

# Spotlight on the Shift to Remote Anatomical Teaching During Covid-19 Pandemic: Perspectives and Experiences from the University of Malta

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Covid-19 has spread globally, affecting all nations. Preventive measures were implemented by governments including the closure of universities. The aim of this study was to evaluate the student's perspectives and experiences on the shift to remote preclinical medical education while inquiring whether there has been any psychological impact on the students. A customized questionnaire utilizing Likert-scale-based questions and the Generalized Anxiety Disorder-7 assessment tool was distributed online to enrolled preclinical medical students at the Faculty of Medicine and Surgery at the University of Malta. Quantitative and qualitative analyses of the data gathered was carried out. Multivariate logistic regression analyses was performed to establish independent variables associated with anxiety symptoms. A total of 172 responded out of a cohort of 299 preclinical students (58%). The majority perceived a positive learning experience following the shift to remote lectures, however, it was not the case for small group teaching including dissection sessions. Nonetheless students reported concerns about their education, examinations, progression to next academic year and wellbeing. Less than half the students exhibited symptoms of anxiety. Students exhibiting "moderate" worry (OR:7.6; CI 95%:1.98–29.31;  $P < 0.01$ ) and "severe" worry (OR: 2.0; CI 95%: 5.0–80.5;  $P < 0.01$ ) on their mental, emotional, and wellbeing due to Covid-19 were associated with anxiety symptoms after adjusting for cofounders. Apart from the short-term effects, the Covid-19 pandemic may have a long-term impact on both the medical education and the students' future careers. It is important that the implemented changes in medical education are recorded and studied since such data will be essential on how to proceed post-Covid-19 pandemic. *Anat Sci Educ* 13: 671–679. © 2020 American Association for Anatomy.

*Key words:* coronavirus; Covid-19; medical education; medical students; anxiety disorders

## INTRODUCTION

In Europe, formal medical education dates back to the late Middle Ages (Custers and Cate, 2018). Medical education in Malta, a small island nation in the Mediterranean, is documented to have started in 1676, when the "School of Anatomy and Surgery" was setup by the Grandmaster Nicholas Cottoner

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(Savona-Ventura, 2005). The Faculty of Medicine and Surgery was instituted as the Collegio Medico in 1771 and has been the main national public/private institution providing medical education up to this day, catering for local and international students with an intake of up to 200 students per year (University of Malta, 2020). Across the centuries medical education in Malta was adversely affected a couple of times for political reasons (Savona-Ventura, 2005) but never for pathological causes, until the pandemic of SARS-CoV-2, also known as Covid-19 in 2020.

## Pre-Covid-19 Undergraduate Anatomy Course at the University of Malta

The course leading to the doctorate of Medicine and Surgery degree at the University of Malta is spread over 5 years and have been accredited by both the Association of Medical

Schools in Europe (AMSE, 2020) and the German accreditation agency ASIIN (University of Malta, 2019; ASIIN, 2020). The first two years are referred to as the “preclinical years,” being dedicated to the teaching of anatomy, embryology, histology, physiology, and biochemistry. The preclinical course follows a regional-based approach where each credited module is based on a particular body region with the integration of all anatomical and physiological aspects related to that system.

The Department of Anatomy within the Faculty of Medicine and Surgery is responsible for the teaching of basic and clinical anatomy, histology, and embryology through a number of modalities including face-to-face lectures, small group critical thinking sessions, clinical skills sessions, video dissection and hands-on cadaver, and prosection dissection sessions. The lectures and the video dissections are delivered to the whole class at the same time. However, for all the other teaching modalities, students are subdivided into small groups of around 20. During the first year, each medical student receives 69 hours of lectures, 16 hours of critical thinking sessions, 15 hours of clinical skills sessions, and 27 hours of dissections from the Department of Anatomy. In the case of the second-year medical students, the Department of Anatomy delivers 71 hours of lectures, 20 hours of critical thinking sessions, 15 hours of clinical skills sessions, and 37 hours of dissections per student.

Anatomy is the basis of medicine and surgery as it supports the basic skills for the examination of patients, the formulation of a medical diagnosis as well as the basis of surgical skills (Turney, 2007). One of the main aims of the Department of Anatomy is to ensure that the teaching and learning of anatomy is not a rite of passage for information regurgitation but rather a way to challenge the students to critically appraise and understand the basis of medicine and surgery. Anatomy teaching and learning in a clinical oriented format forms the crux of students’ understanding and knowledge of the human body that would be the essence for their future practice (Collins, 2008). The majority of the academic staff teaching with the Department of Anatomy are medical doctors, and this enables the incorporation of clinical-based scenarios and relevance during gross anatomy lectures and small group sessions. Furthermore, students are challenged to apply knowledge of anatomy to clinical settings during the critical thinking sessions. During these sessions’ students have the opportunity to discuss and express their opinions in a small group setting along with their peers and their lecturer. The clinical skills sessions enable students to acquire knowledge and practice of hands-on examination techniques according to the module they are following. Such sessions are usually conducted on either anatomical models or else students examine each other with consent. The video dissection sessions are conducted by professors at the Department of Anatomy. They demonstrate the surgical skills required for the dissection of a donated cadaver while featuring the anatomical three-dimensional (3D) relationships of structures. During these sessions, the students observe and learn how these surgical skills should be performed before they themselves have hands-on experience during the cadaver dissection sessions. The University of Malta prides itself of a very successful body donation program where students have almost one-third of the anatomy curriculum based on hands-on dissection and practical sessions, as well as peer teaching (Agius et al., 2018; Martin, 2018). Cadaver dissection sessions, which are supervised by an academic, provide invaluable opportunities for the students to develop fine motor skills and

hands-on anatomical learning through a stress-free environment (Krähenbühl et al., 2017). The students have access not only to unembalmed donated cadavers but also to embalmed cadavers and prosections along with the opportunity to practice peer-teaching (Iqbal, 2016) and question-answer sessions in the presence of the academic personnel.

Although the Department of Anatomy opts for a face-to-face interaction for the majority of the teaching, students are encouraged to use digital libraries and resources to enhance their learning experience. Most academics provide additional reading materials including online resources to complement the students notes that are uploaded on the University’s secure “virtual learning environment” (VLE).

Assessments for the preclinical years are divided onto two semester sessions, in January and June, apart for the September reassessments for those students who fail any of their modules. All modules are examinable through a written examination following one or more of the following formats: multiple-choice questions (MCQs), extended matching questions (EMQs), short response questions (SRQ) and/or essays. As part of the anatomy assessments, students have separate credits in the form of a written spotter examination (Smith and McManus, 2015). This examination consists of a number of specimen photos and slides based on the modules that would have been covered in the previous semester. This examination is carried out using a desktop computer at the Information Technology (IT) Services Department. In the past, this examination used to be conducted within the dissection hall using cadaver prosections and histological slides. However, as the number of enrolled medical students increased, it was no longer logistically feasible to carry on this examination in such format. Instead, this shifted to a digital format using photos of the cadavers and slides instead. Over the years, it was noted that this change did not affect the students’ performance. This followed what was already reported in the literature where it was noted that students have similar performance outcomes following a traditional spotter test and an online practical examination (Inuwa et al., 2012).

## Impact of Covid-19 on the Academic Community

Covid-19 was first reported in Wuhan, China in December 2019 but in a couple of weeks this virus spread all across the globe causing the World Health Organization to declare it as a pandemic (Bao et al., 2020; WHO, 2020). Up till the time of submission, this virus has affected (29 August 2020), a total of 24,776,988 individuals across the globe, with 837,979 deaths (CSSE, 2020). This global emergency led to public health authorities and governments to institute several containment preventive measures. One of these containment measures implemented to curb the viral spread was the closure of schools and universities. By the beginning of April 2020, this legislation affected more than 1.5 billion students across the globe (UNESCO, 2020). The closure of schools and universities resulted in an abrupt disruption of the academic year for both the students and the academics. This global public health action imposed a swift shift to remote teaching, learning, and assessment to ensure that students continue their tuition (Evans et al., 2020). Although e-learning modules and online assessments are not novel academic modalities, even for anatomy teaching, this does require time, collaborations, and strategic planning to implement an effective and prestigious teaching

outcome (Ferrer-Torregrosa et al., 2016; Longhurst et al., 2020). Furthermore, academics need to invest a considerable amount of time to create online teaching material and optimize the learning outcomes for their students through such online modalities, apart from the fact that academics are required to learn new technological skills (Longhurst et al., 2020). However, most academics during this overnight shift due to Covid-19 pandemic did not have this luxury and had to do their utmost to transform their tuition which had matured and was well-crafted after years of practicing face-to-face teaching to new remote modalities. The shift to remote teaching is most likely to have had a lesser effect on the students' adaptation to use the different online teaching modalities. This is due to the fact that most students belong to the "millennial generation" with exceptional online and social media skills, that enables them to undergo a much smoother transition to the remote teaching than their professors (Barry et al., 2016; Pickering and Swinnerton, 2019). A number of universities including medical schools across the world (Longhurst et al., 2020; Pather et al., 2020; Ravi, 2020) passed from these Covid-19 pandemic experiences and had to adopt to a new remote environment in order to continue providing medical education to their students.

## Impact of Covid-19 on Malta's Academic Community

The first imported case of Covid-19 in Malta was reported on the 6 March 2020. A week later (13 March 2020), the Government of Malta along with the Superintendent of Public Health closed off all schools and universities in order to curb the viral spread (Cuschieri, 2020; Public Health Act, 2020). The University of Malta mandated the immediate action to replace the face-to-face lectures and other teachings, for remote equivalents to ensure social distancing. The University of Malta, including the Faculty of Medicine and Surgery already had several years' experience in using the online VLE and the online lecture recording platform Panopto™ (Panopto Inc., Seattle, WA) to disseminate pre-recorded lectures to students on the already available secure VLE. However, up till the day that students were not able to attend the University campus, the use of these online platforms by the academics was not compulsory or enforced. Given the preference to hands-on teaching, only a minority of the academics had been resorting to online teaching prior to the pandemic. The University of Malta immediately provided the academic staff and students unlimited access to two novel modes of online teaching: (1) Zoom™ (Zoom Video Communications, Inc., San Jose, CA)—a video communications cloud platform used for video and audio conferencing, chat, and webinars, and (2) Google Meet™ (Alphabet Inc., Mountain View, CA)—for real-time video conferencing.

## Impact of Covid-19 on the University of Malta's Faculty of Medicine and Surgery

Overnight, academics within the Faculty of Medicine and Surgery, including the Department of Anatomy, the majority of whom are part-time academics and clinically involved in the one and only main national public hospital, had to self-teach, with support of online tutorials provided by the University, to use these online platforms effectively. This was also in the midst of the evacuation of the administrative offices, including the Deanery of the Faculty of Medicine and Surgery, which is located within the hospital grounds, to make space for makeshift emergency wards in

preparation for a rise in hospital admissions. This was first shifted to the nearest building on campus. Within a week of settling in the new location, the administration of the Faculty of Medicine and Surgery had to be further relocated to yet a second place further away, as the previously assigned location was also transformed into emergency wards. A roster was done where the administrative staff could work remotely, minimizing the number of individuals sharing the same office, and respecting the social distancing rules as advised by the public health authorities. In spite of all these hurdles, the running of the Medical School including the administrative matters, training of academics, and administrators to the new online teaching and assessment, board meetings and setting up of assessment continued, albeit the very fluid national situation, which was changing on a day-by-day basis. This particular situation was unique to the Faculty of Medicine and Surgery, in comparison to the other faculties, as while contributing to the teaching of one of the largest student bodies, the Faculty was also handling the clinical management and the upheavals directly related to the Covid-19 pandemic. Since the preclinical medical students were mostly studying at home, many were not realizing this, and it took some time before they were aware of what was going on from the administrative side. In order to avoid the ongoing rumors and "fake news" related to the fate of their course and mode of assessments, it was agreed that any developments were only to be officially issued via the faculty administration, which in turn had to be approved by the University Senate as the highest University academic body.

The Department of Anatomy, like the rest of the other departments, changed the classroom in-person face-to-face lectures, tutorials, and anatomy dissection sessions to remote sessions. Given that the second semester started in early February 2020, the bulk of the gross anatomy lectures and the small group sessions had already been delivered when the mandatory legislation of university closure took place. However, the remaining sessions were converted into remote teaching. Gross anatomy lectures were changed to pre-recorded lectures using Panopto. The critical thinking skills were changed into either Zoom, or "group assignment" type sessions with feedback given to each group. The clinical skills were changed to "online resources" where a list of over 20 different links for anatomy resources were given through the close network between the academics at the Department of Anatomy as members of the Anatomical Society (AS, 2020) and the International Federation of Associations of Anatomists (IFAA). In the case of cadaver and prosection sessions, the academic responsible for these sessions recorded the lectures on lecture recording platform Panopto, and then, attached it to the secure VLE that forms part of the internal university platform. Of note, the prosecutions are entirely anonymous, while the donors of the cadavers as part of their bequeathal form give permission for imaging of the cadaver for the purposes of anatomical teaching.

The Department of Anatomy did its best to continue the delivery of the teaching as smoothly as possible considering the pandemic and its effects. However, such an overnight unexpected drastic change as a consequence of the Covid-19 pandemic could have affected the preclinical medical students' learning, teaching outcomes, possibly their way of studying, psychology and mental health. The aim of this study was to evaluate the students' perspectives and experiences on the shift to remote preclinical medical education during these unprecedented times, evaluate whether there has been any psychological impact on the students, while exploring any evident differences between the first- and second-year medical students experiences.

## MATERIALS AND METHODS

### Design and Dissemination of the Questionnaire

An anonymous online questionnaire was created following discussions between both authors about the shift to remote teaching that was imposed on academics and students due the Covid-19. Such an event had never been experienced at the University of Malta and it was considered timely and appropriate to understand the students' perspectives and experiences following this shift in teaching. Such information could potentially enable the Department to learn from such an experience and improve tuition in the future. It was considered as appropriate that a customized questionnaire for the preclinical years would be created. The questionnaire included nominal and ordinal non-personalized demographic questions, as well as number of questions relating to the Department of Anatomy remote shift in its teaching. Considering that these questions were intended to assess the student's opinions and perspectives, a Likert-scale questionnaire format was considered as the most appropriate format for these particular questions. To assess for presence of potential anxiety, the validated GAD-7 (Generalized Anxiety Disorder) assessment tool was used (Swinson, 2006). In order to avoid self-reporting bias, the GAD-7 assessment tool was incorporated within the customized questionnaire without identifying it as an anxiety tool. Students were provided a free text comment box at the end of the questionnaire to share any comments/concerns about the shift to remote teaching and its effect on their personal wellbeing. A copy of the questionnaire is provided as Supporting Information. The questionnaire was tested by both authors, but no students were involved in this process. Taking in account that a 50% response rate was expected and that the overall number of enrolled preclinical students was small, it was considered inappropriate to perform a pilot study since it would have reduced the actual study's power.

The questionnaire was submitted to the Faculty of Medicine and Surgery Research Ethical Committee (FREC), where ethical permission was granted (Reference number: 5093\_24042020). Participating students were asked to give informed written consent prior to starting the questionnaire.

The questionnaire was converted into an online questionnaire by using Google Forms<sup>®</sup> (Alphabet Inc., Mountain View, CA). The link for the online questionnaire was distributed to the class representatives of both preclinical years through an email. The class representatives were responsible for the dissemination of the link to their fellow classmates ( $n = 132$  first year and  $n = 167$  second year of study) through their personal emails and social media private group accounts. The students were informed that they had a week (between 24 April and 1 May 2020) to respond to the questionnaire. During this period, two reminders were issued by the class representatives to encourage their classmates to take part in the questionnaire.

### Quantitative Analysis

Descriptive and analytic analyses were performed using the IBM SPSS software, version 26 (IBM Corp., Armonk, NY). The demographic characteristics of the students (sex, preclinical year, age group, and residency during Covid-19) were tabulated. A descriptive analysis of the survey data was performed by establishing proportions (%) out of the total respondents and proportions after stratification of the enrolled preclinical year. Chi-squared test was used to assess for any statistically significant differences between the categorical proportions. A

significant value was considered if the  $P$  value was less or equal to 0.05.

The GAD-7 score was calculated as per published guidelines (Spitzer et al., 2006). The mean and its associated standard deviation ( $\pm$ SD) were calculated for the continuous GAD-7 score for the whole study population as well as after stratification by the enrolled preclinical year. An independent student  $t$  test was performed to establish any significant difference between the preclinical year's mean values. The GAD-7 questionnaire score for each student was then categorized following published literature, where a threshold score of 10 was used as the cutoff point for presence of anxiety (Kroenke et al., 2007). It was reported that this threshold has a sensitivity of 89% and a specificity of 82% for determining the presence of generalized anxiety disorder. Furthermore, Kroenke, et al. (2007) also reported that the same GAD-7 threshold of 10 was a good screening threshold for panic disorder (74% sensitivity, 81% specificity), social anxiety disorder (72% sensitivity, 80% specificity), and posttraumatic stress disorder (66% sensitivity, 81% specificity). Based on this literature, students with a threshold of more than 10 were considered to have anxiety symptoms and used as the dependent variable in multivariate binary logistic regression analyses following a backward stepwise approach. The independent variables considered in this model were: "sex," "age groups," "academic year (first year or second year)," "place of residence during Covid-19 pandemic," "worried about the wellbeing of their loved ones," "worried about their physical health, safety and wellbeing," "worried about the their own mental and emotional wellbeing," "worried about the impact of Covid-19 on their examinations," and "worried about impact of Covid-19 on their medical progression to next academic year."

### Qualitative Analysis

The comments shared by students were analyzed following a thematic analysis by the authors. Initially all the comments were read to get familiarize with the data available. Three main themes were established as (1) perspectives on remote teaching; (2) experiences achieved from the shift to remote teaching; and (3) perspectives on Covid-19 and its impact. After setting these three themes, the data were reanalyzed by both authors and the students' comments were categorized in accordance to the three themes. This process was done manually due to the small sample size.

## RESULTS

An average response of 57.5% (CI 95%: 51.9–63.0) ( $n = 172$ ) was achieved (first years 56%  $n = 74$ ; second years 58%  $n = 97$ ) with a female majority (66.3%  $n = 114$ ) from both preclinical years. The majority of the respondents were between the age of 18 and 20 years (69.8%) and reported to be living with their family during the pandemic (97.7%). It is important to note that since Malta is a small island, it is customarily that students, even during normal academic semesters, reside with their family, with some exceptions. In fact, 15.1% of the total preclinical students are international students, while the remainder are Maltese students. The respondent student's demographic data are shown in Table 1. In total, 76.7% (CI 95%: 69.9–82.5;  $n = 132$ ) expressed concern about the effect of Covid-19 on their medical education, with no significant difference was present between first and second years ( $P = 0.3$ ).

**Table 1.****Demographic Data of the Participating Preclinical Medical Students**

Demographics	Male n (%)	Female n (%)	Total n (%)
<b>Preclinical medical students</b>			
Total number	58 (100.0)	114 (100.0)	172 (100.0)
First-year	32 (55.2)	43 (37.7)	75 (43.6)
Second-year	26 (44.8)	71 (62.3)	97 (56.4)
<b>Age Groups</b>			
18–20 years old	46 (79.3)	74 (64.9)	120 (69.8)
21–23 years old	8 (13.8)	25 (21.9)	33 (19.2)
>24 years old	4 (6.9)	15 (13.2)	19 (11.0)
<b>Residence during Covid-19</b>			
At home with family	57 (98.2)	111 (97.4)	168 (97.7)
Alone	1 (1.8)	3 (2.6)	4 (2.3)
With friends	0	0	0

### Perspectives on Remote Teaching

On assessing “how satisfied students were with the online teaching,” the majority (63.4%; CI 95%: 55.9–70.2) reported to be satisfied, with no difference between first and second years ( $P = 0.7$ ). Of note 36.05% (CI 95%: 29.2–43.5) claimed not to be sure if they achieved their desired anatomy learning outcomes. This was especially predominant among the first year (44.6%; CI 95%: 33.8–55.9) preclinical students, while the second years (42.3%; CI 95%: 32.9–52.2) perceived that they did achieve their learning outcomes ( $P = 0.02$ ). Out of all the different remote teaching modalities available, pre-recorded sessions were mostly appreciated (55.2% CI 95%: 47.8–62.5) by both years ( $P = 0.2$ ). A positive consensus was shared by students toward pre-recorded lectures following the fact that “*I can go back over aspects; I don’t understand first time round.*”

### Experiences from the Shift to Remote Teaching

Learning through remote teaching was considered equivalent to face-to-face teaching by half of the students (50% CI 95%: 42–56.8) in both years ( $P = 0.1$ ). However, students shared their positive experiences especially for the online pre-recorded lectures and even gave strong recommendations that “*Lectures should remain to be recorded even after the Covid pandemic ends*” as well as strong pleas of “*Please PLEASE consider having recorded lectures.*” A number of reasons were provided as to why lectures should remain in the pre-recorded fashion including: (1) “*Not having to worry about taking notes; but solely listening to the lecture and trying to understand, with the possibility of rewinding if you haven’t understood something, this greatly enhances medical education*”; (2) “*This allows students to learn at their own pace*”; (3) “*not having to wake up at 5.30AM for an 8am lecture due to traffic and parking.*” These positive experiences changed for critical thinking and

dissection sessions, as “*they [critical thinking and dissections] are interactive and on zoom it is a bit difficult to have it as an interactive session.*” Even though online teaching was well received especially for lectures, a high proportion of the students reported that their studying patterns (73.3% CI 95%: 66.2–79.3;  $P = 0.05$ ) as well as their wellbeing (58.7% CI 95%: 51.3–65.8;  $P = 0.8$ ) were affected by the shift to remote teaching. In fact, this can be observed through a student’s experience that “*since university is a working environment, I usually get things done; at home there are more distractions which hinder my studies.*” Although appreciation was brought forward by students with “*thanks to the efforts of all my teachers and lecturers who took time out of their day to learn how to, and produce, online lectures and prerecorded lectures,*” while others reflected on the experience with “*perhaps through this situation we can all learn that we can change the way we work.*”

### Perspectives on Covid-19 and its Impact

The preclinical students reported to be worried “a great deal” about the impact of the unprecedented times due to Covid-19 on their studies (46.51% CI 95%: 39.2–54;  $P = 0.46$ ), learning outcomes (41.9% CI 95%: 34.7–49.3;  $P = 0.2$ ) and their examinations (77.9% CI 95%: 71.1–83.5;  $P = 0.58$ ). In fact, students stated that their anxiety was originating from “*the poor and delayed communication of the Faculty with students*” and “*not knowing what’s going to happen with examinations*” especially if online examinations were to be carried out due to “*any power cuts or disruption of WIFI.*” The second-year medical students (73.2% CI 95%: 63.6–81.1) reported to be significantly more concerned about their progression in their medical course when compared to the first years (52.1% CI 95%: 40.7–63.3;  $P = 0.02$ ). Furthermore, other concerns were perceived by the preclinical students including “*stress of being in isolation*” and the lack of “*physical experience of university*”

leading to inability to “clarifying things with your friends sitting next to you.”

## Preclinical Students and Anxiety Symptoms

The GAD-7 assessment tool was used to evaluate the presence of anxiety symptoms among preclinical students during the Covid-19 academic period. A mean GAD-7 score of 9.58 (SD:5.2) was obtained for the first years, while a mean score of 9.19 (SD: 5.30) for the second years ( $P = 0.6$ ). On considering the GAD-7 threshold of 10, the majority of the preclinical years scored less than this threshold (56.4% CI 95%: 48.92–63.6;  $P = 0.72$ ).

After multivariate logistic regression analysis, the only significant independent variable contributing to anxiety symptoms was the “students’ worry on their own mental, emotional and wellbeing due to Covid-19” variable. “Moderate” worry (OR: 7.6 CI 95%: 2–29.3  $P < 0.01$ ) and “severe” worry (OR: 20 CI 95%: 5–80.5  $P < 0.01$ ) showed a significant association with GAD-7 score of 10 or more.

## DISCUSSION

This is the first study conducted during the Covid-19 pandemic by the University of Malta, Faculty of Medicine and Surgery in order to explore the students’ perception to the change to their teaching of anatomy. Similarly to the rest of the world, the University of Malta shifted all teaching, from face-to-face to a virtual mode (Evans et al., 2020; Franchi, 2020; Longhurst et al., 2020; Ravi, 2020; Srinivasan, 2020; Theoret and Ming, 2020). Online medical education is not a new concept even for anatomy (Ferrer-Torregrosa et al, 2016; Trelease, 2016), however, for Malta this was a novel experience for the majority of academics. Such shift proved to be a challenge for the administrative staff, academics and students alike, topped up with the fact that everyone was experiencing a fear of the unknown future premonitions due the Covid-19 pandemic (Grech, 2020). The biggest challenges for academics, as noted by others (Pather et al., 2020), were to learn how to use efficiently the remote modalities and to quickly shift the already prepared face-to-face teaching materials in an appropriate way to be delivered remotely. In fact, it was reported that the preparation of online material can take up to three times the usual preparation time for traditional material (Gewin, 2020). Students appreciated the effort put in by academics, however, they were less forgiving for the administration. Due to the shifting of the administrative offices of the Faculty of Medicine and Surgery from the original location as part of the hospital medical school to other university grounds, twice in a row over a short span of time, there was a lag of a number of days in having the questions correctly answered to the whole medical student body. This may have led to the students “feeling left in the dark” at the time this study was carried out. It appeared that students expected faster communication from administration on pressing issues, mainly how and when examinations were going to be held.

## Student’s Perspectives and Experiences on Remote Teaching

Pre-recorded lectures were well received by students with recommendations to institute such virtual lecture delivery as a permanent teaching modality throughout the 5 years of the

medical course. Such a virtual learning environment provides a number of advantages to students, some of which are academically acceptable, while some are for personal gain. As noted before, online learning caters for different learning patterns unlike face-to-face teaching (Guy et al., 2018; Evans et al., 2020). Hence, for this reason online lectures will be considered as a future implementation, however, student’s queries will not be answered during such pre-recorded sessions and there will be lack of spontaneous clinical scenarios and interactions between the lecturer and students. Such unique teaching experiences may hinder the learning outcome of students. However, shifting to online teaching so as “students do not have to wake up early” is an unacceptable reason, especially since as future medical doctors they would be starting their daily work early, and for long shifts.

The study’s participants expressed concern about the use of the Zoom platform for e-tutorials and dissections, similar to other medical students (Pather et al., 2020; Srinivasan, 2020). This is understandable since there is a huge difference from an in-person experience to a virtual experience, especially for the dissection sessions. The tradition dissection session offers unique opportunities to medical students with one major asset being the ability to appreciate and observe the 3D relations of structures in cadavers and prosections. This is very difficult to illustrate when viewing a dissection session through a virtual mode, and hence, this is not recommended for the post-Covid-19 era. However, it needs to be appreciated that during these unprecedented times, lecturers tried their best to continue providing their students with the intended dissection sessions and not just provide an online atlas which would not have provided students with the “appreciation for the fabric of the human body” (Gregory and Cole, 2002). Nonetheless, this is a far-cry from having hands-on-experience at the laboratory. In fact, students had no access not only to cadavers and prosections, but also to microscope slides and models, which might have an impact on the student’s anatomy education and knowledge (Singal et al., 2020).

With regards to online small group tutorials, this study’s students unlike other medical students, did not perceive that an anatomy e-tutorial using Zoom platform was an effective learning tool (Srinivasan, 2020). Potential reasons for this include: (1) student’s reluctance to come to terms that these were difficult times for everyone (both student and academic) which might have effected their perception on the tutorials; and the fact that (2) this was the first time that e-tutorials were being conducted by the academics hence the delivery of the e-tutorial was experimental. Should student’s feedback been provided such as those reported by Srinivasan, 2020, the delivery of future e-tutorials might be improved.

## Student’s Perspectives and Experiences Resulting from Covid-19

Covid-19 has impacted on the global psychological wellbeing and mental health, with some individuals being affected more than others (Balkhi et al., 2020; Bao et al., 2020). It was reported that students along with those with high education status are more prone to negative Covid-19-related psychological effects along with higher levels of anxiety (Dubey et al., 2020). Every student has a personalized Covid-19 experience, however, the uncertainty brought about by the Covid-19 pandemic, the constant global news reporting

the increasing numbers of positive cases, deaths, shortage of masks and disinfectants were indeed contributing to the anxiety and an overwhelming impact on medical students (Ayttey et al., 2020). Having a better understanding of the possible medical complications brought about by this pandemic, medical students are more likely to experience increased anxiety and fear than other university students. In fact, mental health issues are already more prevalent among the medical students even under normal circumstances (Zeng et al., 2019). As was expected, this study established that a high proportion of the preclinical medical students expressed concern on their medical education, particularly their anatomy teaching. This concern is the by-product result of the unprecedented times brought about by Covid-19 pandemic (Franchi, 2020). The sudden changes in both the university life and teaching creates anxiety, apart from fear of contracting the virus and being in isolation (Dubey et al., 2020; Han et al., 2020; Rajkumar, 2020; Sher, 2020). Anxiety also arises from the isolation from friends and academic staff (Pather et al., 2020). The Department of Anatomy staff made their utmost to continue providing the preclinical students with a structured and supportive environment during this pandemic to try to minimize the pandemic effect on the anatomy teaching.

Of concern was the fact that almost half of the responders exhibited an element of anxiety, irrespective of gender, or year of preclinical studies, with concerns about their health and wellbeing being linked to their anxiety. This is definitely an issue that should be looked into and tackled by the educational authorities with the consideration of provision of counseling services and psychological aid (Kazerooni et al., 2020; Zhai and Du, 2020). Furthermore, second year preclinical students expressed a significant higher concern on their academic progression rather than the first years, most likely because they already were aware of the “gold standard” as experienced prior to the pandemic. Every medical student is eager to start the clinical years, and the second years were faced with a dilemma of an unknown future with potential lack of real-life patient interactions and clinical experience (Wang et al., 2020). Such thought alone is still a cause concern and anxiety in these students.

## Opportunities and Lessons Learned for the Future

It is important that the changes implemented to the medical education, particularly to the teaching of anatomy, during this pandemic are recorded and studied since such data will be essential on how to proceed during the still on-going pandemic and post-Covid-19 (Ferrel and Ryan, 2020). The teaching material that was prepared during this period can still be used for future academic years as part of the virtual Supporting Information deposited on the VLE. Although these resources need to be reassessed to make sure that the presentation of this Supporting Information does not overwhelm the students (Leppink and van den Heuvel, 2015). Considering that the pandemic imposed changes in the anatomy teaching, this may be the perfect opportunity to revise the curriculum while considering the students’ comments and assessment outcomes. Furthermore, since assessments were shifted to virtual platforms, should this mode of assessments be instituted for future examination periods, the online questions bank and the facility to automatic mark the examinations can facilitate the academic’s workload. The pandemic also provided the opportunity for a pan-university reflection on the teaching, learning, and

assessment provided to all students, the potential implications these might have had and the changes that will be required in the future.

The pandemic also brought with it a bigger global problem of cadaver scarcity, with postulations that in the future anatomy teaching will be “cadaverless” (Singal et al., 2020). This will have a deterrent effect on the medical student’s education leading to a potential loss of appreciation for anatomical variations as well as lack of compassion and emotional impact when working with cadavers (Singal et al., 2020). However, this is not the case in Malta, where over the period of Covid-19 the donor program was not affected and body donations continued as before. This was possible following the very good surveillance, control, and extensive testing that Malta’s Public Health Response Team have carried out so far with containment of Covid-19 spread with very low Covid-19 deaths: 10 patients to date, who had serious comorbid conditions (Cuschieri, 2020). Of note, a decision was made by the Department of Anatomy’s Head of Department in conjunction with the Public Health Department that the body of donors who died of Covid-19 could not be accepted.

The drastic changes implemented during this pandemic can serve as an opportunity for the medical students to develop collaborative skills, self-teaching as well as resilience. These skills are essential tools for a practicing medical doctor since interdisciplinary collaborations as well as adaptation to different work scenarios is essential for good medical practice. Those students who take this unique Covid-19 situation in their stride and have the ability to think outside the box, are better geared for when they are actually practicing medicine (Ferrel and Ryan, 2020). Furthermore, during the Covid-19 pandemic telemedicine has gain momentum and it may be the direction of medicine for the next generation of health care. Medical education and practice may need to adopt for this type of telemedicine practice and potentially incorporate this as part of the medical training program (Theoret and Ming, 2020).

This pandemic is also the ideal time for students to find innovative ways on how to exhibit their teamwork skills as well as their life skills. As in other medical schools abroad, such as the “Medical Student Response Team” initiated by medical students at the Harvard Medical School (Soled et al., 2020), medical students at the University of Malta have contributed to the public health management, such as answering telephone helplines, swabbing, contact tracing, and educating their peers, families, and friends.

## Limitations of the Study

The strength of this study is that there was a good response (more than 50%) from the preclinical students, who consisted of both local and international students, so this gives a good indication of the student’s perspectives and experiences on the shift to remote preclinical medical education, especially anatomy, during these unprecedented times. The timing of the survey might have influenced the responses since during the period of the survey, the Faculty was being transferred to another office site and students were not yet informed about the plans for June’s examination. The survey questions were created by the authors, but this questionnaire was not assessed by Kendall’s tau B and Cronbach’s alpha to determine the validity and the reliability. Hence, the lack of such process might have had an effect on the interpretation

ability of the survey. Anxiety was measured using a validated assessment tool, however, this tool was not validated using the study population. The questionnaire did not assess for depression symptoms and so it is not possible to comment on the presence of such symptoms. Moreover, since the questionnaire was distributed online, self-reported bias could have been present, especially for the anxiety-related questions. The presence or absence of any preexisting mental health problems suffered by students was not collected. The stressful period of Covid-19 might have triggered exacerbations of previously diagnosed anxiety problems and contributed to a higher GAD-7 score due to this predisposition.

## CONCLUSIONS

The Covid-19 pandemic has affected all the population from the very young to the elderly. Medical students are no exception. After a month from closure of the University of Malta, the majority of the preclinical students showed concern about their medical education (particularly the hands-on anatomy teaching) and their future, with a high percentage of these students exhibiting anxiety symptoms. The shift to remote lectures was well received by the students up to the point that they urged the university to make it the norm. However, this was not the case for remote e-tutorials and dissection sessions. This may be the appropriate time for the reevaluation of the medical education curriculum considering the changes that have been implemented, the students' comments and their assessment outcomes. The current medical students are the health leaders of tomorrow and this pandemic ought to have an impact not just on their medical education, but also possibly on their future careers. Although too early to understand its full impact, the Covid-19 pandemic might lead to an increased interest in medical students opting to specialize in public health or acute medicine in the future, or else it might have a negative impact with students opting out of the medical profession. Nevertheless, only time will tell.

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