Traditional Teaching versus Online Teaching of Forensic Autopsy Case Study – “Grigore T. Popa” University of Medicine and Pharmacy of Iasi

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Abstract: Traditional medical education can be disrupted during periods of epidemic or pandemic, due to the closure of universities and the restriction of social human contact in order to limit the pathogen transmission. COVID-19 pandemic determined universities and teachers to identify alternative virtual education methods, by teaching online courses and practical activities stipulated in the university curriculum. The aim of this paper is to compare the traditional method of teaching forensic autopsy with the virtual one, imposed by the COVID-19 pandemic. Based on the literature data, the authors analyze the importance of autopsy in the training of future physicians, including the advantages and disadvantages of direct exposure of students to this medical procedure. The virtual teaching of forensic autopsy is also analyzed, highlighting its advantages and disadvantages. The authors particularize the analysis through a case study, in which they describe the online teaching of forensic autopsy at “Grigore T. Popa” University of Medicine and Pharmacy of Iași, Romania and underline the challenges faced by the teachers involved in this educational approach. The authors conclude that studies are needed to evaluate the efficacy of the online teaching and also to find out the opinions and attitudes of students towards online teaching compared to traditional autopsy teaching in order to decide which is the most appropriate educational approach to be applied at “Grigore T. Popa” University of Medicine and Pharmacy in the future.

Keywords: *education; pandemic; online; traditional; forensic autopsy.*

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1. Introduction

Over the last decades there have been several epidemic and pandemic outbreaks, including H1N1 (swine flu), H5N1 (avian influenza), Influenza, MERS, SARS, Ebola (WHO, 2020) which imposed emergency measures such as the establishment of the mandatory quarantine status and implicitly the closure of schools and universities to prevent the spread of infection. The COVID-19 virus is unique in its virulence (for example, SARS-Cov2-ARN was discovered 17 days after quarantine of the “Princess Diamond” cruise ship on different surfaces of the booths) (CDC, 2020) and its ability to spread through Flügge’s drops, affecting the general population, especially the elderly, who suffer from various associated comorbidities. In such conditions, the teaching activity in the university medical clinics and other facilities for the training of the medical students is stopped, in order to avoid their direct contact with the patients (Anantham et al., 2008; Herman et al., 2007; Sherbino & Atzema, 2004). Even if medical students are considered to be young doctors as part of the medical team, they must be protected because they are not under the same contractual obligations as the employees of the medical system, lacking the knowledge, skills and especially the clinical experience of a qualified doctor (Lim et al., 2009). The risks to which they may be exposed under these conditions are greater than the benefits of receiving a medical education based on direct contact with the admitted patients. On the other hand, patients involved in the teaching process are exposed to the risk of contamination in case of direct contact with students.

Due to the fact that epidemic outbreaks can occur any time, in order to ensure the continuity of medical education, even after medical universities are closed, teachers are required to seek solutions, namely to use online education methods (Lim et al., 2009).

The aim of this paper is to compare, based on the literature data, the traditional method of teaching forensic autopsy with the virtual one imposed by the COVID-19 pandemic. Also, in the paper is described and analyzed the teaching of the forensic autopsy at the “Grigore T. Popa” University of Medicine and Pharmacy of Iasi, Romania.

2. Alternative methods of medical education

The alternative methods that the medical schools have successfully used involve various software platforms that virtually replace the patients offering the possibility of teaching the study material through video films,

power-point presentations, photos, live transmission, online conferences, several studies showing that these methods are just as effective as traditional teaching (Ali et al., 2009; Gillett et al., 2008).

During the epidemic or pandemic periods professors were motivated to develop teaching innovations, trying to replace the clinical examination by direct contact with virtual, online patient simulators, using digitalized teaching methods, using multimedia files to acquire radiological diagnostic skills, including virtual reality simulators for teaching anatomy, surgery, clinical examination or cardio-pulmonary resuscitation skills (Kossi & Luostarinen, 2009; Petersson et al., 2009; Semeraro et al., 2009; Zhang et al., 2009).

When choosing a suitable online teaching software, one must consider aspects related to the type of module, study program, nature of use, ease of use for both students and teachers and also the costs of creating the virtual environment.

When organizing online courses in a medical university, attention must be paid to certain important aspects, such as: dividing the students into groups, allocation of a time interval for each group of students, the possibility for the students who are not available within the time range allocated to their group to participate in the courses of other groups, the possibility of applying assessment tests, online examination, the possibility of the software platform to allow a certain format of the class (practical class, seminar, laboratory class, clinical class, projects, courses), ease in collaboration with the administrative staff that supports the organization of the classes, the professional coordination by the head of the discipline and the supervision of the execution of the teaching activities (Roszak et al., 2015).

An online lab is a learning environment in which students and professors interact through various technical tools provided by software programs. These software programs began to develop initially from the desire of educational institutions and professors to teach from the distance (nationally and internationally) the students who cannot participate physically, being also very useful during periods of epidemic and pandemic when physical contact between participants is not recommended (Soltanimehr et al., 2019).

Long distance courses and practical activities can be held in a virtual classroom, based on verbal teaching interaction similar to a traditional class. Thus, students have the opportunity to view presentations, videos, photos and can give real-time tests. Virtual classes can be an integral part of an educational management system or should be integrated into one, in order

to fight absenteeism of students who cannot be physically present at practical activities and courses (Soltanimehr et al., 2019).

There are a number of conditions that need to be met for the inclusion in the educational management system of a virtual class, such as: having the possibility of live video conferencing, screen sharing, the option of online blackboard, the possibility to transmit and download study materials, the possibility of visualizing multimedia materials, the possibility of evaluating the students' knowledge in real time (Roszak et al., 2015; Soltanimehr et al., 2019).

The list of software programs used in medical education is extensive. A search on Google offers multiple possibilities, such as: Adobe Connect, Blackboard Collaborate, LearnCube, ezTalks Webinar, Fastmeeting, WizIQ, Udemy, Articulated Storyline etc. These programs allow the professors, in addition to the teaching activity, to conduct surveys and questionnaires for feedback in real-time, thus facilitating a better understanding of the participants' needs.

The online medical education has a number of advantages, such as: the comfort of the students' participation in the learning process, the efficiency and optimization of the professors' activity, easy, fast and secure access to learning resources, data security, multiple communication options, efficient information flow, efficient organization of student groups and, last but not least, continuity in medical training (Roszak et al., 2015).

A study conducted in 2019 at the Faculty of Dental Medicine, Shiraz University of Iran, which aimed to compare the efficiency of the traditional teaching method with that of the alternative online teaching method of dental radiology, has shown that the virtual method has been more effective than the traditional one regarding the radiographic interpretation of the injuries of the maxilla, thus representing an effective alternative method of teaching (Soltanimehr et al., 2019).

3. The importance of autopsy in educating medical students

Autopsy has been an integral part of medical education for centuries, providing important benefits to medical students in terms of medical knowledge and acquiring personal skills such as developing respect, empathy and compassion (Altaf et al., 2015).

In the last decades, however, we have witnessed a decrease in the use of autopsy in the teaching process in medical schools. The reasons for this decrease are complex: the decrease of the autopsy rate in general (the number of autopsies has decreased dramatically in the last 50 years), the

loaded program of the professors or difficulties related to the legislative provisions. Regarding the latter aspect, in some countries (e.g. UK) students can attend a forensic autopsy only with the consent of the authorities (e.g. coroner); in other countries, such as New Zealand, students are not allowed to attend forensic autopsies under any circumstances (Bamber & Quince, 2015; Ioan et al., 2012).

In some medical faculties, the time allocated to autopsies was reduced in favor of other disciplines such as anatomy or physiology, and in some medical faculties the participation of students in the autopsy became optional, being replaced by various visual interactive technologies as teaching tools (Burton, 2003). An important aspect is the difficulty of inserting autopsies in the university curriculum and in the students' program, mainly because it is not known in advance whether there will be cases available for autopsy when the students' preset schedule requires it. Student participation in the autopsy also involves a number of technical challenges, such as: ensuring a safe and healthy environment in the morgue and ensuring that all students can attend and see the autopsy procedure (Bamber & Quince, 2015).

The degree of student involvement in performing the autopsy ranges from simple assistance, removal and examination of the organs to the complete autopsy (Bamber & Quince, 2015).

Assisting in autopsy facilitates understanding of anatomy and physiology, but also of other subjects such as clinical pharmacology or radiology, by providing students with the opportunity to see three-dimensional, on a fresh (un-embalmed) corpse, to describe more accurately what they observe, to understand human anatomy and physiology in a clinical context, related to a real patient and also improves the students' abilities to make clinical-pathological correlations. The autopsy allows students to learn the forensic issues related to death, especially the legal framework that applies to the deceased, which is important as all doctors come into contact with a deceased person at some point in their careers. Direct exposure to autopsy also has a positive impact on the students' abilities of diagnosis and communication, and thus contributes to improving the quality of care that they will provide to their future patients, as well as the quality of communication with the patients' families, especially in the context of end-of-life issues and autopsy (Altaf et al., 2015; Bamber & Quince, 2015; McNamee et al., 2009; Roman et al., 2013, 2014; Warter & Warter, 2018).

Attending the autopsy is likely to provide students with aspects related to the so-called "hidden curriculum" in medical education, that is,

information that cannot be taught through formal courses and seminars, but is subconsciously assimilated by observing the activities and attitudes of professors and fellow students. Students learn to be focused but at the same time distant and to have the right attitudes towards death and the grieving ones. They are in a position to reflect on the limits of modern medicine and to accept the idea that patients may die. The autopsy also allows students to understand the impact of lifestyle, social deprivation and other socio-economic factors on health, well-being and death (Altaf et al., 2015; Anders et al., 2014; Bamber & Quince, 2015; Hanganu et al., 2018; McNamee et al., 2009). The attitude of the professor and the team members working in the morgue is a key element in the benefits that the students get from being present at autopsy. Thus, teachers are the ones who promote the andragogical principles and provide valid arguments regarding the importance of autopsy and the benefits for the students of getting involved in this medical procedure to help them overcome the psychological impact of the autopsy, so as to develop emotional detachment, professionalism and ethical behavior, as well as abilities to elucidate the causes of death and the mechanisms that led to its installation (Ioan et al., 2014; McNamee et al., 2009). Once this psychological threshold is overcome, students are able to recognize the value of the autopsy and how participating in the autopsy helps them better understand the pathology and mechanisms associated with death (Altaf et al., 2015; McNamee et al., 2009).

In terms of students' perspective, studies in the field show that they have a positive attitude, in the sense that most of them consider the participation in the autopsy as useful for the medical education, especially in terms of learning the basic sciences, integrating clinical medicine with pathology and understanding the weakness of medicine (Bamber & Quince, 2015; Ioan et al., 2014; Manoilescu et al., 2017).

However, participating in an autopsy can have a negative psychological and emotional impact on students (Bamber & Quince, 2015; Ioan et al., 2014; Manoilescu et al., 2017). Although autopsy is a beneficial educational tool, there are studies to show that students may feel uncomfortable, considering the autopsy frightening from the emotional point of view because they are not psychologically prepared to attend the body dissection, some of them even accusing severe disorders such as fear or nightmares after having assisted at the first postmortem examination (Altaf et al., 2015; Khoo, 2014; Ruhaya & De Villiers, 2003). Such disorders occurred mainly due to the unfavorable working conditions in the morgue, such as: the use of old autopsy techniques, dirty equipment, bad smell and lack of cleanliness during autopsy (Altaf et al., 2015).

Given the potential negative psychological and emotional impact, students must be adequately supported and prepared, both before actually attending an autopsy- by viewing some images from the morgue or visiting the morgue when nobody is working there, and after completing the autopsy- by discussions during debriefing sessions (Bamber & Quince, 2015; Ioan et al., 2014; Manoilescu et al., 2017).

Another solution to mitigate the emotional and psychological impact of attending autopsy on students is to use alternative methods of teaching autopsy, such as: using different types of pathological specimens (real, three-dimensional, or virtual images) for case-based or problem-based learning, video recordings with the key steps of an autopsy or e-learning packages that allow the use of post-mortem material (Bamber & Quince, 2015; Hanganu et al., 2017).

4. Advantages and disadvantages of online autopsy delivery over the traditional teaching method

Using digitalized learning methods is useful for teaching autopsy from distance, allowing the curriculum to be respected and the medical training not to be interrupted during the pandemic and epidemic periods while maintaining social distance, offering a wide range of variants, such as video and multimedia files with autopsies, or online case scenarios.

An important advantage of studying forensic autopsy online is the removal of factors that can negatively affect the student, such as: the unpleasant or unusual odor of the autopsy room, or the sound of the bone-cutting electric saw.

The main disadvantage of using the online teaching methods is the inability to maximize the learning process from the perspective of all three important dimensions: cognitive, emotional and social. This is because the emotional and social dimensions cannot be reached online; no other method than the traditional one could completely replace the experience lived in the autopsy room, such as deepening the notions of anatomy, traumatology, end-of-life decisions, medical conduct, the suspense of the progressive discovery of injuries and elucidating the cause of death, deductive reasoning, emotional detachment, social interaction, empathy and compassion (Bamber & Quince, 2015; McNamee et al., 2009; Sanchez & Ursell, 2001).

Many benefits of the autopsy result from the “reality” of the situation, as opposed to the anatomical dissection where embalmed bodies are used, in which the organs and tissues have an artificial appearance; by moving the autopsy experience out of the morgue, part of this experience is

lost. Also, one of the great advantages of effectively assisting in autopsy is preparing students for the reality of death; therefore, removing direct exposure to autopsy could dilute this advantage. At the same time, creating the resources needed for online teaching and integrating them into the curriculum takes time, which causes an overload of the professors' program (Bamber & Quince, 2015).

In a study conducted in 2009 by McNamee et al. it was found that the interviewed students had positive attitudes towards learning through direct autopsy assistance and considered that no virtual alternative would be acceptable (McNamee et al., 2009). However, some authors point out that virtual tools and alternative methods of teaching forensic autopsy, except for emergency situations (such as epidemic or pandemic crisis), are useful tools that should be used as methods that complement traditional autopsy teaching by direct exposure (Fisk, 2008; McNamee et al., 2009).

5. Case study: “Grigore T. Popa” University of Medicine and Pharmacy of Iasi

At “Grigore T. Popa” University of Medicine and Pharmacy of Iași, Forensic Medicine is taught to the students in the final years at the faculties of Medicine, Dental Medicine and Nursing. In the practical classes of Forensic Medicine, the students have the opportunity to attend autopsies and to actually get involved in autopsies, the latter aspect being strictly voluntary.

A study carried out at “Grigore T. Popa” University of Medicine and Pharmacy in 2014, on a group of 219 students in the 6th year at the Faculty of Medicine, which aimed to evaluate the usefulness of the autopsy in medical education, found that many of the participants consider that autopsy is useful for medical education, but also for medical practice and society in general. Most of the participants reported that they felt moderately uncomfortable at the first autopsy and that it is sufficient to attend the autopsy without actually engaging. However, some participants felt that assisting multiple autopsies and effective involvement would be beneficial for their medical education, which suggested the need to organize extracurricular activities for students who want to deepen the notions of forensic thanatology and to be effectively involved in performing the autopsies under the guidance of their professors (Ioan et al., 2014).

A second study carried out at the same university, in 2017, on a group of 66 students at the Nursing Specialization, which aimed to identify the opinion of the students regarding the usefulness of the autopsy for their

training, as well as for the progress of medicine and society, over half of the respondents agreed that the autopsy is useful for society and for the progress of medicine. Also, participants agreed that autopsy is important for their medical training and considered that it has an impact on their preferences to work in a particular medical field. Therefore, the participants consider that autopsy should be part of the university curriculum of the students at the Nursing Specialization. The results of the study also showed that most of the participants accept the autopsy to be performed in order to clarify the cause of death. Many of the participants said that they felt uncomfortable while attending the autopsy, which suggests the need to organize debriefing sessions during the Forensic Medicine classes, but also to integrate this discipline in the context of end-of-life medical, social and legal problems (Manoilescu et al., 2017).

In the context of the current pandemic of COVID-19 disease and the establishment of emergency measures which involve social distance in order to combat viral transmission, “Grigore T. Popa” University of Medicine and Pharmacy was forced, for the first time since it was founded, to shift its entire teaching activity online. This was possible thanks to the development of a virtual academic environment, using both the e-Learning platform of the university and the Microsoft Teams platform.

The state of emergency was implemented in Romania on March 16, 2020 for an initial period of 30 days, and a series of measures were taken, which included restricting the exercise of the following rights of interest for teaching: free circulation, right to education, freedom of assembly (Decree no. 195 of March 16, 2020). Thus, faced with social distancing in the educational environment, “Grigore T. Popa” University of Medicine and Pharmacy Iasi had to find a quick solution to prevent the loss of the academic year. In order to organize an online platform to ensure the continuation of courses and laboratories, while respecting the recommendations of the officials in the field of education, the spring holiday has been changed, being brought forward with one month, from April 17-26, 2020, to March 16-22, 2020. All members of the academic community-students and teachers alike participated during this time in online training sessions on the use of the new platform, so that the courses and laboratories to take place in optimal conditions, thus achieving the primary goal of social distancing and simultaneously continuing the education.

Microsoft Teams software is a chat-based workspace in Microsoft Office 365. It is a software for team discussions in an institution/faculty, which meets all the criteria necessary for a good teaching activity and can be used directly in the browser or through the application installed on the PC,

laptop, tablet or smartphone. The application has the facility to inform the participants 15 minutes before the beginning of the classes and also allows the user to send multiple archived files (Microsoft, n.d.).

Forensic Medicine classes are currently carried out online, using the aforementioned software, which allows the faculty staff to use virtual teaching tools, such as: live video conferencing (instead of traditional lectures held in the lecture hall), screen sharing (so that students can see the text and pictures from the Power Point presentation), the online blackboard option, the possibility to transmit and download study materials (which will allow students to deepen the information after classes), the possibility to view multimedia materials - recorded video autopsies or autopsies available on specialized websites (instead of actual presence in the autopsy room). More, given that at the end of the semester every student is tested for the knowledge they gained during the semester, this software allows the use of various online testing methods, such as multiple choice questionnaire which can be checked by each individual student. One limit of teaching autopsy online- in the practical way, is that students cannot perform themselves various techniques in examining a dead body, which would have increased their experience and knowledge. On the other hand, this limit can be partially overcome by the fact that the department already has a series of recorded autopsies, in a didactic manner- showing each step on how to examine a dead body. Regarding the latter aspect, this could be a suggestion for other universities- both from Romania and other countries, to implement a video system and record autopsies to allow the storage of virtual materials where step by step examination of the dead body is shown. Moreover, this will be useful also in the future, after the current crisis will pass, for situations when a dead body is not available during the time when the Forensic Medicine class is held.

An important aspect to mention in teaching forensic autopsy to the medical students is the need to maintain the confidentiality of the cases and to prohibit the filming or photographing the cases presented, both due to the obligation to respect the dignity of the deceased person, as well as because some of the cases may still be under judicial investigation and disclosure of information may have a negative impact on the proper conduct of the respective investigation. For this reason, in the case of teaching the autopsy in the traditional system, the students have the obligation to sign a confidentiality agreement before attending the autopsies. This procedure should also be transferred to online classes in order to ensure the confidentiality of the data related to the cases presented, regardless of the way of teaching - traditional or online.

6. Conclusions

The authors acknowledge the importance of sharing the experience in these difficult times, when we had to transpose the entire teaching activity in the online environment, in a short time so that the medical education of our students not to be affected. This has been a unique challenge in the history of “Grigore T. Popa” University of Medicine and Pharmacy of Iasi.

Shifting the entire educational process to the online environment was a novelty for the university and, implicitly, for teaching forensic autopsy. In order to study the impact and future prospects of alternative virtual methods of studying forensic autopsy, it is necessary to pass the test of time, to deepen the use of the modern digital techniques needed to maximize the teaching process and to maintain the ability of the students to concentrate during the Forensic Medicine classes.

The advantages and disadvantages of the virtual teaching of the forensic autopsy compared to the traditional teaching must be analyzed through studies that analyze, on the one hand, the results obtained by students in the Forensic Medicine exam, and on the other hand the students' perspective on this new educational method in order to decide the future of teaching this part of the medical university curriculum.

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