

A BRIEF HISTORY OF MEDICAL EDUCATION

A key role in the development of all sciences, including medicine, was played by universities, which – according to Walter Rüegg, an academic historian – should be perceived as a European institution par excellence (Ruegg W., 1991)¹. Universities in the Middle Ages, first based on three pillars: law, medicine and theology, but later expanded to encompass many other sciences, created local environments of increasingly high external impact, where teaching and learning, disputes and arguments, and structured and systematised progress of new generations of intellectual elites perpetuated development of new ideas, theories and their applications in practice. Universities were governed by codes of rights, privileges and obligations endowed upon the members of a given academic community, offering education structured in vertical curricula and horizontal levels of advancement, and awarding publicly recognised degrees. In this way they became the incubators of creativity, curiosity and free thought. From the very beginning of the era of universities, and in fact from the dawn of medicine much earlier, there has been international

student mobility. Many of the key figures in the history of medicine and other sciences were migrating to receive education from various masters and experts abroad or at foreign universities. Nowadays students' and researchers' migration between countries and higher education institutions is much easier, relatively cheaper and very popular. It is also supported by programs of international cooperation, e.g. Erasmus+ in Europe. In the domain of science, mobility and experience of participation in international research teams abroad have become essential and inherent elements of a researcher's career path and progress in any area of knowledge.

Contemporary medicine is evidence-based, founded on science with its robust, reliable methodology, and intimately connected to technology, which makes things possible, easier, faster and much more accurate at every level and in every branch of medical activity. It is also inherently about teamwork.

In spite of the rapid pace of progress in medical research and practical medicine, medical education must continue to provide the society with ethical, supportive, communicative, knowledgeable, skilful, cooperative,

critical, rational, pragmatic, lifelong-learning, persistent healthcare professionals. Thus, it must cater for health-related needs of individuals and the entire population, and contribute to both individual and public health, wealth, safety, and well-being. Medical education must ensure reliable, up-to-date, evidence-based content, presented in a comprehensible form, with the use of mind-friendly and efficient methods, with key focus on the students' understanding of the studied discipline and their developing of high self-learning skills, essential throughout a medical career. Medical education conditions the students and prepares them for a new level of accuracy and efficiency, both at learning and in daily practice of medicine after graduation. Therefore, it is essential to optimise the teaching process and facilitate students' learning experience to assure that their understanding of the concepts and mechanisms of health and disease is accurate and obtained in a most efficient manner.

Medical schools vary as to status, reputation, experience, resources, methods of teaching, and language of instruction, not to mention the obvious dramatic differences in cultural, economic and social environments of various countries which greatly influence, and in practice define, the operational culture and performance of educational institutions. Despite an increase in the number of medical schools over the last

two decades from about 1,900 in 2007 (Boulet J. et al., 2007)² to about 2,800 at present, there is a shortage of doctors globally (Rigby Perry G. and Gururaja Ramnarayan P., 2017; OECD, Health at a Glance 2021)^{3,4} to cater for the needs of the world's growing population. As wealth and resources remain distributed very unevenly around the globe, different regions have dramatically different access to both primary and secondary education, as well as to tertiary education in medicine or healthcare disciplines (Rigby Perry G. and Gururaja Ramnarayan P., 2017)³.

According to the World Directory of Medical Schools there are about 2,409 med schools globally in 180 countries⁵ (currently about 2,800). Among them, 617 med schools are in European countries (Russian Federation – 89 and Turkey – 97 included), which means there is 1 medical school per 1,2 million population (European population estimated at 743 million). Thus, in Europe, even without Russia and Turkey, there is one medical school per ca. 1,345 million population. For comparison, in Africa there is on average 1 med school per 6-7 million people (Rigby Perry G. and Gururaja Ramnarayan P., 2017)³, while the Netherlands Antilles and Belize have 1 med school per 40 thousand (!) people and Montserrat has 1 med school per only 5 thousand (!) people (Rigby Perry G. and Gururaja Ramnarayan P., 2017)³. Distribution of doctors is also very

different, ranging from 3.4-3.6 physicians per 1,000 people in Europe, 2.2/1,000 average for North America, 1.39/1,000 average for South America, 0.85/1,000 average for Asia, and a staggering low 0.26/1,000 average for Africa (with minimum of 0.08/1,000 for Eastern Africa) (Boulet J. et al., 2007)². Physician density is very low in Asia, although it varies much between countries, because this continent is home to 60% of the global population, but only 44% of the total number of med schools. And this is not helped by the fact that the greatest number of all “active” med schools are located in India (Boulet J. et al., 2007; Rigby Perry G. and Gururaja Ramnarayan P., 2017; World Directory of Medical Schools: <https://search.wdoms.org/>)^{2,3,5}.

The constellation of factors influencing students' choices of medical studies abroad includes i.a. the numerus clausus policies limiting availability of medical education in various countries, quality of education/reputation of the university/med school, program curriculum and delivery (in non-English language countries almost only the international programs offered in English are chosen due to the language barrier), total tuition and living costs, campus facilities and student life, safety in the country of destination – including attitudes of the local community to cultural diversity, travel and accommodation options and costs, local support from their own ethnic or religious minority, and attractiveness of

the city/region/country of destination. Some students choosing medical studies abroad intend to facilitate their employment in the country of studies or in another country where the obtained diploma is recognised. For example, in 2016 medical graduates from India, Nigeria, Pakistan and Sudan collectively accounted for over a quarter (28%) of all junior doctors seeking or having training opportunities in Ireland, with a significant share of them holding a medical degree diploma from a Central and Eastern European country (OECD, 2019, “Recent trends in internationalisation of medical education”)⁶.

Regardless of the driving motivation, in today's globalised, highly interconnected world, millions of students choose to migrate to other countries for education. This is no different for medical/healthcare students, with the numbers rising quickly⁶.

It is a well-established fact that learning efficiency heavily depends on the learner's language competence. This holds true for both the vernacular and any other languages used by the learner. With all its vocabulary and grammar principles, the language, both spoken and written, constitutes the essential tool for both describing and explaining any element of reality by the educators, and for building the concepts related to objects and phenomena by the learners. In the educational environment, including

medical schools, language competence of both educators and students plays a key role in the process of learning. It is used for communication, presentation of the academic content and tasks, navigating the learning process and teamwork, assessment of the students' progress and competence level, building classroom environment, and more.

Therefore, it is crucial to acknowledge the likely negative impact of language competence deficits on the efficiency of the learning process, and take appropriate measures to minimise such risk. Such awareness and actions are vital in any educational setting, but seem even more important in the case of international medical students, who learn and get trained in a non-native language in the field of medicine, where the stakes are high - safety, well-being and comfort of the patients and their families.

As a result of the globally increased availability of education in general and language education in particular, facilitated travel and migration, and unprecedentedly increased contacts between people from different countries, cultures, and language groups via social media or telecommunication technology in general, studying and getting assimilated in the new, often remote and unfamiliar environment abroad have become much easier than ever before.

Recognising the central role of language in the process of learning, the methods used to achieve the key educational objective of promoting the students' best possible understanding of the academic content should best include approaches which both expose the learners to the specific content and enhance their language competence. This is particularly important given the rapid growth of the volume of content to be processed and absorbed by the students, as well as highly varied educational, cultural, and language backgrounds of medical students from various countries following the same curriculum. Content and Language Integrated Learning (CLIL) appears to be a good example of such approaches, likely to benefit international medical students who study in a non-native language.

Despite the unquestionably tremendous impact of science in general, technology and engineering on the development of medical research, clinical practice and healthcare education as we know it, these are not simply and solely the products of the last few decades, but rather are founded on the rich heritage of the past centuries and millennia. A long history of human quest for knowledge, skills and methods to offer help and assistance to those who suffer. A long history of students' and apprentices' migration to remote institutions and tutors providing quality education. A long history of influence of the most widespread

languages (Greek, Latin, Arabic, Chinese, and Indian languages) on the medical vocabulary still used today, and of the students' need to adjust and learn some of those languages to be able to study medicine in their home countries or abroad.

Many of the problems and needs experienced by the patients around the globe are the same or very similar, which makes medicine transnational, intercultural and translingual. To emphasise the increasingly rapid progress in medical practice, medical research and medical education and reflect on their continuity, as well as to put medicine in a certain historical context, a brief historical note is presented below.

Medical education - student and teacher migration, learning in foreign languages, experience of diversity

Over the centuries or even millennia, medicine has gone a very long way from its ancient or traditional shape. Most of the old-time doctors were not able to receive well-founded, reliable and universally structured and standardised formal education, but rather were learning by experience in a master-apprentice mode, which made medics rare and their competences highly varied. Propagation of the brilliant thoughts, observations and practice developed by the geniuses of their times, such as founding fathers of medicine like Hippocrates, Claudius Galenus or

Avicenna Ibn Sina, to mention just a few, was not easy, as literature was not readily available, communication was based mainly on migration and mobility, making progress in the theory and practice of medicine rather slow and limited in range. Therefore, medical professionals of the old times were scarce and medical care other than folk medicine was not much available, especially for the poor and/or those living far from the bigger towns. Unfortunately, in many places around the globe the latter holds true also today, although for different reasons.

Like any other area of science, development in medicine and medical education benefited much from the invention of the printing press by Johannes Gutenberg in 1450. A totally new approach to thinking about nature, the world, the universe and the human body occurred as a result of the scientific revolution, a period “from Copernicus to Newton”, when not only revolutionary and fundamental theories were formulated in astronomy, mathematics, philosophy of science, physics, chemistry, biology and medicine, but when a more rational and increasingly evidence-based approach to research evolved. Then followed requirements to publish research outputs in widely available form, inexpensive, peer-reviewed journals issued by research societies, describing research in comprehensible language, standardised manner and sufficient detail to make the experiments transparent and

reproducible, focus in research more on “how” and quantitative approach to nature rather than on “why” and qualitative dissertations; all these contributed greatly to quantum leaps in all the sciences, thus creating a fertile ground for much quicker progress in medical research, clinical medicine, and hence also medical education.

In the historical introduction to international medical education, it is necessary to emphasise the role of the process of global expansion of several western European countries – especially Britain, France, Spain, Italy, the Netherlands, and Portugal. To say the least, this process was contributing greatly to the wealth of these states and hence also funding of their universities and scientific societies, provided opportunities for massive broadening of horizons in sciences (including medicine), and exposed millions of people in multiple generations in the overseas territories to the language, culture, and social organisation of the governor states. The spreading of the English language and ultimately its success at becoming the world’s lingua franca have certainly been rooted in that process, as well as in Britain’s long-term economic, political and scientific domination. English is native to 527 million people worldwide, with 1,5 billion learning it as a second language. It has become the primary language of science, trade and politics. Today international student mobility remains

somewhat affected by the heritage of the colonial era, for example in the choice of European universities by students from overseas countries depending on their exposure to English, French or Dutch in their native countries, former colonies or dependencies (OECD, 2019, “Recent trends in internationalisation of medical education”)⁶.

Another important factor which has been significantly affecting not only medicine as a science, but also confronting physicians, medical researchers and educators, and healthcare policy-makers with multiple new health challenges, is the ongoing industrial and technological transformation, which started in mid-18th century in Britain, and – coming in waves – by today has reached most countries and societies, changing their lives at both individual and population levels. Next to multiple benefits, there are severe negative outcomes related to industry and transport-driven overexploitation of the natural environment, chemical pollution, climate change and global warming, which lead to deterioration of health and well-being of entire populations, as well as much faster transmission of infectious diseases due to easy and affordable massive-scale travel and increased migration.

The most recent third and fourth stages of the process, referred to as the digital revolution and cyber-revolution respectively, both opened an incredible

range of new possibilities in research and education globally, of which medicine benefits tremendously, and have created a number of previously unknown problems and challenges to interpersonal relations, social trust, mental health, and physical well-being. Sadly, high level of inequality in distribution of the access to the benefits and profits of these stages of progress, along with ongoing major or minor wars and conflicts, remains a major challenge and a source of multiple problems of social, economic and political nature, also translating into higher prevalence of health hazards and a greater demand for healthcare in the disadvantaged countries and regions (Rigby Perry G. and Gururaja Ramnarayan P., 2017)³.

It took a very long time and sparks of genius of multiple inquisitive, open-minded, creative and careful observers, thinkers and experimenters asking the right questions and persistently looking for the answers over the centuries, to advance and develop medicine to its current status of a complex, multidisciplinary area of knowledge and know-how, focusing on prevention and treatment of health problems founded on solid fact-base, thorough understanding of the mechanisms and processes, and extensive use of discoveries and inventions in a number of sciences, engineering and technology.

The first-ever description of the structure and function of the cardiovascular system by William Harvey as recently as in 1628, the introduction of anaesthesia to medical practice by Crawford Long, William Clarke and William Morton in mid-19th century, the fundamental works of Ignaz Semmelweis and Joseph Lister on antiseptics, the invention and development of microscope by Hans and Zacharias Janssen, Anton van Leeuwenhoek, the discovery of smallpox vaccine by Edward Jenner, the discovery of X-radiation by Nikola Tesla and Wilhelm Roentgen and its application in medical imaging, the works of Georg Mendel and Thomas Hunt Morgan who laid foundations for genetics, the revolutionary works of Louis Pasteur and Robert Koch – founding fathers of medical microbiology and Alexander Fleming's discovery of penicillin, are just some of the key milestones that brought medicine to the new era of rapid development of all sciences and technology and were the cornerstones for the contemporary understanding of the structure and function of the human body, as well as mechanisms of diseases, their diagnostics and treatment.

Each of those discoveries, inventions and explanations of the human body in health and disease was making further progress faster and deeper, both in patient care, medical research, and in medical education.

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PROJECT



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