

A proposed worldwide classification system for ways of sourcing of anatomical cadavers that is progressive towards the use of donated anatomical cadavers

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INTRODUCTION

Historically, there were five ways of acquiring cadavers to enrich the learning of anatomy: illegal grave digging, unwilled claimed cadavers, ‘purchased’ cadavers, unclaimed cadavers and donated cadavers (other synonyms are anatomical donation, body donation and body bequest) [1–6]. The first two respective cadaver sources have become redundant because of the immense social conflict they created [1–3]. There is a clear trend in anatomy schools of moving towards the use of donated cadavers [7], being bolstered by ongoing international debates on best guidelines on using donated cadavers [8], because donated cadavers are probably the most preferred ethically, usually has the least amount of social conflict and fill the void left by persistent shortages of unclaimed cadavers [1, 5, 6, 9]. The paper proposes a classification system of how anatomical cadavers are obtained and could help bring clarity to the landscape of sourcing cadavers.

FACTORS DRIVING THE POPULARITY OF USING DONATED CADAVERS OVER UNCLAIMED CADAVERS

The use of unclaimed bodies has several criticisms that have encouraged the use of donated cadavers. Donated cadavers are generally easier to preserve in a better state than unclaimed cadavers who have to undergo a time consuming process of trying to locate their relatives before embalming [10]. The number of unclaimed cadavers obtained is potentially liable to further reduction from relatives claiming back some cadavers due to late identification. Although unclaimed cadavers tend to be younger and may even include pediatric cases [10], unclaimed cadavers have very low female numbers when compared to donated cadavers and may compromise the learning of female reproductive anatomy and research [7, 11, 12].

The most potent criticisms against the use of unclaimed cadavers are the negative emotions and ethical issues when compared to using donated cadavers because using unclaimed cadavers allows dissection without the consent of the person-now-dead, depends on the ignorance of the relatives [13] and is “exploitation of those on the margins of society” (p. 248) [14]. The worldwide practice of using unclaimed bodies is simply and sadly based on taking bodies of the “friendless dead” (p. 822) who “do not like it and cannot resist” (p. 819), and targeting communities who cannot effectively protest [15]. In Nigeria, unclaimed cadavers tend to come from the much poorer northern regions of the country [16]. The “Prussian Directives” were fully exploited by anatomy departments under the Nazi realm and large numbers of political victims on the wrong side of the Nazi philosophy ended up being used for anatomical teaching [17]. Across the Atlantic Ocean, a number anatomy schools in USA were once so proud of exclusively using Afro-American as unclaimed cadavers during the time of slavery [18]. The very high proportion of adult male unclaimed cadavers [7, 11, 12] maybe due to more familial isolation in adult males than females.

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There appears to be a reciprocal relationship between the number of unclaimed cadavers and donated cadavers and is driven primarily by the number of available unclaimed cadavers. Increased numbers of available unclaimed cadavers make it harder to obtain donated cadavers, while the scarcity of unclaimed cadavers stimulates the supply of donated cadavers. For example, effective state burial financial assistance for the poor dwindled the supply of unclaimed cadavers [13] and stimulated the use of donated cadavers [5] in the USA (triggered by the horrible Great Depression during the 1930s) [18] New Zealand [19] and in Britain [5, 20]. The state incentivized institutions and undertakers to bury unclaimed bodies for a handsome fee from the state and further reduced the available number of unclaimed cadavers [5]. Actually by the 1960s, the medical schools with the most successful number of donated cadavers were located in states with the most efficient state burial welfare for the poorest [5]. Thus countries with less financial resources should be warned of the significant state financial resources required for successful conversion from unclaimed cadavers to donated cadavers

It is insufficient to say that ethical reasons alone led to the rise of donated cadavers in the USA and UK [5], as some would like to suggest [14, 21] and the demise of unclaimed cadavers is a prerequisite requirement to allow for the rise in the use of donated cadavers. Jones and Whitaker [14], stressed “that anatomists should cease using unclaimed bodies” (p. 246), perhaps by legally banning the use of unclaimed cadavers, as was done in the United Kingdom in 2004 [22]. The reality is that a number of countries, such as Romania [23], have no legal permission to use donated bodies and would be caught in ‘no-man’s land’.

Unfortunately, the use of unclaimed cadavers is still very popular and extensive. Most countries in the world depend on unclaimed cadavers for most of their teaching cadavers [24]. Even the USA and Canada have failed to stop their dependency on unclaimed cadavers and about 20% of their anatomy departments still use unclaimed cadavers [9]. The numbers of cadaveric donations in recent times is said to have over taken the number of unclaimed bodies used in most countries [14], but this may be misleading. Regions with huge populations of over one billion each are heavily dependent upon unclaimed cadavers, such as China, India and Africa, while Russia has a huge population and is also depended on unclaimed cadavers [4, 7, 24].

PROPOSED CLASSIFICATION FOR SOURCING DONATED CADAVERS BY COUNTRIES

Having gone through the extensive literature (indicated in Table 1) of how countries worldwide are

currently sourcing cadavers, the editorial paper would like to propose a classification system of nine grades to show the progression of various countries towards using donated cadavers and the amount of success they have had. The proposed classification of sourcing of cadavers by countries could help anatomy teachers by indicating countries similar to them and countries on the next progressive stage they could learn from.

Grade-0 is a hypothetical grade and it represents countries without medical schools and which might have failed to obtain cadavers because of a number of factors. Grade-0 countries would typically be countries of limited financial means or legal means to allow for the importation of cadavers.

Grade-1 represents countries (e.g. Muslim dominated countries in Northern Africa and the Middle East and some Caribbean countries) that have failed to obtain cadavers from within its own borders and is an indication of the tenacious resistance against all forms of local sourcing of either unclaimed cadavers or donated cadavers. Grade-1 represents countries that have opted for the importation of cadavers and have supportive legislation. Grade-1 countries are relatively wealthy countries, like Middle East countries, or countries with medical schools with relatively high tuition fees in less wealthy countries, like the various medical schools in Caribbean countries whose graduates are trained for the USA market. Although the cadavers are not ‘bought’, some excessive transportation and shipping costs (probably about \$8000 per body) by some entrepreneur companies in USA ought to be probed by the exporting/importing governments and the International Federation of Associations of Anatomists, to avoid tarnishing the good will of anatomical donors. Anatomical education could be jeopardized if the government authorities are heavy handed. The disposal of the ‘bought’ cadavers could be a source of ethical irritation when it becomes difficult to resend the remains of imported cadavers due to the state of the remains confusing the border control officials or costly return transportation.

Grade-2 countries represent countries (e.g. Romania; Turkey and most sub-Saharan African countries such as Cote d’Ivoire, Ethiopia, Kenya, Nigeria, Zambia) using ancient legislation solely depend on unclaimed cadavers. A mix of ignorance on body donations by the public, the relative ease of obtaining unclaimed cadavers, the reluctance by anatomists to face the anticipated cultural resistance and state legislations that does not allow body donations are the major impediments among Grade-2 countries. Some have found that the setting up of body donation administrative structures too difficult, although administrative resources for body donation programs can be pooled together and a centralized anatomy body donation centre can be set up [16], such as London Anatomy Office which runs for seven medical schools in London [25].

Table 1: Proposed classification of sourcing of cadavers around the world

Classification Grade	Description	Countries	References
0	Countries that have failed to acquire any cadavers	Countries without medical schools	Personal hypothesis
1	Unable to use unclaimed cadavers and donated cadavers. Use purchased cadavers as a last resort	Caribbean countries Muslim dominated countries in Northern Africa and the Middle East	From personal email correspondence [7]
2	Content to exclusively use unclaimed cadavers	Most sub-Saharan African countries (e.g. Cote d'Ivoire, Ethiopia, Kenya, Nigeria, Zambia, Tanzania) Romania Turkey	[7, 10, 12, 16, 30, 31] [23] [32]
3	Virtually all cadavers are unclaimed cadavers but unpromising campaigns towards donated cadavers have been made or planned	Serbia	[24]
4	Virtually all cadavers are unclaimed cadavers but promising campaigns towards donated cadavers have been made	Singapore Brazil	[33] [34, 35]
5	Largely use unclaimed cadavers and some donated cadavers	China Italy Ghana, Malawi, South Africa, Zimbabwe Bangladesh Hong Kong India Russia Chile	[36] [23] [7] [37] [38] [4, 39–41] [24] [42]
6	Largely use donated cadavers and some unclaimed cadavers	Germany, Portugal, Spain USA Thailand	[23] [9] [43, 44]
7	Exclusive use of donated cadavers with limited success	Australia Austria, France, UK Israel Japan New Zealand	 [23] [45] [46] [47, 48]
8	Exclusive use of donated cadavers and with excellent success	Netherlands South Korea	[23, 28] [27]

Grade-3 countries (e.g. Serbia, Singapore) solely depend on unclaimed cadavers and have made unsuccessful bold attempts to start or have planned body donation programs. The lack of proven public support for body donations characterizes these countries.

Grade-4 countries (e.g. Brazil, China and Italy) are even more promising than Grade-3 countries and have had recent limited promising results for their body donation initiatives, especially in their large mega-cities e.g. China and Brazil. Grade-4 countries face far less resistance than the above three grades, have the body donation legislation on their side and need to broaden their body donation programs for a wider audience.

Grade-5 countries (e.g. Ghana, Malawi, South Africa, Zimbabwe, Bangladesh, Hong Kong and India) are similar to Grade-4 countries, but have been having body donations on a small scale for many years and donated bodies account for a small percentage of annual cadavers. Some body donations are probably on an 'autopilot' and medical schools receive body donations without anybody donation outreach programs because the public have limited awareness of donating.

Grade-6 countries (e.g. Germany, Portugal, Spain and USA) have turned the tide from largely using unclaimed cadavers to largely using donated cadavers and are a result of active body donation programs. Unclaimed cadavers make up a smaller percentage of cadavers for Grade-6 countries.

Grade-7 countries (e.g. Australia, Austria, France, UK, Israel, Japan and New Zealand) exclusively rely on donated cadavers for mainly legal reasons but all have limited success in obtaining enough numbers of cadavers, in contrast to Grade-8 countries who are able to obtain all the cadavers from body donations.

Grade-8 countries (e.g. The Netherlands and South Korea) are characterized by aggressive, active and successful body donation programs and do not use any unclaimed cadavers. South Korea is perhaps the country with most organized and well-run body donation program that is fully known by most stakeholders. South Korea has a government run Korean Network for Organ Sharing [26], which has over 2000 centers nationwide to coordinate organ and body donations and has glossy adverts containing celebrities and use almost every conceivable media [27]. There is hope. It must be borne in mind that a tiny percentage of donors are required to sustain a body donation program. In Netherlands, a mere 0.1% of the population of 16.5 million enlisting to be body donors was enough to provide adequate numbers of cadavers of 650 per year [28]. Organ donation needs higher numbers and 28% of the population was not enough [29].

The proposed classification system provides a bigger perspective of practices and policies of sourcing cadavers around the world, helps individual countries to know where they are relative to other countries and what stages they are yet to progress onto. The classification system

provides a succinct way of describing the sources of cadavers. For example, a methodology of a certain paper can now report saying "cadavers used in the study were obtained using Grade-5 of the Classification system of sourcing cadavers". The classification system could help drive up ethical standards if ethical research committees and research funders require research, for instance, to have a Grade-4 or higher on the classification system before approval.

The proposed classification was based on available literature and could have been more robust had the author been able to visit all the mentioned and unmentioned countries. The paper has taken a national reflection which might not obscure significant variations of medical schools within a country, especially in large and diverse countries such as India, China, Russia and USA. Nevertheless, the classification system can still be applied at regional, city or university levels. The review was mainly focused on English speaking countries that had literature on cadavers, due to the linguistic limitations of the author.

In conclusion, the proposed classification system provides a concise way of comparing sourcing of cadavers and could assist ethical committees and research funders in setting ethical benchmarks for sourcing cadavers.

Keywords: Donated, Unclaimed, Teaching, Cadaver sources

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Conflict of Interest

Authors declare no conflict of interest.

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