policies (FICEM, 2012) (Table 3). In fact few medical schools have incorporated this idea into their dissection program and these have been detailed by Ghosh and Kumar (2019) in a systematic review. However majority of medical schools and anatomists are till date inclined towards maintaining the anonymity of the human body during dissection (Williams et al., 2014; Jones and King, 2017). It is interesting to note that the trend of maintaining anonymity of a human body being dissected can be traced back and associated with the long history as well as cascading events analogous to human dissection. These events and their influence on anonymity of human body have been detailed by Jones and King (2017) in their review article. Based on their observation they have recommended four (04) options in this context whereby the first option refers to maintenance of complete anonymity and remaining options suggest disclosing the identity albeit in a graded manner. Researchers have noted that the ethical implications as to whether anonymity of a human body is to be maintained or otherwise essentially hinges on communication between the donor and the beneficiary institution/department at the time of receiving

the informed consent (Riederer and Bueno-López, 2014; Jones and King, 2017). As mentioned previously maintenance of anonymity is age long tradition which is more suited to the previously prevalent practice of using unclaimed human bodies as consent of the individual was not available for using his/her mortal remains for dissection. However in present times in the light of popular body donation programs the decision towards revealing the identity of the donor should be at best entrusted to the concerned department. In addition to donor consent, another factor also needs to be considered while resolving this ethical dilemma. This is about the outcome of a dissection program where identity of the donor is revealed to the students (Jones and King, 2017). If it is observed that such an experiment actually enriches the dissection program or contributes to enhancement in terms of skills acquired by students then this should justify the decision. However, if the evidence points otherwise like students are having problems to cope with the identity/personal information of the donor then the decision calls for review/revision.

#### 4.4. *Maintaining dignity of the donor is paramount during communication*

Another significant ethical consideration as applied to the dissection room activity is the nature of communication between the students as well as between student and staff. This ethical aspect has implications on the communications within the dissection room premises as well as outside (Table 3). Students need to be guided so as to not make any loose references or casual remarks with regards to the mortal remains of the donor at any point of time (Ghosh, 2020). They are also required to maintain the same decorum with regards to the donor while they are interacting with their family members/relatives/friends/general public (Ghosh, 2017a). This ethical aspect mandates strict compliance throughout the duration of the human dissection course. Adherence to this ethical practice may possibly shape their outlook towards the patients and the society in general. Mutual respect is an integral element of physician-patient relationship and is the cornerstone of ethical medical practice. In maintaining a respectful attitude towards the human remains of the donor, a student not only uplifts his own moral standard but also projects a better reflection of oneself within the society in general.

However it is important to remember that this particular aspect pertaining to respectful communication should not encourage lack of communication at any stage of dissection course. Particularly care has to be taken at the beginning of the course, when the students probably comes in close contact with the mortal remains of a person for the first time in their life. Subsequently they are confronted with issues related to death and dying and undergo a myriad of emotional thoughts (Pabst, 1993; Tschernig et al., 2000). It is absolutely essential to encourage students to express their individual emotions within groups and in no way they should suppress them (Babad and Kedar, 1999) (Table 3). Organizing group based academic activities dedicated for this purpose during the initial phase of dissection course is critical to the ethical build-up of a future physician as it provides a role model to deal with their patients later on during clinical practice (Tschernig et al., 2000).

The best way to learn is to practice and best practices are those which shape the future towards the better. It may be opined that there is no better place than the dissection room, in presence of the mortal remains of a human donor, for honing the skills as applied to ethical practice for a medical student. In a way the ethical standards followed in the dissection room guide students towards the ethical trail in medical practice thus shaping physicians for a better tomorrow. It may be mentioned that in relation to the points discussed in this section of the review, there is considerable overlap of quality assurance measures (concerning safety and hygiene), factors rele-



vant to professionalism (maintenance of confidentiality) along with the details aimed to promote basic ethical understanding. Although all of these issues may not strictly align with measures intended to cultivate principles of medical ethics among medical students, however from a cumulative perspective, they possibly contribute to the overall ethical outlook of these future professionals.

## 5. Ethical guidelines recommend respectful disposal of dissected remains

On completion of anatomical dissection the focus should be on disposal of the human body (including its parts if any) in an ethical manner. The events involved in the process of disposal of the human remains should be guided by fundamental principles such that compliance with ethical norms is maintained. At first it needs to be ensured that disposal of human remains should be in accordance with the information provided to body donor and/or his/her family members at the time of legalising the consent deed (FICEM, 2012) (Table 4). Secondly, during cremation/burial of the dissected body, the same has to be handled with utmost respect and dignity. In a way such an event may simulate a worthy farewell to the departed soul (Riederer et al., 2012; Jones, 2016). Finally the disposal process (any movement of human remains as such) needs to be regulated through rigorous record keeping at the institute/departmental level (Queensland Health, 2017). Hence ethical disposal of dissected human remains depends on the transparency of the communication between the donor and the institute/department while receiving informed consent (as is the case for preservation), regular monitoring with interventions if required by the institute oversight committee and innovative concepts (if any) as designed by respective institutes to honour the noble act of the person for one last time.

### 5.1. Human remains should be graciously cremated post dissection

The disposal of the dissected human body should be undertaken in the form of cremation/burial as early as possible after it has been used for the purpose for which its retention was authorized by the donor (Ghosh, 2017a). It would be pertinent to mention here that the time interval between acquisition of the human body and its disposal post dissection should comply with the time duration (or a range) committed to the donor while receiving his/her consent (FICEM, 2012; Riederer and Bueno-López, 2014) (Table 4). It is essential that disposal of a dissected body implies disposal of all its parts. Exceptions to the above clause may be considered by the oversight committee in case of anatomical tissue wastes being generated on a daily basis during dissection (as it would not be practical to store them until such time as the body being disposed), if a body part needs to be disposed before the dissection on the remaining body gets completed (possibly due to risk of damage/deterioration to the concerned part which is against ethical preservation) or when a body part is to be preserved as a specimen for display and prior consent to this regard is in place (Queensland Health, 2017) (Table 4).

### 5.2. Funeral ceremonies should be organized in honour of the donor

Disposal of the dissected human body essentially refers to its cremation or burial. Arrangements to this regard including financial implications are usually borne by the beneficiary department/institution (Jones, 2016). In fact most medical schools perceives the occasion as an opportunity to bid adieu to a noble person who has enlightened the students with knowledge and through selfless act contributed towards the welfare of the society (Ghosh,

2017a). Students and faculties alike overwhelmingly participate in a respectful cremation process to express their thankfulness to the departed soul (Table 4). Research shows that most of the potential body donors wish for a respectful and ceremonial cremation of their remains after anatomical dissection (Richardson and Hurwitz, 1995; Rizzolo, 2002). Hence from an ethical perspective it is the responsibility of all stakeholders involved in the exercise of human dissection to fulfil the last wish of the donor. In this context, as reported in the literature, there are two major trends which are emerging globally. Medical schools such as The Basic Biomedical Sciences Division at University of South Dakota, United States; School of Medicine, University of Alabama, Birmingham, United States and School of Anatomy, Physiology and Human Biology, The University of Western Australia, arrange for funeral services whereby all dissected cadavers are properly cremated and the ashes are either handed over to the family members or they are buried at the cemetery with a memorabilia displaying a note of acknowledgement in the cemetery area (Ramsey-Stewart et al., 2010; Pawlina et al., 2011; Ghosh, 2017a). At the Juntendo University School of Medicine, Tokyo, Japan, after rightful cremation ashes of the donor are returned to the family members (Sakai, 2008). Elsewhere in the world like at Tzuchi University Medical School, Hualein, Taiwan; Medical Schools in Thailand; Korean Medical schools and Trinity School of Medicine, Caribbean Islands, students actively participate in the funeral ceremony alongside the family members. In some cases the funeral rites are followed by brief ceremonies comprising of primarily cultural performances from students (Prakash Prabhu et al., 2007; Park et al., 2011; Tseng and Lin, 2016; Ghosh, 2017a). Participating in funeral ceremonies, which effectively constitutes the final journey of the wilful donor, is in accordance with ethical practice and a reflection of the humanistic side of dissection programs. Such events are effectively aimed to instil an appreciation for the humanity of the donors in the young minds of medical students and possibly enhance the societal impact of the practice of human dissection.

Funeral ceremonies provide an ideal platform for the students to be confronted with the ethical dimensions of clinical practice. Since dissection course in most cases is the first contact for medical students with a dead person, hence they are mostly unaware about the model ethical practice with regards to the mortal remains of the donor. Consequently malpractices at the student level are often reported like students taking photographs while posing next to the donor or even recording video clips. Participation of students in funeral ceremonies contribute to strengthening their spiritual outlook and developing a respectful attitude towards the body of the donor. There is evidence in literature that participation in ceremonies remarkably improve the behaviour of students during dissection thus reducing chances of ethical transgressions (Pabst et al., 2017). Moreover discussion within groups (comprising of faculty members and students) following funeral ceremonies and sharing each other's experiences further contribute to building perspectives in this regard which in turn leads to refinement of ethical behaviour of the students towards the better (Tschernig and Pabst, 2001).

### 5.3. Cremation details to be shared with family members prior to event

In the context of cremation a significant ethical contemplation is that the family members/relatives should be informed about the event well before the scheduled date (Riederer and Bueno-López, 2014) (Table 4). Based on the discussion till now there may be three possible situations: family members participate in the cremation ceremony along with students & faculties or cremation is conducted by the institute and ashes are handed over to the family members or arrangements are made for the ashes to be buried in

**Table 4**

List of guidelines/recommendations relevant to respectful disposal of human remains following dissection.

Sl no.	Guidelines/recommendations	Remarks	Reference(s)
01	Disposal of human remains after dissection should be in accordance with the terms of donor consent (guideline)	Core ethical practice in human dissection	IFAA Guidelines (FICEM, 2012)
02	Time interval between receiving the donor body and cremation of the dissected remains should be in accordance with the terms of donor consent (guideline)	Core ethical practice in human dissection	IFAA Guidelines (FICEM, 2012)
03	Cremation of dissected remains should include all parts of the human body. Exceptions if any to be scrutinized by Institute Oversight Committee (suggestion proposed in present review based on regulations established by Educational Institutions)	Core ethical practice in human dissection	Queensland Health (2017) (please see references)
04	Funeral ceremonies should be organized for respectful cremation of the mortal remains of the donor. The event ideally should involve participation of students and staff (recommendation in published literature)	Core ethical practice in human dissection	Ghosh (2017a) (please see references)
05	Details about cremation of the dissected remains to be shared with family members/ relatives of the donor well in advance to the schedule (recommendation in published literature)	Measure to promote professionalism (example of high standard <sup>a</sup> )	Riederer and Bueno-López (2014) (please see references)
06	Post cremation the ashes of the donor (if not handed over to family) to be buried in a designated area and identified with a memorial plaque (suggestion proposed in present review based on regulations established by Educational Institutions)	Measure to promote professionalism (example of high standard <sup>a</sup> )	Queensland Health (2017) (please see references)
07	All relevant records of the cremation process including financial expenditures to be maintained meticulously (suggestion proposed in present review)	Measure to promote professionalism (example of high standard <sup>a</sup> )	Present review article

IFAA: International Federation of Association of Anatomists.

FICEM (2012): please see references.

<sup>a</sup> Presenting examples of high standards at multiple levels of human dissection related activities possibly enhances ethical outlook of medical students.

the cemetery by the institute/department. In the first case, cremation is taking place in presence of the donor family so it is implied that they have been informed. However in second and third cases, it is the institute which is conducting the cremation hence it is very important from ethical viewpoint that information should be there with the relatives. Another point merits discussion in the third case when responsibility of burying the ashes rests on the institute. As per standard ethical practice the ashes should be deposited at a designated memorial garden or an earmarked area within a cemetery. Ideally a memorial plaque should also be erected at the place as a mark of respect to the donor (Queensland Health, 2017) (Table 4).

#### 5.4. Records of cremation process to be maintained in meticulous manner

From ethical perspective, significance of maintaining record at the department/institute level for cremation of dissected body is paramount (Table 4). Such measures effectively check any possible malpractice pertaining to dissected remains and also ensures handling of precious human tissues in a respectful manner (Tomasini, 2008). Hence date and time needs to be mentioned in the register when the dissected is being removed for cremation. While removing the body for cremation, it would be prudent to cross-check the details of the donor with those recorded at the time of receiving the human body. Further the person in-charge who has authorized the removal of the human remains for cremation should be recorded with his/her signature. Moreover the name of the family member(s) who have attended the funeral service and/or have received the ashes after cremation should also be recorded with signature(s). The date and time of cremation ceremony with all the details thereof (venue and participants with course of events) needs to be recorded. If burial of the ashes is undertaken by the institute, then a short description of the site of burial along with date and time should be recorded (Queensland Health, 2017). It is also advisable to maintain a record of the financial expenditures borne by the institute on account of the cremation ceremony under separate heads as applicable (Table 4). Maintaining record of the cremation process of dissected remains of a donor in a transparent manner speak volumes about the overall performance of the body

donation program. It is a testimony to the fact that the cremation of the mortal remains of the donor has been carried out as per ethical standards followed by medical schools across the globe.

## 6. Conclusion

The dissection room experience provides an opportunity for nurturing the principles of ethical practice among medical students early in the curriculum. Following ethical guidelines as applied to every possible activity within the dissection room is the desired path for setting standards before the students. It is like propping up live simulation, albeit on a smaller scale, of ideal behaviour in the clinical scenario. It may be opined that by toeing the line of ethical practice in the dissection room, it is possible to use the premises as a platform to build physicians in an ethical mould who would serve the society in a better way. This review article is an attempt to collate the recommendations documented by researchers in the context of dissection room activities. As discussed previously, the present review includes recommendations pertinent to all activities related to human dissection (Tables 1–4). Some of these activities like source of the human body to be dissected, details concerning its preservation and storage, safety instructions for staff members, documentation of records, are apparently beyond the purview of medical students during dissection course. Nevertheless, these are integral elements of dissection related activities and it would not be prudent to keep medical students unexposed to these details. It may be opined that it is always better to set as much ideal examples as possible before the students in the context of ethical practice in human dissection. As a part of good practices in the context of human dissection, medical students may be exposed to these details (which are apparently not directly related to the dissection room activity pertaining to anatomy curriculum) through academic sessions (seminars/group discussion/workshops) either at the beginning of the course or at suitable intervals. Knowledge about the practice of high standards at multiple levels in the context of human dissection would undoubtedly enhance the ethical outlook of the students.

It may be mentioned here that the recommendations mentioned in this review are in accordance with the guidelines (and modifi-

cations thereof) issued by IFAA and other recognised anatomical bodies. Most of the recommendations have already been embraced as part of anatomical dissection linked to successful ongoing body donation programs in medical schools across the globe. Viewpoints documented as a part of active research in this domain strongly suggest that these recommendations need to be adopted by institutions elsewhere also. This review article will serve its intended purpose if it is able to guide anatomists towards thinking about the ethical dimension of human dissection. Uniform adoption of the recommendations highlighted in the review will be a remarkable contribution to the ongoing reforms in anatomical sciences education. It may be mentioned here that further research on this topic will possibly lead to more insights and better outcome in the future.

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## References

- American Association of Anatomists, 2018. *A Discussion on Body Donation*, 1st ed. American Association of Anatomists, Bethesda, MD, 1 p.
- American Association of Clinical Anatomists, 2017. *Best Practices Guide for Donation Programs*, 2nd ed. American Association of Clinical Anatomists, LaGrange, GA, 7 p.
- Babad, Y., Kedar, H., 1999. How to remain sensitive without becoming vulnerable: medical students coping with reactions to dissection. *J. Chittagong Med. Coll. Teach. Assoc.* 21, 227.
- Bajracharya, S., Magar, A., 2006. Embalming: an art of preserving human body. *Kathmandu Univ. Med. J. KUMJ (KUMJ)* 4, 554–557.
- Balta, J.Y., Cronin, M., Cryan, J.F., O'Mahony, S.M., 2015a. Human preservation techniques in anatomy: a 21st century medical education perspective. *Clin. Anat.* 28, 725–734.
- Balta, J.Y., Lamb, C., Soames, R.W., 2015b. A pilot study comparing the use of thiel- and formalin-embalmed cadavers in the teaching of human anatomy. *Anat. Sci. Educ.* 8, 86–91.
- Bard, J.S., 2008. Black markets: the supply and demand of body parts. *J. Health Polit. Policy Law* 33, 117–133.
- Bellier, A., Cavalie, G., Masson, P., Palombi, O., Chaffanjon, P., 2019. Feedback on the usefulness of an illustrated guidebook in an anatomy dissection course. *Surg. Radiol. Anat.* 41, 1173–1179.
- Bowman, D., 2012. Putting ethical principles into clinical practice. *BMJ* 344, e1311.
- Brady, B.A., 1998. *The Ethics of Biomedical Research: An International Perspective*. Oxford University Press, Oxford, pp. 55–75.
- Brenner, E., 2014. Human body preservation—old and new techniques. *J. Anat.* 224, 316–344.
- British Institute of Embalmers, 2017. *The British Institute of Embalmers—Australasian Division. About Us – History*. <https://bieaust.org/about-us/history>.
- Cahill, D., Leonard, R., Weiglein, A., von Lüdinghausen, M., 2002. Viewpoint: unrecognized values of dissection considered. *Anat. Sci. Educ.* 24, 137–139.
- Caplan, I., DeCamp, M., 2019. Of discomfort and disagreement: unclaimed bodies in anatomy laboratories at United States Medical School. *Anat. Sci. Educ.* 12, 360–369.
- Champney, T.H., 2011. A proposal for a policy on the ethical care and use of cadavers and their tissues. *Anat. Sci. Educ.* 4, 49–52.
- Champney, T.H., 2016. The business of bodies: ethical perspectives on for-profit body donation companies. *Clin. Anat.* 29, 25–29.
- Champney, T.H., 2019. A bioethos for bodies: respecting a priceless resource. *Anat. Sci. Educ.* 12, 432–434.
- Chan, L.K., Pawlina, W. (Eds.), 2015. *Teaching Anatomy: A Practical Guide*. Springer International Publishing, Basel, Switzerland, 403 p.
- Charles University, 2020. Department of Anatomy, Second Faculty of Medicine: Rules of the Classrooms and Dissection Rooms., (Accessed 5 April 2020) <https://anatomie.lf2.cuni.cz/en/general-medicine/rules-of-the-classrooms-and-dissection-rooms>.
- Cornwall, J., Hildebrandt, S., 2019. Anatomy, education, and ethics in a changing world. *Anat. Sci. Educ.* 12, 329–331.
- Daemen College, 2014–2015. *Human Anatomy Laboratory Rules, Regulations and Guidelines*. <https://www.daemen.edu/sites/default/files/documents/GROSS%20ANATOMY%20LAB%20POLICIES%202014-2015.pdf>. (Accessed 5 April 2020).
- Evans, D.J., Pawlina, W., Lachman, N., 2018. Human skills for human[istic] anatomy: an emphasis on non-traditional discipline-independent skills. *Anat. Sci. Educ.* 11, 221–224.
- Evans, D.J., Bay, B.H., Wilson, T.D., Smith, C.F., Lachman, N., Pawlina, W., 2020. Going virtual to support anatomy education: a STOPGAP in the midst of the Covid-19 pandemic. *Anat. Sci. Educ.* 13, 279–283.
- FICEM, 2012. *Federative International Committee for Ethics and Medical Humanities of the International Federation of Associations of Anatomists (IFAA). Recommendations of Good Practice for the Donation and Study of Human Bodies and Tissues for Anatomical Examination*. Plexus, pp. 4–5.
- FICEM, 2018. *Federative International Committee for Ethics and Medical Humanities of the International Federation of Associations of Anatomists (IFAA). Ethical and Medical Humanities Perspectives on the Public Display of Plastinated Human Bodies*, 1st ed. International Federation of Associations of Anatomists, Johannesburg, South Africa.
- Gangata, H., Ntuba, P., Akol, P., Louw, G., 2010. The reliance on unclaimed cadavers for anatomical teaching by medical schools in Africa. *Anat. Sci. Educ.* 3, 174–183.
- Garment, A., Lederer, S., Rogers, N., Boulton, L., 2007. Let the dead teach the living: the rise of body bequeathal in 20th-century America. *Acad. Med.* 82, 1000–1005.
- Ghosh, S.K., 2015. Human cadaveric dissection: a historical account from ancient Greece to the modern era. *Anat. Cell Biol.* 48, 153–169.
- Ghosh, S.K., 2017a. Paying respect to human cadavers: we owe this to the first teacher in anatomy. *Ann. Anat.* 211, 129–134.
- Ghosh, S.K., 2017b. Cadaveric dissection as an educational tool for anatomical sciences in the 21st century. *Anat. Sci. Educ.* 10, 286–299.
- Ghosh, S.K., 2020. Transformation of the role of human dissection in medical education: cultivating principles of medical ethics. *Surg. Radiol. Anat.* 42, 855–856.
- Ghosh, S.K., Kumar, A., 2019. Building professionalism in human dissection room as a component of hidden curriculum delivery: a systematic review of good practices. *Anat. Sci. Educ.* 12, 210–221.
- Ghosh, S.K., Sharma, S., 2015. Cadaveric preservation under adverse climatic conditions. *Surg. Radiol. Anat.* 37, 1287–1288.
- Goodwin, M., 2006. *Black Markets: The Supply and Demand of Body Parts*, 1st ed. Cambridge University Press, Cambridge, UK, 314 p.
- Grant, K., 2019. For Anatomy Labs in Search of Cadavers, Assisted-dying Law Brings Scheduled Arrivals, and Ethical Complications. *The Globe and Mail Canada*, 12 April 2019. *The Globe and Mail Inc.*, Toronto, ON, Canada.
- Gürses, İ.A., Coşkun, O., Öztürk, A., 2018. Current status of cadaver sources in Turkey and a wake-up call for Turkish anatomists. *Anat. Sci. Educ.* 11, 155–165.
- Habicht, J.L., Kiessling, C., Winkelmann, A., 2018. Bodies for anatomy education in Medical Schools: an overview of the sources of cadavers worldwide. *Acad. Med.* 93, 1293–1300.
- Hayashi, S., Naito, M., Kawata, S., Qu, N., Hatayama, N., Hirai, S., Itoh, M., 2016. History and future of human cadaver preservation for surgical training: from formalin to saturated salt solution method. *Anat. Sci. Int.* 91, 1–7.
- Hildebrandt, S., 2008. Capital punishment and anatomy: history and ethics of an ongoing association. *Clin. Anat.* 21, 5–14.
- Hildebrandt, S., 2009. Anatomy in the Third Reich: an outline, part 1. *National Socialist politics, anatomical institutions, and anatomists*. *Clin. Anat.* 22, 883–893.
- Hildebrandt, S., 2019. The role of history and ethics of anatomy in medical education. *Anat. Sci. Educ.* 12, 425–431.
- Hutchinson, E.F., Kramer, B., Billings, B.K., Brits, D.M., Pather, N., 2019. The law, ethics and body donation: a tale of two bequeathal programs. *Anat. Sci. Educ.* 13, 512–519.
- Jones, D.J., 1998. Anatomy and ethics: an exploration of some ethical dimensions of contemporary anatomy. *Clin. Anat.* 11, 100–105.
- Jones, D.G., 2016. Searching for good practice recommendations on body donation across diverse cultures. *Clin. Anat.* 29, 55–59.
- Jones, D.G., 2019. Ethical perspectives on body donation following physician assisted death. *Anat. Sci. Educ.* 13, 504–511.
- Jones, D.G., King, M.R., 2017. Maintaining the anonymity of cadavers in medical education: historic relic or educational and ethical necessity. *Anat. Sci. Educ.* 10, 87–97.
- Jones, D.G., Whitaker, M.I., 2009. Engaging with plastination and the Body Worlds phenomenon: a cultural and intellectual challenge for anatomists. *Clin. Anat.* 22, 770–776.
- Jones, D.G., Whitaker, M.I., 2012. Anatomy's use of unclaimed bodies: reasons against continued dependence on an ethically dubious practice. *Clin. Anat.* 25, 246–254.
- Jones, D.G., Gear, R., Galvin, K.A., 2003. Stored human tissue: an ethical perspective on the fate of anonymous, archival material. *J. Med. Ethics* 29, 343–347.
- Lantos, J.D. (Ed.), 2011. *Controversial Bodies: Thoughts on the Public Display of Plastinated Corpses*, 1st ed. Johns Hopkins University Press, Baltimore, MD, 160 p.
- Li, M., Watt, S., Escaf, M., Gardam, M., Heesters, A., O'Leary, G., Rodin, G., 2017. Medical assistance in dying – implementing a hospital-based program in Canada. *N. Engl. J. Med.* 376, 2082–2088.

- Liberati, A., Altman, D.G., Tetzlaff, J., Mulrow, C., Gøtzsche, P.C., Ioannidis, J.P.A., Clarke, M., Devereaux, P.J., Kleijnen, J., Moher, D., 2009. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *PLoS Med.* 6, e1000100.
- Longhurst, G.J., Stone, D.M., Duloherly, K., Scully, D., Campbell, T., Smith, C.F., 2020. Strength, weakness, opportunity, threat (SWOT) analysis of the adaptations to anatomical education in the United Kingdom and Republic of Ireland in response to the Covid-19 pandemic. *Anat. Sci. Educ.* 13, 301–311.
- Macdonald, G.J., MacGregor, D.B., 1997. Procedures for embalming cadavers for the dissecting laboratory. *Proc. Soc. Exp. Biol. Med.* 215, 363–365.
- Manyacka Ma Nyemb, P., Ndoye, J.M., Gaye, M., Ai, N., Ndiaye, A., Dia, A., 2014. Donation of whole bodies for anatomy teaching: social consciousness, willingness and practices in Senegal. *Int. J. Curr. Res.* 6, 7183–7185.
- Mason, J.K., Laurie, G.T., 2001. Consent or property? Dealing with the body and its parts in the shadow of Bristol and Alder Hey. *Mod. Law Rev.* 64, 710–729.
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., PRISMA Group, 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med.* 6, e1000097.
- Moxham, B.J., Plaisant, O., Lignier, B., Morgan, S., 2019. Attitudes and responses of medical students and professional anatomists to dissecting different regions of the body. *Clin. Anat.* 32, 253–267.
- Nie, J.B., Jones, D.G., 2019. Confucian Ethics on the commercial use of human bodies and body parts: Yi (Righteousness) or/and Li (Profit)? *Anat. Sci. Educ.* 12, 444–453.
- Nuhn, A., Holmes, S., Kelly, M., Just, A., Shaw, J., Wiebe, E., 2018. Experiences and perspectives of people who pursued medical assistance in dying: qualitative study in Vancouver, BC. *Can. Fam. Physician* 64, e380–e386.
- Pabst, R., 1993. Gross anatomy: an outdated subject or an essential part of a modern medical curriculum? Results of a questionnaire circulated to final-year medical students. *Anat. Rec.* 237, 431–433.
- Pabst, R., Schmiedel, A., Schrieber, S., Tschernig, T., Pabst, V.C., 2017. Ceremonies of gratitude following the dissection course: a report on procedures in departments of anatomy in German speaking countries. *Ann. Anat.* 210, 18–24.
- Park, J.T., Jang, Y., Park, M.S., Pae, C., Park, J., Hu, K.S., Park, J.S., Han, S.H., Koh, K.S., Kim, H.J., 2011. The trend of body donation for education based on Korean social and religious culture. *Anat. Sci. Educ.* 4, 33–38.
- Paul, N.W., Caplan, A., Shapiro, M.E., Els, C., Allison, K.C., Li, H., 2017. Human rights violations in organ procurement practice in China. *BMC Med. Ethics* 18, 11.
- Pawlina, W., Hammer, R.R., Strauss, J.D., Heath, S.G., Zhao, K.D., Sahota, S., Regnier, T.D., Freshwater, D.R., Feeley, M.A., 2011. The hand that gives the rose. *Mayo Clin. Proc.* 86, 139–144.
- Pouliot, B.P., 2000. "Organic Materials". *The Winterthur Guide to Caring Your Collection*. University Press of New England, Hanover, pp. 45–56.
- Prabhu, P.K., 2019. Is presumed consent an ethically acceptable way of obtaining organs for transplant. *J. Intensive Care Soc.* 20, 92–97.
- Prakash Prabhu, L.V., Rai, R., D'Costa, S., Jiji, P.J., Singh, G., 2007. Cadavers as teachers in medical education: knowledge is the ultimate gift of body donors. *Singap. Med. J.* 48, 186–190.
- Queensland Health, 2017. Best Practice Guideline for Schools of Anatomy in the Disposal of Human Remains. [https://www.health.qld.gov.au/\\_data/assets/pdf\\_file/0030/692274/best-practice-disposal.pdf](https://www.health.qld.gov.au/_data/assets/pdf_file/0030/692274/best-practice-disposal.pdf).
- Rajasekhar, S.S.S.N., Aravindhana, K., Gladwin, V., Chand, P., 2016. Body donation-consent from non-related persons: case series, review and recommendations. *J. Clin. Diagn. Res.* 10, AR01–AR04.
- Ramsey-Stewart, G., Burgess, A.W., Hill, D.A., 2010. Back to the future: teaching anatomy by whole body dissection. *Med. J. Aust.* 193, 668–671.
- Richardson, R., Hurwitz, B., 1995. Donors' attitudes towards body donation for dissection. *Lancet* 346, 277–279.
- Riederer, B.M., 2016. Body donations today and tomorrow: what is best practice and why? *Clin. Anat.* 29, 11–18.
- Riederer, B.M., Bueno-López, J.L., 2014. Anatomy, respect for the body and body donation – a guide for good practice. *Eur. J. Anat.* 18, 361–368.
- Riederer, B.M., Bolt, S., Brenner, E., Bueno-López, J.L., Chirculescu, A., Davies, D.C., Decaro, R., Gerrits, P.O., McHanwell, S., Pais, D., Paulsen, F., Plaisant, O., Sendemir, E., Stabile, L., Moxham, B.J., 2012. The legal and ethical framework governing body donation in Europe—1st update on current practice. *Eur. J. Anat.* 16, 1–21.
- Rizzolo, L.J., 2002. Human dissection: an approach to interweaving the traditional and humanistic goals of medical education. *Anat. Rec.* 269, 242–248.
- Sakai, T., 2008. Body donation: an act of love supporting anatomy education. *JMAJ* 51, 39–45.
- Semmelweis University, 2016. Department of Anatomy, Histology and Embryology—Rules and Regulations in the Dissecting Room. <http://semmelweis.hu/anatomia/files/2016/09/Dissection-room-rules-2016-OK.pdf>.
- Shimazono, Y., 2007. The state of the international organ trade: a provisional picture based on integration of available information. *Bull. WHO* 85, 955–962.
- Stephens, G.C., Rees, C.E., Lazarus, M.D., 2019. How does donor dissection influence medical students' perception of ethics? A cross-sectional and longitudinal qualitative study. *Anat. Sci. Educ.* 12, 332–348.
- The Institute of Anatomical Sciences, 2020. Guidelines During Anatomical Examination: The Use of Human Cadavers. <https://www.anatomical-sciences.org.uk/guidelines/>.
- Tomasini, F., 2008. Research on the recently dead: an historical and ethical examination. *Br. Med. Bull.* 85, 7–16.
- Tschernig, T., Pabst, R., 2001. Services of Thanksgiving at the end of gross anatomy courses: a unique task for anatomists? *Anat. Rec. (New Anat)* 265, 204–205.
- Tschernig, T., Schlaud, M., Pabst, R., 2000. Emotional reactions of medical students to dissecting human bodies: a conceptual approach and its evaluation. *Anat. Rec. (New Anat)* 261, 11–13.
- Tseng, W.T., Lin, Y.P., 2016. "Detached concern" of medical students in a cadaver dissection course: a phenomenological study. *Anat. Sci. Educ.* 9, 265–271.
- University of Bristol, 2014–2015. Foundation Program Year 2014–2015. The Human Dissection Room: Health and Safety. <https://www.bristol.ac.uk/media-library/sites/anatomy/vesalius/documents/Health%20&%20Safety%20HDR%20guidelines.pdf>. (Accessed 5 April 2020).
- University of New South Wales, 2015. Dissecting Room Rules – SoMS Health & Safety. <https://medicallsciences.med.unsw.edu.au/sites/default/files/soms/page/Undergrad/Course%20Outline%20Supplement%20%20Dissecting%20Room%20Rules%205Bv2015055D.pdf>.
- Vani, N.I., 2020. Safety and ethical issues of barehand cadaver dissection by medical students. *Ind. J. Med. Ethics* 7, 124–125.
- Wainman, B.C., Cornwall, J., 2019. Body donation after medically assisted death: an emerging consideration for donor programs. *Anat. Sci. Educ.* 12, 417–424.
- Williams, A.D., Greenwald, E.E., Soricelli, R.L., DePace, D.M., 2014. Medical students' reactions to anatomic dissection and the phenomenon of cadaver naming. *Anat. Sci. Educ.* 7, 169–180.
- Winkelmann, A., 2016. A consent and consensus—ethical perspectives on obtaining bodies for anatomical dissection. *Clin. Anat.* 29, 70–77.
- Zhang, L., Wang, Y., Xiao, M., Han, Q., Ding, J., 2008. An ethical solution to the challenges in teaching anatomy with dissection in the Chinese culture. *Anat. Sci. Educ.* 1, 56–59.