











International consensus for a dissection room quality system (DRQS): A Delphi panel study

M. Dalmau-Pastor^{1,2}  | N. Alvarez Toledo³  | I. Valdivia-Gandur⁴  |
R. S. Tubbs^{5,6,7}  | T. Vázquez-Osorio⁸  | J. M. de Anta¹  |
C. Simon de Blas⁹  | A. Prats-Galino¹⁰  | M. Loukas⁶  |
M. C. Manzanares-Cespedes^{1,11} 

¹Human Anatomy and Embryology Unit, Department of Pathology and Experimental Therapeutics, School of Medicine and Health Sciences, Universitat de Barcelona, Barcelona, Spain

²MIFAS by GRECMIP (Minimally Invasive Foot and Ankle Society), Merignac, France

³Department of Neurosurgery, Tulane University, New Orleans, Louisiana, USA

⁴Human Anatomy Unit, Biomedical Department, Universidad de Antofagasta, Antofagasta, Chile

⁵Department of Neurosurgery, Neurology, Surgery, and Structural and Cellular Biology, St. George's University, Grenada

⁶Department of Anatomical Sciences, St. George's University, Grenada

⁷Department of Neurosurgery and Ochsner Neuroscience Institute, Ochsner Health System, New Orleans, Louisiana, USA

⁸Department of Anatomy and Embryology, School of Medicine, Complutense University of Madrid, Madrid, Spain

⁹Department of Statistics and Operations Research, Computer Science School, Rey Juan Carlos University, Madrid, Spain

¹⁰Laboratory of Surgical Neuroanatomy (LSNA), Human Anatomy and Embryology Unit, Department of Surgery and Medical-Surgical Specialties, Universitat de Barcelona, Barcelona, Spain

¹¹UNIPRO-Oral Pathology and Rehabilitation Research Unit, University Institute of Health Sciences (IUCS), Gandra, Portugal

Correspondence

M. Dalmau-Pastor, Human Anatomy and Embryology Unit, Department of Pathology and Experimental Therapeutics, School of Medicine and Health Sciences, University of Barcelona, Barcelona, Spain; MIFAS by GRECMIP (Minimally Invasive Foot and Ankle Society), Merignac, France.
Email: mikeldalmau@ub.edu

Abstract

Dissection Rooms (DRs) are key facilities that allow teaching and research on human anatomy, where students and researchers work with human bodies to acquire, increase, or create new knowledge. Usually, DRs work with a Body Donation Program (BDP), where living donors bequeath their bodies for use in teaching and research after they expire. Despite DRs being part of universities worldwide, no common guidelines, regulations, or quality management systems (QMS) exist that could be applied to different countries. With that purpose in mind, we aimed to develop a QMS that could be applied to DRs globally, using a Delphi panel to achieve consensus about the items that should constitute the QMS. The panel was constituted by 20 anatomy professors from 20 different countries, and the 167 standards to create the rules or guidelines that constitute the QMS were divided in five categories: direction, body donation, students, instructors, and research. After two rounds of revisions, 150 standards were considered “essential” or “important” by more than 70% of the participants, thus being incorporated to the Dissection Room Quality System

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(DRQS). The results of this panel represent a minimum list of items of the DRQS for improving the functioning of DRs globally.

KEYWORDS

anatomy, consensus, Delphi panel, dissection, human body, living donors, university

1 | INTRODUCTION

Dissection rooms (DRs) are basic facilities in any Medicine and Health Sciences School. They are necessary for learning anatomy from real bodies, complementing the information taught in the classroom, improving tridimensional understanding of the relationships among anatomical structures (Collins, 2008). The progressive reduction of anatomy curricula (Williams et al., 2019) further highlights the importance of DRs as key learning centers for future Health Sciences professionals, as it allows for interaction between the students and dissections and prosections in a way that theoretical content alone cannot achieve. In addition, DRs allow and encourage training in surgical anatomy and surgical techniques to be provided for surgeons of all specialties.

Usually, a DR works together with a Body Donation Program (BDP), by which living donors bequeath their bodies for use in teaching after they expire (Porzionato et al., 2012). A BDP should be transparent and organized, allowing persons interested in contributing to science to make altruistic donations of their bodies in an effective and respectful manner. On the other hand, the DR should use its resources efficiently, ensuring adequate maintenance of the bodies and offering controlled access and correct functioning to users participating in learning, teaching, and research activities.

As DRs are part of medical and health sciences schools worldwide, it might be expected that common or equivalent guidelines, regulations, and management systems would be found in all countries. However, to the best of our knowledge, there is no literature presenting an integrated management system that could be applied universally, permitting basic but efficient functioning of DRs and BDPs. In addition, our experience is that most DRs have traditionally been managed relying on the know-how of the direction rather than in normalized processes. To help normalize processes and management, quality management systems (QMS) have been developed as a “formalized system that documents processes, procedures, and responsibilities for achieving quality policies and objectives” (ASQ, 2022). This management system allows not only normalization of management but also the ability to “improve its effectiveness and efficiency on a continuous basis” (ASQ, 2022), which is usually known as “continuous improvement.” Although traditionally applied to industries to improve customer satisfaction rates while reducing costs to the organization, QMS is also applied to higher education (Seyfried & Ansmann, 2018), and it has been applied to BDP (Porzionato et al., 2012).

Our purpose was therefore to develop a QMS that could be applied to DRs globally. To achieve this goal, we decided to use a Delphi panel, a consensus survey among experts to help achieve

agreement regarding a specific topic. In this case, the rules or guidelines that constitute a QMS were organized into five categories: direction, body donation, students, instructors, and research.

2 | METHODS

The compilation of suggested standards for the DRQS is a product of a two-round Delphi Method Survey. Twenty anatomy professors teaching at university level were selected as participants and tasked with reviewing a list of identifiable quality standards related to DR functioning. The statements for the study were developed from the study's team expertise.

The selection of the 167 statements was performed through group discussions. Participants in these group discussions were anatomy professors with an extensive experience in teaching and research in DRs.

The questionnaire was designed using multiple-choice questions and we use the same criteria to categorize all the responses to compute Cronbach's alpha (1951) to assess the reliability of this instrument. All test and data analysis were conducted using IBM SPSS 18 Software. Cronbach's alpha is a test or scale score reliability (or consistency) is a measure of internal consistency between the items of a test or scale. The score is a function of the number of test items and the average inter-correlation among them with values in the interval [0,1]. Cronbach's alpha score increases in case the number of items or average inter-item correlation increases. A reliability coefficient of 0.6–0.70 or higher is considered “acceptable” in most social science research situations and 0.8 or greater a very good level (Hulin, Netemeyer, and Cudeck, 2001).

The Delphi process comprised two rounds (illustrated in Figure 1). In Round 1, the experts were asked to rank 167 statements, distributed in five categories and subcategories, as “essential,” “important,” “acceptable,” and “not required.” Additional space for comments was included for each statement, providing an opportunity to explain the responses (illustrated in Figure 2).

In Round 2, the experts received an individualized questionnaire comprising all 167 statements from Round 1 alongside the participant's own responses in Round 1. The questionnaire also included the group's collective response (percentage Essential/Important/Acceptable/Not required). Round 2 did not include any new statements derived from Round 1 comments. There was no option for comments in Round 2. The experts were asked to reconsider their previous responses a final time, considering the responses of the group.

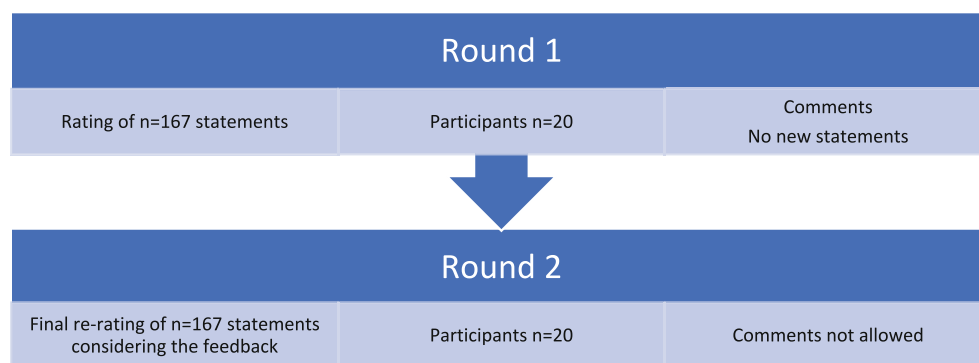


FIGURE 1 Flow diagram of the two-round Delphi survey.

Category	Subcategory	Standards	Essential	Important	Acceptable	Not required	Comments
Direction	Institutional governance of the DR	The DR should have an Academic Director to manage the normal functioning of the DR					
		The director of the DR should be designated by the Institutional Authority					
		The director of the DR should be designated by the Human Anatomy Unit of the Institution					
		The director of the DR should have a Medical Degree					

FIGURE 2 Sample section from Delphi Method questionnaire in Round 1.

In this study, two survey rounds were used (Henderson & Rubin, 2012). The consensus was defined as >70% of experts assigning “Essential” or “Important” to the statements in Round 2. This threshold for consensus was chosen based on previous studies (Diamond et al., 2014; Henderson & Rubin, 2012; Slade et al., 2014; Vogel et al., 2019).

The 20 professors of anatomy who participated in the Delphi survey were from 20 different countries around the world: America (Argentina, Brazil, Chile, Costa Rica, Mexico, USA), Europe (Austria, France, Germany, Hungary, Italy, Malta, Poland, Portugal, Spain, UK), Asia (Japan, Turkey, South Korea), and Oceania (Australia). The participants are involved directly and indirectly in their daily practice with the functioning of a DR, with heavy involvement in teaching, training, and research.

The surveys were collected after completion. Data were compiled and combined into a database organized by categories and subcategories. The quality standards were sorted according to the relative importance assigned by the experts. The data with rankings were sent to the Delphi experts a second time for analysis and confirmation.

3 | RESULTS

Of the 20 experts invited to the present Delphi survey, 20 completed Round 1 (100% response rate), and 20 completed Round 2 (100% response rate). The age of the participants ranged from 35 to 69 years, with a mean of 50.8 years. Five participants were female and 15 were male. Nineteen of the participants had over 10 years of

TABLE 1 Demographic characteristics of the participants in the Delphi survey.

	Round 1 (n = 20)	Round 2 (n = 20)
Age, mean in years	50.8	50.8
Sex		
Male	15	15
Female	5	5
Years of experience		
1–10 years	1	1
>10 years	19	19

experience in teaching anatomy, while one of the participants had 1 year of experience (Table 1).

The survey was applied to a sample of 20 directors of DRs and/or BDPs and were collected from February 10 to November 5, 2022. During that period 20 international directors of BDPs responded, which supposes the 10% of the total population susceptible to respond to the questionnaire of different countries. In this work, we consider a total population of 196 countries susceptible to dispose of a Medicine University School. Therefore, an error sample $\varepsilon = 6.7\%$ was derived considering a significance level $\alpha = 0.05$ following Equation (1).

$$\varepsilon^2 = \frac{N \cdot Z_{\alpha}^2 \cdot p \cdot (1-p)}{N-1} - Z_{\alpha}^2 \cdot p \cdot (1-p) \quad (1)$$

where n is the sample size, N is the total population size, p is the proportion (in case is unknown, $p = 0.5$), Z_{α}^2 is the right tail value for a

normal distribution with mean zero and variance 1 considering a significance level α (in this case, $Z_{\alpha}^2 = 1.96$) and ε is the error sample. A corrector for finite populations was applied.

A larger sample size would be desirable to reduce the error sample and is a limitation of this study.

The distribution of the 167 statements examined in Round 2 and the proportion of those statements for which consensus was achieved in Round 2 is presented in Table 2. The category Direction included 47 standards distributed in seven subcategories: institutional

governance of the DR, DR direction, ethical guidelines, guidelines for safety processes, guidelines for emergency situations, guidelines for accidents, and guidelines for personal protection equipment. The category body donation included 30 standards distributed in three subcategories: institutional guidelines for donations, guidelines for the donation process, and clauses for possible rejection. The category Students included 44 standards distributed in nine subcategories: general regulations for students, penalties, general safety, requirements for students to access the DR, guidelines for safety, emergency situations,

TABLE 2 Distribution of quality standards reviewed in the Delphi survey by categories and subcategories and the statements for which consensus was achieved.

Category	Subcategory	Number of standards, round 2	Number of statements for which consensus was achieved (proportion)
Direction (47 standards)	Institutional governance of the DR	10	5 (0.50)
	DR direction	15	15 (1.00)
	Ethical guidelines	3	3 (1.00)
	Guidelines for safety processes	10	5 (0.50)
	Guidelines for emergency situations	5	4 (0.80)
	Guidelines for accidents	2	2 (1.00)
	Guidelines for personal protection equipment (PPEs)	2	2 (1.00)
Body donation (30 standards)	Institutional guidelines for donations	3	3 (1.00)
	Guidelines for the donation process	19	17 (0.89)
	Clauses for possible rejection	8	8 (1.00)
Students (44 standards)	General regulations for students	3	3 (1.00)
	Penalties	2	2 (1.00)
	General safety	8	6 (0.75)
	Requirements for students to access the DR	9	8 (0.89)
	Guidelines for safety	1	1 (1.00)
	Emergency situations	2	2 (1.00)
	Accidents	3	3 (1.00)
	Handling of cadavers during practical lessons	14	14 (1.00)
	Emotional issues	2	2 (1.00)
Instructors (28 standards)	General regulations for instructors	4	4 (1.00)
	Penalties	1	1 (1.00)
	General safety regulations	3	3 (1.00)
	Clothing and personal protection equipment (PPEs)	1	1 (1.00)
	Guidelines for safety	5	4 (0.80)
	Emergency Situations	2	2 (1.00)
	Accidents	4	4 (1.00)
	Emotional issues	2	2 (1.00)
	Acceptance of the regulations	5	5 (1.00)
Research (18 standards)	Ethical guidelines	1	1 (1.00)
	General regulation for research	7	7 (1.00)
	Research projects involving cadavers	9	9 (1.00)
	Ethical guidelines	2	2 (1.00)

accidents, handling of cadavers during practical lessons, and emotional issues. The category Instructors included 28 standards distributed in 10 subcategories: general regulations for instructors, penalties, general safety regulations, clothing and personal protection equipment, guidelines for safety, emergency situations, accidents, emotional issues, acceptance of the regulations, and ethical guidelines. Finally, the category research included 18 standards distributed in three subcategories: general regulation for research, research projects involving cadavers, and ethical guidelines.

The Cronbach's alpha was computed for direction, body donation, students, instructors and research items. The results were the following for the first round: direction items = 0.877; body donation items: 0.783; students items: 0.925; instructors items: 0.903 and research items: 0.876.

For the second round, results were the following: direction items = 0.879; body donation items: 0.782; students items: 0.921; instructors items: 0.935 and research items: 0.903.

Results surpasses the indications given by Nunnally and Bernstein (1994) about the minimum reference score for research questionnaires (Chronbach's alpha higher than 0.7), therefore, the instrument presents sufficient reliability scores for their use in the present research.

The following is a summary of the results of the Delphi survey, organized in the categories of direction, body donation, students, instructors, and research.

3.1 | Direction

Of 47 standards in this domain, 36 were considered “essential” or “important” by more than 70% of the participants. Eight standards were considered “essential” by 90% or more of the experts: the DR should have an Academic Director to manage the normal functioning of the DR; direction must ensure that all cadaveric and anatomical specimens are properly registered, inventoried and catalogued by technical staff in collaboration with Human Anatomy Unit professors; dissection room regulations and processes (DRPP) methods and key processes should be consistently documented and made available for instructors/researchers conducting teaching and research in the DR; research and teaching materials, reagents and samples should be fit for purpose and documented so that reproducibility can be ensured; special lectures/tutorials in ethics relating to the donors of human remains should be made available to all students studying anatomy (this is to encourage the development of appropriate sensitivities in relation to conduct and the respect that is expected of those handling human remains for anatomical education and research); direction must ensure that adequate precautions are taken to avoid chemicals coming into contact with eyes and skin or being inhaled or ingested by students or participants in research activities; direction should ensure that DR staff are trained to provide First Aid during office hours; and in case of emergency, direction should supervise or ensure that staff are available to supervise an evacuation, ensure that all attendants follow the instructions, direct the attendants to the emergency exit and

proceed quickly to the assembly area, and do not leave the assembly area until all the students are accounted for (Table 3).

3.2 | Body donation

Of the 30 standards examined in this category, 28 were considered “essential” or “important” by more than 70% of the participants. There was complete agreement among experts on five standards considered “essential”: donation regulations by the Institution should state that the study of human cadavers is essential for teaching, advanced training, and research in health and anatomical sciences; institutions must establish procedures of the highest ethical standards in order to give donors full confidence in their decision to donate; institutions must ensure transparency regarding the use of human material in order to increase public trust and support for body donation; the donation process must be clear and rigorous in accordance with the legal framework at a national and/or state level; and the decision to donate should be free from financial considerations (Table 4).

3.3 | Students

Of the 44 standards related to this category, 41 were considered “essential” or “important” by more than 70% of the participants. Full agreement was not reached in any of the proposed standards but four were considered as “essential” by 90% or more of the experts: if a student should cut, puncture, or wound him/herself or a colleague with any instruments, he/she should immediately notify the instructor for assistance while thoroughly washing the wound; if a student should splash preservative fluid, disinfectant, or specimen fragments into his/her eyes, he/she must thoroughly rinse them in the eyewash fountain while his/her colleagues should immediately notify the instructor for assistance; and students should be advised that it is illegal for any anatomical material to be removed from the premises of the DR (Table 5).

3.4 | Instructors

Of the 28 standards examined, 27 were considered “essential” or “important” by more than 70% of the participants. There were no standards with full agreement but six were considered “essential” by 95% of the experts: instructors must follow and enforce the regulations of the DR during both teaching and research activities; instructors must ensure that students know and abide by the general regulations as stated in the DRRP documents; instructors must inform students clearly about the procedures to be performed in order to avoid mistakes that could entail incorrect use of a cadaver; instructors should report ALL accidents, spills, breakages, or injuries to the DR staff in order to apply adequate preventive measures; instructors must ensure that if a student should cut, puncture, or wound him/herself or a colleague with any instruments, he/she should immediately notify

TABLE 3 Summary of the relative importance of standards related to the category direction in the Delphi method survey, identified as “essential” or “important” by >70% of experts.

Subcategory	Standard	Percentage essential (%)	Percentage important (%)	Percentage acceptable (%)	Percentage not required (%)
Institutional governance of the DR	The DR should have an Academic Director to manage the normal functioning of the DR	90.00	5.00	5.00	0.00
	The Director of the DR should be designated by the Institutional Authority	80.00	5.00	10.00	5.00
	The Director of the DR should be designated by the Human Anatomy Unit of the Institution	75.00	10.00	5.00	10.00
	The Director of the DR should have a medical degree	45.00	30.00	10.00	15.00
	The dissecting room should be designated as a teaching room as well as a research laboratory	65.00	15.00	10.00	10.00
Dissection room direction	Direction must ensure that the DR facilities are fit for their research and teaching activities and provide safe and secure work environments	85.00	10.00	5.00	0.00
	Direction must ensure that hygienic conditions are maintained during anatomical prosection activities, avoiding the generation of odors from blood decomposition and tissue degradation	85.00	15.00	0.00	0.00
	To guarantee hygienic conditions during cadaveric material manipulation, direction must ensure that bodies are thoroughly exsanguinated to retard tissue degradation	75.00	15.00	0.00	10.00
	Direction must ensure that all cadaveric and anatomical specimens are properly registered, inventoried and catalogued by technical staff in collaboration with Human Anatomy Unit professors	90.00	10.00	0.00	0.00
	Direction must ensure that resources are allocated to implement, maintain, and continuously improve the dissection room regulations and processes (DRRPs) and to ensure compliance with them	85.00	15.00	0.00	0.00
	Direction is responsible for data management for all dissection room regulations and processes (DRRPs), to ensure long-term data security and straightforward data retrieval	75.00	25.00	0.00	0.00
	DRRP methods and key processes should be consistently documented and available for instructors/researchers conducting teaching and research activities in the DR	90.00	10.00	0.00	0.00

(Continues)

TABLE 3 (Continued)

Subcategory	Standard	Percentage essential (%)	Percentage important (%)	Percentage acceptable (%)	Percentage not required (%)
	Research and teaching materials, reagents, and samples should be fit for purpose and documented so that reproducibility can be ensured	95.00	5.00	0.00	0.00
	Cadaveric and other anatomical specimens should be preserved throughout their life cycle until their disposal, which should be consistent with defined regulations	80.00	20.00	0.00	0.00
	DR staff should be competent and trained to perform their functions in an effective and safe manner, assisting the academia in teaching and research activities	85.00	15.00	0.00	0.00
	The DRRPs should be applied to all activities, both internal and external (conducted by other institutional groups, external research centers, academic laboratories, or service providers)	70.00	20.00	10.00	0.00
	Agreement to comply with requirements of DRRPs should be signed off before any research work with research groups outside the organization is started	85.00	15.00	0.00	0.00
	DRRPs are required for the safety of the staff and students and for the care and respect for the cadaveric material	75.00	20.00	5.00	0.00
	Direction must ensure that a webpage or a dedicated section on the webpage of the Institution is available for the DR to inform students about the DRRPs	50.00	40.00	5.00	5.00
	DRRPs must be presented on the notice board at the entrance	25.00	75.00	0.00	0.00
Ethical guidelines	Special lectures/tutorials in ethics relating to the donors of human remains should be made available to all students studying anatomy (this is to encourage the development of appropriate sensitivities in relation to conduct and the respect that is expected of those handling human remains for anatomical education and research)	90.00	10.00	0.00	0.00
	Direction and all personnel (DR staff) handling dissection or cadaveric material must have the appropriate ethical training for their activity	85.00	15.00	0.00	0.00
	Institutions should be encouraged to hold services of thanksgiving or commemoration for those who have donated their bodies for medical education and research, to which relatives of the deceased can be invited, along with staff and students	85.00	10.00	5.00	0.00

TABLE 3 (Continued)

Subcategory	Standard	Percentage essential (%)	Percentage important (%)	Percentage acceptable (%)	Percentage not required (%)
Guidelines for safety processes	Direction must ensure that the chemicals used as preservation fluids in the DR are clearly stated on the notice board at the entrance	20.00	60.00	15.00	5.00
	Direction must ensure that the safety data sheets (SDSs) for the chemicals used are located by the lab First Aid Kit	65.00	30.00	5.00	0.00
	Direction must ensure that all persons of reproductive age are aware that the chemicals used are suspected human reproductive and developmental toxins and could therefore pose a hazard to the unborn child	70.00	15.00	10.00	5.00
	Direction must ensure that women who know they are pregnant should be aware of all these suspected human reproductive and developmental toxins that could pose a hazard to the unborn child	75.00	15.00	10.00	0.00
	Direction must ensure that adequate precautions are taken to avoid chemicals coming into contact with eyes and skin or being inhaled or ingested by students or participants in research activities	90.00	5.00	5.00	0.00
Guidelines for emergency situations	Direction should ensure that DR staff are trained to provide First Aid during office hours	90.00	5.00	5.00	0.00
	Direction should ensure that a list of Institution staff other than DR staff who are able to provide First Aid is available on the notice board at the entrance	60.00	20.00	20.00	0.00
	Direction should ensure that a list of Institution staff other than DR staff who are able to provide First Aid is available beside the lab First Aid Kit	65.00	25.00	10.00	0.00
	In case of emergency, Direction should supervise or make sure that staff are available to supervise an evacuation, ensure that all attendants follow the instructions, direct the attendants to the emergency exit and proceed quickly to the assembly area, and do not leave the assembly area until all the students are accounted for	90.00	10.00	0.00	0.00
Guidelines for accidents	Direction is responsible of maintaining an updated First Aid Kit and its proper indication within the DR	80.00	10.00	10.00	0.00
	Direction is responsible of reporting all accidents to the appropriate Institutional Safety Officer	85.00	5.00	10.00	0.00

(Continues)

TABLE 3 (Continued)

Subcategory	Standard	Percentage essential (%)	Percentage important (%)	Percentage acceptable (%)	Percentage not required (%)
Guidelines for personal protection equipment (PPEs)	In case the students forget to bring adequate PPEs, Direction must ensure that gloves, lab coats, goggles, surgical masks, and face masks are available from shops on campus	50.00	25.00	20.00	5.00
	Direction must ensure that PPEs are available for staff and academia (for teaching and research) in the DR	80.00	10.00	10.00	0.00

the instructor for assistance while thoroughly washing the wound; and instructors must ensure that if a student should splash preservative fluid, disinfectant, or specimen fragments into his/her eyes, he/she must thoroughly rinse them in the eyewash fountain while his/her colleagues immediately notify the instructor for assistance (Table 6).

3.5 | Research

Of the 18 standards related to research in the Delphi method study, 18 were considered “essential” or “important” by more than 70% of the participants. Three of the proposed standards were considered “essential” by 95% of the experts: DRRPs are required for the safety of the research team members, and the need for care and respect for the cadaveric material; DR Direction must supervise all research projects involving cadaveric material and ensure that all the members of the research team know and follow the DRRPs; and research projects must obtain adequate ethical clearance to be developed in the DR (Table 7).

4 | DISCUSSION

DRs are essential in medical teaching, medical training, and research. The development of QMSs applied to the DRs is an important topic of discussion for improving the functioning of such important places. QMS, as “a structured, evidence-based approach to increase value” (Dirnagl et al., 2018), has a “proven track record in many businesses and clinical research” (Dirnagl et al., 2018), with a “great potential to improve rigor and reproducibility” (Dirnagl et al., 2018). Many fields and scenarios have moved forward and developed their own QMS, but despite the potential benefits there is a lack of dedicated QMS in some academic scenarios (Hülsemann et al., 2022). The authors have found no literature about QMSs related to the management of DRs. This could affect their efficiency and potential as suitable spaces for teaching, training, and research; hence the necessity for creating an international and widely accepted dissection room quality system (DRQS).

In this study, the authors have aimed to present a list of minimum standards or regulations for inclusion in a DRQS. 167 standards were evaluated by the panel, and 150 of them were considered “essential” or “important” by more than 70% of the participants, thus being incorporated to our final DRQS. Participants who contributed to the study, as the experts in the Delphi method survey, were chosen based on their well-established professional credentials and work related to DRs. They were from different countries around the world. The Delphi method technique has long been used in “health sciences to find consensus” (Niederberger & Spranger, 2020) by compiling a range of opinions on certain topics. In this technique, the experts answer a series of questionnaires in iterations. Most Delphi surveys comprise “two or three rounds” (Niederberger & Spranger, 2020). In the present study, two rounds were enough to achieve a level of consensus with the participation of 20 experts. The Delphi method requires “a minimum of 12 respondents” (Vogel et al., 2019).

The study has strengths and weaknesses. In general, there was good consensus about what standards were “Essential” for the DRQS. The study gathered responses from 20 experts, all anatomy professors, from 20 different countries of the world, a large sample considering the recommended minimum of 12 (Vogel et al., 2019). Another strength was that the drop-out rate of participants was 0% during rounds 1 and 2. On the other hand, an important limitation is that the study did not provide definitive guidelines; rather, it offers a consensus about minimum standards. Another limitation is that participants could have reflected their own DR role and professional interests in their response patterns. According to one expert, all 47 standards in the category Direction were “essential,” while for another expert only 12 were “essential.” One respondent considered all the standards in the category student as “essential,” while a second respondent considered five of them “not required.” Another point is that the study did not cover the particularities of all cultural environments in each nation, and a topic as sensitive as body donation could be viewed significantly differently from country to country. Another potential limitation is that only Anatomy Professors were included in the panel, excluding technicians, who could have a different opinion. Further research could include technicians together with professors to have a broader view regarding DRs.

TABLE 4 Summary of the relative importance of standards related to the body donation category in the Delphi method survey, identified as “essential” or “important” by >70% of experts.

Subcategory	Standard	Percentage essential (%)	Percentage important (%)	Percentage acceptable (%)	Percentage not required (%)
Institutional guidelines for donations	Donation regulations by the Institution should state that the study of human cadavers is essential for teaching, advanced training, and research in health and anatomical sciences	100.00	0.00	0.00	0.00
	Institutions must establish procedures of the highest ethical standards in order to give donors full confidence in their decision to donate	100.00	0.00	0.00	0.00
	Institutions must ensure transparency regarding the use of human material in order to increase public trust and support for body donation	100.00	0.00	0.00	0.00
Guidelines for the donation process	The donation process must be clear and rigorous in accordance with the legal framework at a national and/or state level	100.00	0.00	0.00	0.00
	The decision to donate should be free from financial considerations	100.00	0.00	0.00	0.00
	Informed consent from donors must be obtained in writing before any donation can be accepted	95.00	5.00	0.00	0.00
	Informed consent must state that donors are entirely free in their decision to donate	95.00	5.00	0.00	0.00
	The informed consent must include a clause to permit access the donor's medical records	70.00	20.00	5.00	5.00
	Donation documents must include the signature of (one or more) witness(es) in order to confirm that donor is mentally capable	80.00	10.00	10.00	0.00
	Donation documents must include copies of any identity document belonging to donor and witness (or witnesses)	80.00	15.00	5.00	0.00
	Donation documents must include a clause and instructions to inform the donor's relatives	75.00	25.00	0.00	0.00
	There should be no commercialization of human remains for anatomical education and research	95.00	0.00	5.00	0.00
	The procedures to facilitate the supply of bodies, body parts, or plastinated specimens to other institutions for educational or research purposes must not be based on commercial gain	90.00	5.00	0.00	5.00
	The normal practice is to retain donor anonymity	95.00	0.00	5.00	0.00
	Any exceptions to donor anonymity should be formally agreed to beforehand by the donor and, if appropriate, the family	80.00	5.00	0.00	15.00
	No individual should be identifiable on images	90.00	5.00	0.00	5.00
	The informed consent must include a clause to authorize the taking of images and their use for scientific purposes	90.00	10.00	0.00	0.00

(Continues)

TABLE 4 (Continued)

Subcategory	Standard	Percentage essential (%)	Percentage important (%)	Percentage acceptable (%)	Percentage not required (%)
	Limits need to be placed on the extent to which images, or other artifacts produced from donations, are placed in the public domain, including on social media, both to respect the privacy of the donor (and their surviving relatives) and to preclude morbid curiosity	85.00	15.00	0.00	0.00
	Specimens must be treated with respect at all times. This includes, but is not limited to, storing and displaying human and non-human animal parts separately	90.00	10.00	0.00	0.00
	Donation should be free of cost for donors at all times	85.00	15.00	0.00	0.00
Clauses for possible rejection	Once a donation has been accepted, there should be no clauses for rejection of the body by the Institution in the informed consent, as it would force the relatives of the donor to incur unplanned economic costs. If the state of the body is not appropriate for research or teaching, the Institution will take care of burial/cremation. The only exception to this is the place of death being outside the designated limits of the donating area	45.00	35.00	5.00	15.00
	Causes for rejection of the body by the Institution should be stated in the informed consent so in some circumstances (see below), donation of the body could be declined by the Institution. In this case, the relatives of the donor will meet the expenses of burial/cremation	80.00	15.00	0.00	5.00
	The physical condition of the body is a possible reason why a body donation could be rejected	65.00	35.00	0.00	0.00
	The virological or microbiological status of the donor in life is a possible reason why a body donation could be rejected	80.00	20.00	0.00	0.00
	Body weight over a specified limit is a possible reason why a body donation could be rejected	55.00	20.00	10.00	15.00
	Lack of space to maintain the donated body adequately in the DR is a possible reason why a body donation could be rejected	55.00	20.00	10.00	15.00
	The existence of diseases (for example neurological pathology) that might expose staff or students handling the body to unacceptable risks is a possible reason why a body donation could be rejected	75.00	15.00	5.00	5.00
	The possible over-supply of donations at that institution at that time is a possible reason why a body donation could be rejected	55.00	20.00	0.00	25.00

TABLE 5 Summary of the relative importance of standards related to the category students, in the Delphi method survey, identified as “essential” or “important” by >70% of experts.

Subcategory	Standard	Percentage essential (%)	Percentage important (%)	Percentage acceptable (%)	Percentage not required (%)
General regulations for students	Students are allowed to enter and study specimens in the DR only in the presence of an instructor and/or during designated tutorial/laboratory class hours	80.00	15.00	0.00	5.00
	Students should know and abide by the rules of the DR	90.00	10.00	0.00	0.00
	Each student attending the DR should receive a copy of the DR rules and sign for it	80.00	15.00	5.00	0.00
Penalties	Students should know that failure to follow the rules of the DR will result in penalties appropriate to the fault	90.00	5.00	5.00	0.00
	Students should know that repeated or grave failures to follow the rules of the DR will result in referral to the Office of Student Judicial Affairs/ Student Council for disciplinary action	85.00	10.00	5.00	0.00
General safety	Students should note the location of the safety equipment: emergency shower and eyewash station, fire extinguishers and fire blanket, and first aid kit	85.00	15.00	0.00	0.00
	Students who for some specific health reason could suffer allergic or toxic reactions to the products or solutions used in the DR should inform their instructor	85.00	10.00	0.00	5.00
	Students should never eat or drink in the dissection room premises	90.00	10.00	0.00	0.00
	Students should never put anything in their mouth while they are in the Dissection Room premises; for example, pens or pencils picked up from the table	85.00	15.00	0.00	0.00
	Students should avoid inhaling preservative solutions for prolonged periods	80.00	10.00	0.00	10.00
	Students should report ANY and ALL accidents, spills, breakages, or injuries to the instructor, no matter how trivial they appear	85.00	15.00	0.00	0.00
Requirements for students to access the dissection room	Wear covered, non-slippery shoes with enclosed heels. Never use thongs or sandals	90.00	10.00	0.00	0.00
	Wear long pants	80.00	15.00	0.00	5.00
	Wear the laboratory coat when entering the lab	80.00	10.00	5.00	5.00
	Lab coats must not be worn in the hall or anywhere outside the laboratories	65.00	15.00	10.00	10.00
	Loose/long hair must be tied back to prevent contact with the cadaveric material	75.00	15.00	10.00	0.00

(Continues)

TABLE 5 (Continued)

Subcategory	Standard	Percentage essential (%)	Percentage important (%)	Percentage acceptable (%)	Percentage not required (%)
	Wear powder-free latex or vinyl gloves when touching specimens	70.00	10.00	15.00	5.00
	Students should be aware that it is not advisable to wear soft contact lenses in the gross anatomy lab, as they could absorb the chemicals used in the lab and cause eye irritation	60.00	25.00	5.00	10.00
	Students should be aware that if soft contact lenses must be used, they should be cleaned thoroughly after each visit to the lab	55.00	30.00	5.00	10.00
Guidelines for safety	Health Sciences students should be trained to know the chemicals used in the DR, their toxic effects and adequate preventive measures for management	20.00	80.00	0.00	0.00
Emergency situations	Health Sciences students should be trained for evacuation in emergency situations	75.00	25.00	0.00	0.00
Accidents	If a student feels in need of fresh air, he/she should ask permission from the instructor to leave the laboratory for a few minutes	70.00	30.00	0.00	0.00
	If a student should cut, puncture, or wound him/herself or a colleague with any instruments, he/she should immediately notify the instructor for assistance while thoroughly washing the wound	95.00	5.00	0.00	0.00
	If a student should splash preservative fluid, disinfectant, or specimen fragments into his/her eyes, he/she must thoroughly rinse them in the eyewash fountain while his/her colleagues immediately notify the instructor for assistance	95.00	5.00	0.00	0.00
Handling of cadavers during practical lessons	Students should be advised that they are learning from human material prepared from people who have generously donated their bodies for the benefit of science	95.00	5.00	0.00	0.00
	Students should be advised to always have and show utmost respect for the specimens in the DR, treating cadavers and all other gross anatomy specimen preparations according to the ethical standards of the profession, human standards and moral respect	90.00	10.00	0.00	0.00
	Students should be advised that skilled staff members have dissected the specimens to allow them to see anatomical structures in fine detail	65.00	35.00	0.00	0.00
	Students should be advised to restrict their sense of humor to topics other than anatomy and the cadaver	75.00	20.00	5.00	0.00
		80.00	20.00	0.00	0.00

TABLE 5 (Continued)

Subcategory	Standard	Percentage essential (%)	Percentage important (%)	Percentage acceptable (%)	Percentage not required (%)
	Students should be advised to handle the specimens with great care, in order to preserve their delicate structures				
	Students should be advised to come to the DR prepared for that day's lesson by reading/reviewing notes and viewing the dissection video in advance, or the practical lesson protocol referred to the material to be covered	75.00	15.00	10.00	0.00
	Students should be advised always to use only blunt forceps to handle specimens and probes to point to structures	70.00	15.00	10.00	5.00
	Students should be advised that it is illegal for any anatomical material to be removed from the premises of the DR	95.00	5.00	0.00	0.00
	Students should be advised that photography and video recording are not permitted in the DR. It will be considered a serious disciplinary offense for a student to take or to possess pictures of the DR's human specimens	85.00	5.00	5.00	5.00
	Students should be advised to deposit all the biological tissues/organs removed into each individual donor bin	85.00	15.00	0.00	0.00
	Students should be advised, if applicable, to cover wet specimens with the towels provided at the end of the lesson	75.00	20.00	5.00	0.00
	Students should be advised to be sure that towels do not hang over the edge of the table, because this allows fluid to drip on to the floor. Fluids on the floor are a major safety hazard and should be reported to staff immediately	70.00	25.00	5.00	0.00
	Students should be advised to remove their gloves and dispose in the bio-waste bins provided at the end of the lesson	85.00	10.00	5.00	0.00
	Students should be advised to wash their hands and instruments thoroughly with the soap provided and dry their hands with the paper towel	85.00	10.00	5.00	0.00
Emotional issues	Students should be advised that emotional adjustment to cadaver dissection is a normal process experienced by all students	75.00	25.00	0.00	0.00
	Students should be advised that if they encounter difficulties making this adjustment, they can contact University support services	75.00	20.00	5.00	0.00

TABLE 6 Summary of the relative importance of standards related to the category instructors in the Delphi method survey, identified as “essential” or “important” by >70% of experts.

Subcategory	Standard	Percentage essential (%)	Percentage important (%)	Percentage acceptable (%)	Percentage not required (%)
General regulations for instructors	Instructors must follow and enforce the regulations of the DR during both teaching and research activities	95.00	5.00	0.00	0.00
	Instructors must ensure that students know and abide by the general regulations as stated in the DRRP documents	95.00	5.00	0.00	0.00
	Instructors must inform students clearly about the procedures to be performed in order to avoid mistakes that could entail incorrect use of a cadaver	95.00	0.00	5.00	0.00
	Instructors must inform the Director if taking visitors into the DR	85.00	10.00	5.00	0.00
Penalties	Instructors must ensure that the students know the regulations and the penalties to be imposed in case of failure to follow the DR rules	90.00	5.00	5.00	0.00
General safety regulations	Instructors should be trained to provide First Aid during office hours	85.00	10.00	5.00	0.00
	Instructors must exercise caution when bringing any personal electronic device such as phones or computers to the DR laboratories	85.00	10.00	5.00	0.00
	Instructors should report ALL accidents, spills, breakages, or injuries to the DR staff in order to apply appropriate preventive measures	95.00	0.00	5.00	0.00
Clothing and personal protection equipment	Instructors and visitors must use personal protective equipment (PPE) and suitable clothing for the activities that they are developing in the DR	80.00	15.00	5.00	0.00
Guidelines for safety	Instructors must ensure that students know the chemicals used as preservation fluids in the DR	60.00	25.00	10.00	5.00
	Instructors must ensure that women of reproductive age are aware that the chemicals used are suspected human reproductive and developmental toxins and could therefore pose a hazard to the unborn child	85.00	5.00	5.00	5.00
	Instructors must ensure that women who know they are pregnant should be aware of all suspected human reproductive and developmental toxins that could pose a hazard to the unborn child	85.00	10.00	0.00	5.00
	Instructors must ensure that adequate precautions are taken to avoid chemicals coming into contact with eyes and skin or being inhaled or ingested by students or participants in research activities	85.00	15.00	0.00	0.00
Emergency situations	If the student feels in need of fresh air, he/she should be given permission by the instructor to leave the laboratory for a few minutes, and to signal another student or a staff member to accompany him/her until recovered	90.00	5.00	5.00	0.00
	Instructors must ensure that in case of emergency, all attendants follow the instructions, supervise the evacuation, and	90.00	5.00	5.00	0.00

TABLE 6 (Continued)

Subcategory	Standard	Percentage essential (%)	Percentage important (%)	Percentage acceptable (%)	Percentage not required (%)
	direct the students to the emergency exit and proceed quickly to the assembly area. They have to stay in the assembly area until all the students are accounted for				
Accidents	Instructors must ensure that if a student should cut, puncture, or wound him/herself or a colleague with any instruments, he/she should immediately notify the instructor for assistance while thoroughly washing the wound	95.00	0.00	5.00	0.00
	Instructors must ensure that if a student should splash preservative fluid, disinfectant, or specimen fragments into his/her eyes, he/she must thoroughly rinse them in the eyewash fountain while his/her colleagues should immediately notify the instructor for assistance	95.00	0.00	5.00	0.00
	Instructors must provide first aid if needed by any attendee at the activities that they are developing in the DR	90.00	5.00	5.00	0.00
	Instructors must ensure that all accidents are reported both to the DR Staff and to the appropriate Institutional Safety Officer	85.00	10.00	5.00	0.00
Emotional issues	Instructors must ensure that the students are advised that emotional adjustment to cadaver dissection is a normal process experienced by all students	90.00	5.00	5.00	0.00
	Instructors must ensure that the students are advised that if they encounter difficulties making this adjustment, they can contact University Support Services	90.00	5.00	5.00	0.00
Acceptance of the regulations	Instructors must ensure that the students are advised that is their responsibility to make sure that they read and understand the rules prior to their first visit to the DR	90.00	10.00	0.00	0.00
	Instructors must ensure that the students are advised about the Web page of the DR in which the DRRPs are available	75.00	20.00	5.00	0.00
	Instructors must ensure that the students are advised that they must sign some document (assistance form to lessons, a separate form, etc.) asserting that they accept and acknowledge the obligation to adhere to the DPRRs and understand that breaking any of them will result in disciplinary hearings and/or criminal prosecution	80.00	20.00	0.00	0.00
	Instructors must ensure that the DPRRs for the students at the DR are taught during the first practical lesson in the DR	80.00	20.00	0.00	0.00
	Instructors must ensure that the DPRRs for the students at the DR are included in the program of the course and submitted for assessment	60.00	40.00	0.00	0.00
Ethical guidelines	Instructors and collaborators handling dissection or cadaveric material must have the appropriate ethical training for their activity	90.00	10.00	0.00	0.00

TABLE 7 Summary of the relative importance of standards related to the research category in the Delphi method survey, identified as “essential” or “important” by >70% of experts.

Subcategory	Standard	Percentage essential (%)	Percentage important (%)	Percentage acceptable (%)	Percentage not required (%)
General regulations for research	DRRPs are required for the safety of the research team members, and the need for care and respect for the cadaveric material	95.00	5.00	0.00	0.00
	DR Direction must supervise all research projects involving cadaveric material, and ensure that all the members of the research team know and follow the DRRPs	95.00	5.00	0.00	0.00
	DR Direction must ensure that IPs from all research projects are advised that they accept and acknowledge the obligation to adhere to the DRRPs and understand that breaking any of them will result in disciplinary hearings and/or criminal prosecution	90.00	10.00	0.00	0.00
	IPs from all research projects must enforce the DRRPs throughout the project's research activities	85.00	15.00	0.00	0.00
	DR Direction must ensure that the risks of the activities in the DR are known in detail by the research team	85.00	15.00	0.00	0.00
	IPs from all research projects must ensure that preventive measures relating to the risks of activities in the DR are known and followed by the research team	90.00	10.00	0.00	0.00
	IPs from all research projects must ask permission to take visitors into the DR	85.00	15.00	0.00	0.00
Research projects involving cadaveric specimens	Research projects must obtain adequate ethical clearance to be developed in the DR	95.00	5.00	0.00	0.00
	Research project reports must include adequate acknowledgement of the donors	90.00	10.00	0.00	0.00
	Research projects must report the origin of the cadaveric samples, the demographics of the donors, and the preparation and conservation techniques used for the specimens	85.00	5.00	10.00	0.00
	IPs from all research projects must ensure that research team members handle the specimens with great care in order to preserve their delicate structures	85.00	15.00	0.00	0.00
	Research projects must report in the Materials and Methods all the manipulations, tests and preparation to which the specimens will be subjected	90.00	10.00	0.00	0.00
	Research projects must take into account and include as a part of the	85.00	10.00	5.00	0.00

TABLE 7 (Continued)

Subcategory	Standard	Percentage essential (%)	Percentage important (%)	Percentage acceptable (%)	Percentage not required (%)
	Materials and Methods the good laboratory practice (GLP) in force in the DR				
	Research projects must include in the Materials and Methods the preventive measures relating to the risks of activities to be developed in the DR	55.00	30.00	15.00	0.00
	Research projects must document their research activities by following the ALCOA+ (attributable, legible, contemporaneous, original, accurate, complete, consistent, enduring, available) principles, to ensure reproducibility and straightforward data reconstruction	70.00	15.00	15.00	0.00
	Research projects must follow the AQUA (Anatomical Quality Assurance*) principles, to ensure the quality and adequate reporting of anatomical data and results	85.00	5.00	10.00	0.00
Ethical guidelines	Research projects to be developed in the DR must show the utmost respect for the specimens, treating cadavers and all other anatomical specimen preparations according to the ethical standards of the profession, human standards and moral respect	100.00	0.00	0.00	0.00
	Researchers and collaborators handling dissection or cadaveric material must have the appropriate ethical training for their activity	90.00	5.00	0.00	5.00

Finally, in the Delphi methodology, “there is debate as to how to define knowledge and experience,” (Trevelyan & Robinson, 2015) so the selection of participants or experts does not necessarily represent all opinions in the field.

5 | CONCLUSIONS

The results of this study represent an important step toward establishing a widely recognized DRQS. This quality system comprises 150 standards related to the five pillars of functioning of DRs: direction, body donation, students, instructors, and research. The agreed standards are based on the opinions of international experts and therefore should be part of a minimum list of items to be presented as part of the DRQS for improving the functioning of DRs globally.

ORCID

M. Dalmau-Pastor  <https://orcid.org/0000-0001-6043-698X>

N. Alvarez Toledo  <https://orcid.org/0000-0002-7443-2995>

I. Valdivia-Gandur  <https://orcid.org/0000-0002-7835-2001>

R. S. Tubbs  <https://orcid.org/0000-0003-1317-1047>

T. Vázquez-Orsorio  <https://orcid.org/0000-0003-3537-0901>

J. M. de Anta  <https://orcid.org/0000-0003-3499-8297>

C. Simon de Blas  <https://orcid.org/0000-0002-6963-1295>

A. Prats-Galino  <https://orcid.org/0000-0002-2710-6433>

M. Loukas  <https://orcid.org/0000-0003-2811-6657>

M. C. Manzanares-Cespedes  <https://orcid.org/0000-0002-4585-4953>

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