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## **Methodology of Teaching on Telemedicine Technologies for Medical Students**

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**Abstract:** The Department of Medical Informatics has developed new curriculum module "Telemedicine" for students of 4-5 courses, which is implemented on the basis of the Telemedicine Center of the Medical Institute of the RUDN-University. It's designed for 1 credit ECTS, 17 hours for practice, and the rest for students' self-education. The following topics are included: the fundamentals of telemedicine, and the world trends in its development; technological equipment of telemedicine events; hardware and software of telemedicine; economic and legal aspects of telemedicine; scenarios of telemedicine activities. After theoretical lectures, students receive practical skills in the course of business games in preparation and conduct of video conferencing. During the classes we demonstrate to students the technologies of remote interactive learning, in particular television lectures and master classes from the leading clinics of Russia, countries of Europe, India, Brazil and Canada. Telemedicine Center for video conferencing equipped with all modern ITU standards. It is equipped with video conferencing complex, Full HD camcorder, professional document camera with built-in illumination plate for displaying x-rays. During two years we have taught over a thousand students. Besides students from Russia, the module was mastered by students from Asia, Africa, America and Europe. Teaching approach allows to obtain theoretical knowledge and practical skills of video conferencing and distance education methods, to get familiarized with international experience and trends in the development of telemedicine technologies. Methodology of training is described.

**Keywords:** Telemedicine, Videoconferencing, Interactive education, Distance learning

### **Introduction**

The increasing digitization has reached medicine and is changing the profession of medical doctors. The modern forms of communication in everyday medical practice demand new skills and qualifications. According to Kuhn (2018) "The teaching of digital skills is a relevant component of future curriculum development in medical studies and also a challenge for continuing medical education". His study showed that neutral attitude towards telemedicine can be changed to a positive opinion after the course on telemedicine technology.

Although telemedicine is widely used for medical education of practitioners but few studies directly investigate efficiency of telemedicine teaching. Brisson (2015) compared telemedicine teaching to conventional in-person

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teaching. The results demonstrate that telemedicine teaching is as effective as in-person teaching, for instance, for the acquisition of bedside ultrasound skill important in trauma care.

Most scientific articles describe investigation in area of using telemedicine technologies for medical consultations and developing of infrastructure of healthcare (Cai, 2016). Many telemedicine programs are designed to train practitioners who already have a specialist diploma and work experience. However, the younger generation looks to the future and wants to get knowledge about telemedicine technologies already at the first stages of training. In their study joined group from Brazil (Medical School of University of Uberaba and Dentistry School of Federal University of Rio Grande do Sul) has mapped those Brazilian medical schools that could have a possible discipline related to telemedicine and/or telehealth, and analyzed the curriculum of each. They found that only 27.9% of medical schools have potential subjects related to telemedicine and telehealth in their curriculum. They conclude, that: "Greater attention should be given to training in telemedicine and/or telehealth". (Neto, E, et al, 2017)

The Department of Medical Informatics has developed new curriculum module "Telemedicine" for students of 4-5 courses, which is implemented on the basis of the Telemedicine Center of the Medical Institute of the RUDN-University.

### **Topics of Curriculum**

The following topics are included:

- the fundamentals of telemedicine, and the world trends in its development;
- technological equipment of telemedicine events;
- hardware and software of telemedicine;
- economic and legal aspects of telemedicine;
- scenarios of telemedicine activities



a)



b)

Figure 1. Equipment of the Telemedicine Center for displaying x-rays:

a) scanner,

b) document camera.

### **Equipment of the Telemedicine Center**

Telemedicine Center for video conferencing equipped with all modern ITU standards. It is equipped with video conferencing complex, Full HD camcorder, professional document camera with built-in illumination plate for displaying x-rays (Figure 1).

## Method

After theoretical lectures, students receive practical skills in the course of business games in preparation and conduct of video conferencing. During the classes we demonstrate to students the technologies of remote interactive learning, in particular television lectures and master classes from the leading clinics of Russia, countries of Europe, India, Brazil and Canada

## Results and Discussion

Module “Telemedicine” is elective for students of our University, it means that they are choosing the module from several different discipline. Because of that we have conducted a survey with the question: "Which module is preferable for you?". In 2016 we interviewed 766 of medical and 223 stomatology students and in 2017 we interviewed 465 medical and 188 stomatology students. First year (2016) module “Telemedicine” this module was studied by 498 (65%) medical and 156 (70%) stomatology students, second year (2017) 395 (85%) and 151 (80%) respectively (Figure2).

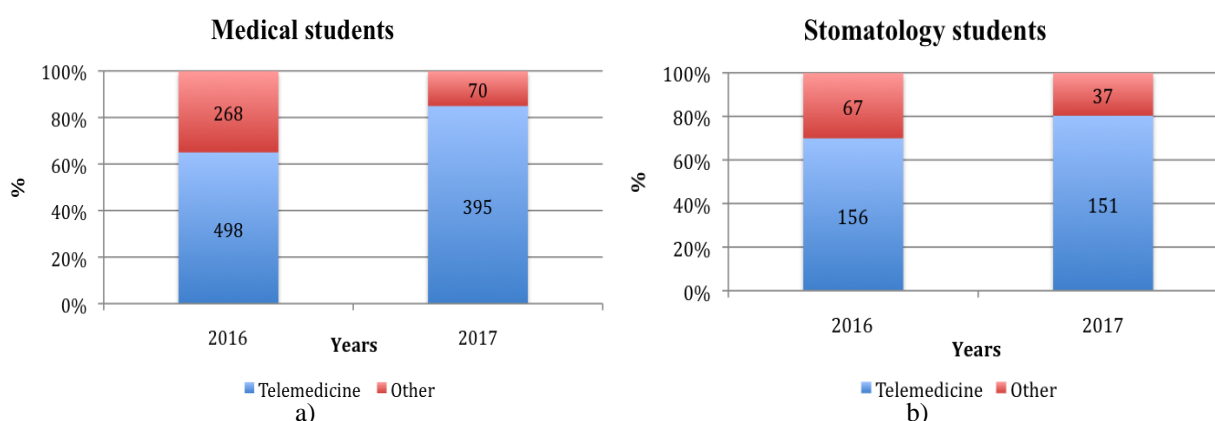


Figure 2. Number of Students who choose “Telemedicine”:  
a) Medical students, b) Stomatologists

During two years we have taught students from different countries. Besides students from Russia, the module was mastered by students from Asia, Africa, America and Europe. (Table 1)

Table 1. Number of students studied “Telemedicine” in 2016-2017 (by regions)

Region	Total	2016	2017
Africa	123	42	81
America	21	10	11
Asia	135	66	69
Europe	22	12	10
Russia	899	524	375
Total	1200	654	546

## Conclusion

Teaching approach allows to obtain theoretical knowledge and practical skills of video conferencing and distance education methods, to get familiarized with international experience and trends in the development of telemedicine technologies.

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