Anatomy in a Post-Covid-19 World: Tracing a New Trajectory

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In responding to Covid-19 anatomists have succeeded in adapting their teaching to online delivery. However, long-term reliance on this mode of teaching raises the prospect that transferring the whole of the learning environment to an impersonal digital world will lead to loss of anatomy’s humanistic side. In looking to a future increasingly dependent upon digital input to teaching, a number of roadblocks are identified. These are: the peril of abandoning the ethos of anatomy; for the workload of staff and especially for female academic staff; by a lack of adequate resources; to the research nature of departments, including the quality of research; to the position of anatomy in the biomedical sciences; and from pressures to retreat from a dissection-based education. In tracing a future trajectory for anatomy, issues outlined are the inevitability of change, the need for anatomy to market itself to the world, and the opportunities presented for anatomy to view itself increasingly as a contributor to broad scholastic endeavors. Suggestions include exploring the possibilities presented by virtual anatomy museums, the use of online learning to reach those not normally in touch with anatomy teaching, and exploring the integrated courses with humanities disciplines. It is concluded that anatomy will flourish if there is a willingness to expand the traditional horizons and be prepared to integrate all that is best in the person-to-person and digital worlds. Anat Sci Educ 14: 148–153. © 2021 American Association for Anatomy.

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INTRODUCTION

To state that the world has been changed by the Covid-19 pandemic is so obvious as to be uninteresting. The claim of this article is that there will be no return to the pre-Covid-19 state, and that serious thought should be given to the new world into which anatomists will be moving. The world of anatomists, as with other disciplines and universities as a whole, has been disrupted by Covid-19, and these disruptions require that academics reimagine their disciplines and their role in society (Kupe, 2020).

Anatomical education is person-focused and body-focused. Nothing could be more tactile and more sensory, or to phase it differently, more person-centered. Whether students are preparing for entry into a health sciences profession or for a research-driven academic career in the neurosciences, reproductive sciences, or biological anthropology, there is no escaping the actual human body and body parts—laboratory-based or clinic-based. The contrast between any of these environments and one centered on a computer screen is stark. Using the latter as an accessory to the former poses no problems, indeed it may well enhance the person-centered experience. However, to transfer the whole of the learning environment to an impersonal, digital world is to transgress familiar boundaries and accepted terrain.

No one knows whether this is an accurate depiction of the world of the future, but it challenges anatomists to redefine what they consider the core of their discipline and what they have to offer the academy. It would be misleading to claim to be able to sketch a clear way forward, but it is possible to identify a number of roadblocks capable of obstructing a way forward. The focus will be on anatomy and anatomists in the widest sense, but much of this discussion also applies to other disciplines and disciplinary areas within the academy.

Roadblock 1: The Peril of Abandoning the Ethos of Anatomy

Over recent years there has been a major move toward viewing anatomy as a humanistic discipline alongside its scientific credentials (Hildebrandt, 2010; Strkalj, 2016). The aim is to emphasize that anatomists are dealing with the bodily remains of a once living person, rather than concentrating...
solely on the fragments of a dissected body. It is a dead person rather than an impersonal cadaver, an embodied individual rather than abstracted bodily remains. The increasing recognition of the place of commemorations and memorials following anatomical dissection is a significant move in this direction (Jones et al., 2014; Štrkalj and Pather, 2017). It is important that online teaching clings to this central insight that anatomy always brings its practitioners face-to-face with the remains of once-living fellow human beings (Jones, 2020). The upshot of this is that virtual cadavers are always more than mere research and teaching tools. They are real bodies “at a distance,” but still one with us in their continuing humanity. In this sense, human anatomy teaching constantly has a “contact” element if it is to remain true to its ethos.

The human body is more than a series of disjointed parts. Theoretically compelling as this may be, it has to be admitted that online teaching and learning makes it difficult to hold on to such a holistic view of the human body (Jones, 2020). Considerable efforts are required to invest the digital with personal dimensions. The person-centered ethos of anatomy, and the notion of viewing dead bodies as the students’ first patient or first teacher, are challenged to the core in a digital-only world (Coulehan et al., 1995; Winkelman and Guldner, 2004; Hasselblatt et al., 2018). A gaping chasm opens up between treating virtual body images as ethically neutral data, as opposed to mirrors into the lives of real people.

If anatomists are to increasingly utilize the digital world, whether out of necessity or choice, they will have to come to terms with this chasm and find ways of minimizing it. How does one deal ethically with the impersonal and artificial? In assessing the place of 3D printed body parts in an ethical hierarchy, Jones (2019) proposed a hierarchical sequence from the intact body at one end to purely artificial models at the other. According to this scheme, images and computer simulations of the body/body parts lie at the artificial end of the scale, far removed from the dissected body and even plastinations. This is a salutary reminder that great care will have to be taken as anatomists move increasingly into dependence upon online learning with its images and simulations.

Roadblock 2: Challenges for the Workload of Staff

The unexpectedly imposed online teaching has led to a marked increase in workload for numerous staff—both academic and technical (Evans et al., 2020; Longhurst et al., 2020; Pather et al., 2020; Smith and Pawlina, 2021). For many of these staff distance teaching is a novelty that has been made more difficult by reductions in the number of staff available due to financial pressures resulting from the loss of international students (Marshman et al., 2020).

In face of the necessity to undertake online teaching, staff at all levels have had to undertake novel work that has become crucial for the preparation of online teaching resources (Pather et al., 2020). Up to the present this has been seen as a temporary necessity, to fill a short-term gap. But if this turns out to be a false assumption, there will be implications for the character of long-term anatomy teaching.

In the longer term, anatomists may be forced to take far more seriously the nature and dimensions of distance teaching and distance learning, with emphasis on the specific requirements of anatomy pedagogy. But it may not be this straight forward, due to the call for double teaching, with face-to-face/contact teaching as well as online teaching for students unable or unwilling to be on campus. This could be described as Covid-19-resilient, which sounds virtuous. However, hybrid teaching is a double burden on staff, who end up having the worst of both worlds—preparation for normal teaching and for virtual teaching. Although the burdens placed on them for lecture-style delivery may not be substantial, the same cannot be said for laboratory sessions, tutorial work, and patient-based teaching. An expectation that dual/hybrid teaching will be undertaken with the number of staff available pre-Covid-19 will have significant repercussions for the nature of the academic environment, let alone for the well-being of staff.

There will inevitably be repercussions for research performance, since the time available to undertake research will be decreased, and in many institutions, this may be accentuated by a lack of research funds and of research assistants due to the decreased income from a loss of international students (Smith-Barrow, 2020; Tran, 2020).

Disadvantages for female academic staff. Particular attention should be devoted to those who are disadvantaged in an online environment, in the face of a reduction in the level of support routinely provided (Godlee, 2020; Viglione, 2020). The disadvantaged will include those with a range of recognized disabilities, but in addition to these, evidence is mounting from a variety of sources that a significantly disadvantaged group are female academics with family responsibilities. A home environment surrounded by children, including those doing school work, is a stark contrast to the environment of an office or laboratory (Reisz, 2020). For instance, female academics with school aged children are publishing less during the pandemic, and are often reported to be struggling with tenure evaluations, undoubtedly due to the intersection of work, school, and home life (Scheiber, 2020; Viglione, 2020). It would be a tragedy if the successes achieved over recent years for the representation of females in anatomy and other disciplines were to be irreparably lost.

A distinct challenge, therefore, is to find the practical ways to protect female academics, and this may require additional support to mitigate the detrimental effects of these increased demands on their time and energy (Gabster et al., 2020; Minello, 2021). If there is to be equality of opportunity for females, particularly those in junior positions, they have to be protected from excessive teaching leading to inadequate research opportunities. In anatomy this may apply predominantly to those teaching dissecting courses alongside running laboratory-based research programs.

Roadblock 3: Challenges Posed by a Lack of Adequate Resources

It is easy for those used to a high quality and range of technical support to underestimate the demands placed on them by an online environment. These demands are both internal and external, that is, internal within anatomy departments and external in students’ places of study (Evans et al., 2020; Pather et al., 2020; Lemos et al., 2021; Singal et al., 2021). Even when the departments and their host universities make online teaching readily available to students, there may be a quality gap between this and the facilities accessible to students away from the institution. Students may be inadvertently disadvantaged if this gap is insurmountable. The challenge of providing an offering equal to that of what was
available pre-Covid-19 is a significant one educationally and ethically, especially for those students coming from disadvantaged sections of society.

A major ethical concern for anatomy globally is the situation in countries with inadequate finances to support students in anything resembling a satisfactory fashion. Reports from anatomy departments with a minimum of technical resources are beginning to come in and show how catastrophically disadvantaged many of them are, for example, Mozambique and Nigeria. Serious as this is for current teaching, it may also have repercussions in the future for graduates from these countries who wish to apply to more advanced institutions to study for postgraduate degrees or even posts. This demonstrates that discussions about responses to the Covid-19 pandemic are incomplete if they are confined to Western countries and those with comparable ample technological, and other resources. This is not a new phenomenon for anatomists since it has been a factor in obtaining body bequests, as opposed to relying on unclaimed bodies (Jones and Whitaker, 2012; Habicht et al., 2018). While the issues have little in common, the discrepancies across countries and cultures are strikingly similar. In light of these concerns, it would be timely if the International Federation of Associations of Anatomists (IFAA) through its constituent anatomical associations sought to provide advice on how best to establish and maintain online programs, including the provision of financial support and academic advice. This would complement the IFAA guidelines on body donation procedures during the pandemic (Kramer et al., 2020).

Roadblock 4: Challenges to the Research Nature of Departments and Institutions

The notion that the status of a department, and even a discipline, rests on its research credentials and research strength may be under threat. This is largely because international students have brought in considerable money, and as this dries up, it is the research thrust that will falter. This has been discussed on numerous occasions, but a barely explored dimension of the pandemic is the relation between teaching and research. Or more pertinently, the importance of teaching.

This is of significance for all anatomy departments, but of immediate consequence for those departments in which research is flourishing and well supported. Here the expectations will have been to place as much, if not more, emphasis on research than on teaching. Anatomy departments need a strong research base, so that they stand tall alongside other strong academic centers of excellence (Jones et al., 2002). An unfortunate consequence has been that, compared with their more prestigious looking research colleagues, teachers have been regarded as poor cousins. Research grants have been welcomed and lauded, whereas those embroiled in teaching large classes, especially in the dissecting room, have been inundated with large teaching schedules and, in the absence of large research grants, have been viewed as bringing in little money.

Only now has the reality hit home. Large sums of money are brought in by teaching large classes, and even these are being severely constrained. This has also meant that the financial base for research support has been detrimentally affected, leading to a serious shortage of research money (Thatcher et al., 2020). The inevitable effect has been to divert staff time from research into teaching, thereby upsetting the teaching-research balance, and even the nature of research-informed teaching. It is unclear at present where this will end or what the long-term effects will be. Were governments to support universities through these difficult times, the long-term effects may be limited, but if that does not eventuate, the research dynamic of many universities, and strong research performing anatomy departments will be substantially upset (Inman, 2020).

With this in mind, anatomy departments would be wise to realign their strategic directions, introducing a degree of flexibility they have not have needed up to now. At the individual academic staff level, it will also require flexibility, with a higher appreciation of the value of teaching. There may have to be a reassessment of how the quality of academic staff is determined, and how staff across the teaching-research divide are best supported and directed. In many universities considerable emphasis has been placed in appointment, tenure, and promotions decisions on performance in research with relatively little attention paid to teaching. One of the lessons to emerge from Covid-19 is that a more equitable balance is required between the two.

Challenges to the quality of research. In a rapidly changing environment, such as a pandemic, it is important for researchers to know what kind of work is happening and who is doing it. This is the domain of pre-prints, that have come into their own as numerous studies have been undertaken with very rapid publication of results (Majumder and Mandl, 2020). However, there may be a problem, since speed is often the enemy of reliable science. There are exceptions, but enormous care is required. And so, unsurprisingly, there has been a flurry of retraction of articles, very often in the most prestigious journals.

Two weeks after a high-profile article in The Lancet reported that the antimalarial drug hydroxychloroquine might be dangerous to patients with Covid-19, three of its four authors retracted the work. The grounds were that they were unable to independently verify their data set, a large proprietary collection of electronic health records analyzed by Surgisphere, a US company (Offord, 2020; Piller, 2020).

On the same day in early June 2020, the same researchers retracted a article in the New England Journal of Medicine for the same reason. That study had looked at the impact of certain heart medications on people with Covid-19, and found no safety concerns. A third study by the same authors, and based once again on Surgisphere data, found a large reduction in Covid-19 mortality with patients given the antiparasitic drug ivermectin. That study had not been peer-reviewed and has since been withdrawn (Offord, 2020).

This is less than rigorous science, with impoverished standards, and opening science up to disrepute (Bramstedt, 2020). This is hugely problematic for the journals, for medicine and clinical trials, and for the integrity of science. It also allows politicians to denigrate science and scientists, and choose which scientific results to take seriously and which to dismiss.

Tragically, this may increase the chances of people joining the infodemic, with its misleading and frequently fabricated news, so beloved of conspiracy theorists (Lancet, 2020). When these misleading data emerge into the public domain via journalists, the provisional and perhaps tenuous nature of some of these pre-prints will not be realized. Inadequately checked results emerge as exciting breakthroughs when they are nothing of the sort. The problem is the lack of peer-review, and
thorough checking and re-checking, the essence of both good scientific and ethical practice.

The excessive speed of publishing has led to errors resulting in misleading claims and directions, needlessly building up hopes, especially when dealing with potentially therapeutic drugs and candidate vaccines. These problems are magnified by political interference stressing certain claims at the expense of others. Developments along these lines destroy scientific/clinical processes, and leave the public at the mercy of hype and unscientific posturing.

These concerns may sound a long way from the world of anatomy, since it is not anatomy that is at the heart of this pandemic. And yet the principles are the same. Sound science must be central to anatomy, from which it can be concluded that ongoing research is critical to contemporary anatomy. If this is correct, the research-teaching tension is as relevant to anatomy as it is to any of the other biomedical disciplines.

Roadblock 5: Challenges to the Position of Anatomy in the Biomedical Sciences

Within the health and biomedical sciences, pandemics throw light onto microbiology, immunology, public health, and epidemiology. That is to be expected. But where does anatomy fit into this changing scene? What is its future as a viable and exciting discipline?

This raises the question of the nature of anatomy. All too often it has been looked at in traditional terms dictated by the education of doctors, within a context provided by surgery. This is perfectly acceptable, but it is misleading if confined to the macroscopic. Anatomy is being pulled in two directions; one is the humanistic; the other is the microscopic, the molecular, and the genetic. These apparently diverging directions simply demonstrate that no healthy discipline can remain stationary (Jones, 2017).

No discipline can be understood apart from its contexts, one of which is currently provided by the pandemic. Distasteful as a viral pandemic is, it opens up possibilities. Technology is having profound implications for anatomy, as it is for every other health science discipline, from its uses in plastination, 3D printing and imaging, to gene technology and neuroimmunology, all of which are relevant to students seeking to come to terms with a contemporary understanding of the organization of the human body.

At a time like this, it is quite right to emphasize viruses, the immune system, and the significance of population-based approaches to disease control. But it would be irresponsible to overlook what lies at the core of these debates—human beings, with their fragile bodies calling out to be understood in their complexity in health and disease. It is at this point that anatomy comes in to its own by the manner in which it throws light onto the whole human person. This is a task to which anatomists are called.

An additional concern being expressed is what has been termed the “Covidization” of research (Pai, 2020). This refers to the distortion of research priorities toward pandemic-focused science at the expense of the non-pandemic interests and contributions of a diversity of disciplines and studies. While this does not primarily affect anatomical research and interests, anatomists among others should be pointing out to tertiary institutions and grant awarding bodies that all health research cannot be about infectious diseases, let alone about Covid-19-related research.

Roadblock 6: Challenges Stemming from Pressures to Retreat from a Dissection-Based Education

For many years, discussions have abounded on the role, if any, of dissection in health science education, with some schools dispensing completely with a dissection-based approach (Jones, 1997; Granger, 2004; McLachlan et al., 2004; Azer and Eisenberg 2007; Lackey-Cornelson et al., 2020). This is not the place to enter into the pros and cons of dissection, but there is an important point that needs to be made. This is that the mode of teaching adopted in any medical or allied health science school should be settled on educational grounds, and not in response to the pressures of a pandemic (Evans et al., 2020; Anbarci and Hernandez-Veciana, 2020).

What is required is creative and innovative thinking about the most appropriate ways of presenting what is deemed the highest level of educational experience possible. Adoption of computer simulations and Zoom presentations may be required under exceptional circumstances, as demanded during the height of a pandemic and lockdown measures, but they should not become the norm when these circumstances no longer apply. Utilize them in full or in part if they fulfill perceived educational imperatives, but not because administrators wish to save money.

The manner in which anatomy is taught in the post-Covid-19 world should be determined primarily by anatomy educators as they seek the best for their students and as they consider adopting innovative hybrid technologies and approaches in light of what they have learned from responding to Covid-19. This is an opportunity for positive educational experimentation, rather than for departing from strategies that have proved seminal in the past. Consequently, it would be foolhardy to dispense with face-to-face dissection-based instruction, since this represents the personal element central to the human sciences. Ways will need to be found of complementing face-to-face teaching and adapting it for hybrid presentations making maximal use of the actual and the virtual.

FUTURE TRAJECTORY

How will anatomists be best prepared for the pressures of a post-Covid-19 world?

First, recognize the inevitability of change. There will have to be rethinking and reimagining of traditional modes of teaching and learning, utilizing various hybrid modes far more than in the past, but paying as much attention as feasible to face-to-face contact sessions. No matter how this is done, and accepting that it will vary across cultures and the demands of the pandemic at any point in time, it will involve considerable adaptation in teaching methods and university attitudes toward academic staff performance.

Second, anatomy has to sell itself to the world. This is something Gunther von Hagens discovered leading to the immensely successful plastination exhibitions (Von Hagens and Whalley, 2000). These have left some anatomists deeply perplexed and its controversial elements have not gone unnoticed (King et al., 2014; Jones, 2016). And, yet he has touched a chord from which conventional anatomists could well benefit. The pandemic has brought possibilities for taking anatomy beyond the walls of the academy, possibilities anatomists at large could well adapt for the flourishing of their discipline.
Anatomy departments with well-established museums, and in some cases with long histories (Hallam, 2016), could go online and make their displays available to the general public. This requires funding and discernment as to what is made available, but placed within an educational context it gives anatomists tools to inform people interested in their bodies in health and disease. The world of the virtual anatomy museum is beginning to be explored in some places, but far more could be done to exploit to the full its educational potential even within constraints imposed by ethical and legislative guidelines (University of Edinburgh, 2016; Jędrzejewski et al., 2020). Online learning has opened educators’ eyes to the possibilities opened up by Zoom, much as excessive dependence upon it has drawn attention to its limitations and short comings. However, it has repeatedly demonstrated to a range of institutions that they can reach out to those who would not normally enter their doors.

Third, anatomy needs to view itself increasingly as a contributor to broad scholastic endeavors. This prospect emerges against the background provided by online learning. A first step could be to take short anatomy courses to tertiary level students outside the health sciences, and also to interested parties outside tertiary institutions. Integrated courses with humanities disciplines broaden the scale of courses available, and demonstrate the relevance of anatomical concepts for a general education crossing the sciences and humanities. Courses along these lines lend themselves to online modes of delivery, and illustrate the possibilities of transdisciplinary approaches in which anatomy plays a central part in throwing light onto social and cultural attitudes toward the human body within a pre-modern as well as contemporary scientific environment (Sawday, 1995).

CONCLUSIONS

The precipitate onset of online learning necessitated by Covid-19 has been a wake-up call for anatomy as it has been for all other disciplines. In this regard, there is nothing special about the demands on anatomy, and yet its dependence upon the availability of the bodies of the deceased for dissection and other studies sets it apart, and makes it less suitable for ready translation to online learning. The main reason for this is that much of the experience of confronting the dead and learning how to cope with this within a professional context has disappeared. This is not an argument against any reliance at all upon online learning, nor against finding ways in which basic anatomical knowledge can be disseminated to those outside the professional world of anatomy, but it does seek to place it in a particular context. However, changes in attitudes and a willingness to expand traditional horizons are crucial if anatomy is to flourish and emerge as a fascinating mix of the traditional and contemporary, integrating all that is best in the person-to-person and digital worlds.

NOTES ON CONTRIBUTOR

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