

# The Physician of the Future

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**ABSTRACT** Medical education has evolved significantly since the establishment of university-based training in the 12th century, continually adapting to scientific, technological, and societal changes. In the 21st century, rapid advances in digital technologies, artificial intelligence, and the widespread availability of medical information are reshaping the competencies required of physicians. This review explores the concept of the *doctor of the future* and the implications for medical education and training. Future physicians will require strong cognitive abilities to interpret clinical data, utilize decision support technologies, and make informed clinical judgments while maintaining responsibility for final clinical decisions. At the same time, lifelong learning will be essential as medical knowledge and technologies rapidly evolve. Despite technological progress, core human qualities including empathy and effective communication, are essential traits that will be needed by future physicians. These skills require educational models that integrate technological competence, humanistic care, interdisciplinary teamwork, and adaptable career pathways to meet the challenges of evolving healthcare systems.

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The formal medical education system in Europe began around 1100 CE [1], coinciding with the emergence of universities. This system had two distinct categories of medical practitioners: academic doctors who were scholarly individuals primarily trained in theoretical knowledge and surgeons, who were a practically trained, diverse group that included barber-surgeons, itinerant practitioners, ship's surgeons, and tooth extractors [2]. In the United States, for example, academic medical education commenced in the mid-19th century, initially offering a 2-year theoretical program [3].

Since those early years, the medical education system

has undergone frequent modifications due to shifts in universities, educational systems, World Wars, technological advancements, among other factors [4]. These changes reflect ongoing efforts to ensure that today's medical students become the ideal doctors of the future [3].

The question of the qualities of the ideal doctor of the future must be addressed in the medical community. This definition helps determine the skills that medical students should focus on during their studies and informs necessary adjustments to the curriculum accordingly [5]. In this review, we delved into the concept of the doctor of the future, how to train them, and what changes we need to make.

## THE FUTURE DOCTOR: SKILLS AND QUALITIES

### *Cognitive abilities*

In 1910, Flexner published a report about the medical education in the United States and Canada that changed the medical education system in the 20th century [6]. He proposed four standard features of a 4-year education leading to the MD degree: admission to medical school based on a bachelor's degree with a strong science background; a university-based medical school providing 2 years of basic science instruction in classrooms and 2 years of clinical experience in a teaching hospital; instruction by physician-scientists who engage in teaching, research, and patient care; and experience with investigation through supervised participation in laboratories and university-based teaching hospitals [6]. This reform emphasized formal knowledge and mastery of facts.

The 21st century is often referred to as the information age, characterized by the rapid adoption of new technologies and a constant flow of information. In the late 1990s, only a small percentage of the global population used the internet or owned cellular phones. However, as of 2019, an estimated 67% owned a cell phone and by 2023, 64.4% of the world's population was online, including those in

developing countries [7]. With such readily available and constantly evolving data, medical students do not necessarily need to memorize all the medical data. Rather, they need to utilize their intelligence, academic abilities, clinical training, and experience to make complex clinical judgement decisions. They need to convey complex cases to various decision-support technology tools that may assist in decision-making. However, in the end, they must rely on their clinical thinking to make final, independent, and informed clinical decisions.

In the 21st century, medical schools should teach students not just medical knowledge but also how to use various technologies and decision-support tools. Furthermore, from their first year, students should practice medical decision-making in a data-rich environment. Instead of examining primarily factual medical data in multiple-choice questions, students should be evaluated more on their skills to analyze and solve complex clinical cases using different technological tools.

#### ***Lifelong learner***

Lifelong learning in one's profession is an integral component of professionalism and practice-based learning and improvement. Richards [8] recommend that skills for lifelong learning be integrated into all degree programs. Given the rapid advancements in medicine, physicians must continuously acquire new knowledge and skills.

Future doctors will need to have skills of lifelong learning. They will also need to be adaptable and open to change. Those skills will be essential not only in clinical practice but also to lead groundbreaking research and innovation.

Panda and Desbiens [9] recommended introducing the idea of lifelong learning during residency through ongoing coaching. This approach should identify each resident's learning style, encouraging them to reflect on their learning methods and develop self-directed lifelong learning skills. We also believe that lifelong learning activities, such as reading medical journals, attending medical education sessions, participating in

clinical research, conducting pre-clinical and clinical research, affiliating with teaching programs, and regularly reading online resources or other materials, should be encouraged starting from medical school.

#### **COMPETENCE-BASED MEDICAL EDUCATION**

In recent years, medical education has increasingly shifted toward competence-based medical education (CBME), a framework that emphasizes the achievement of clearly defined abilities rather than the completion of time-based training. CBME focuses on measurable competencies including clinical decision making, communication, professionalism, teamwork, and procedural skills. This framework ensures that trainees progress only when they demonstrate mastery.

This model is particularly relevant in the evolving landscape of 21st century medicine, where technological integration, complex multidisciplinary care, and rising patient expectations require physicians who are not only knowledgeable but consistently competent across domains. Incorporating CBME into undergraduate and graduate curricula allows educators to tailor learning pathways, provide meaningful feedback, and ensure that tomorrow's doctors are equipped with the skills, behaviors, and attitudes required for safe and effective patient care.

#### **EMOTIONAL AND COMMUNICATION SKILLS**

Robots, artificial intelligence (AI), and autonomous technology are becoming increasingly prominent in healthcare discussions, given their ability to process vast amounts of information more efficiently than the average human [10]. AI systems have assisted in detecting coronavirus disease 2019 in chest X-rays, combating malaria, and diagnosing cancer [11,12]. Surgical robots like the Da Vinci system have also become essential tools in surgeries worldwide [10]. However, these technologies can never fully replace the patient-physician relationship.

Numerous studies have emphasized the importance of a positive physician-patient relationship [13]. Some have found that the quality of this relationship cor-

**BEYOND KNOWLEDGE: DECISION-MAKING SKILLS ARE KEY AND FUTURE DOCTORS MUST COMBINE STRONG COGNITIVE ABILITIES WITH TECHNOLOGICAL LITERACY, USING DECISION-SUPPORT TOOLS TO MAKE INDEPENDENT, CRITICAL CLINICAL JUDGMENTS IN A RAPIDLY EVOLVING, DATA-RICH ENVIRONMENT.**

**HUMAN COMPASSION WILL REMAIN IRREPLACEABLE: EMOTIONAL INTELLIGENCE, EMPATHY, AND EFFECTIVE COMMUNICATION WILL DISTINGUISH PHYSICIANS FROM MACHINES. THESE ATTRIBUTES SHOULD BE NURTURED FROM THE EARLIEST STAGES OF MEDICAL EDUCATION ALONGSIDE TEAMWORK AND LEADERSHIP SKILLS.**

relates with better functional health [14] and even that physician empathy is linked to improved outcomes for patients with chronic pain [15]. These relationships rely on human skills such as empathy, supportiveness, honesty, and the ability to listen and communicate effectively with patients and colleagues. These unique qualities, often regarded as the art of medicine [16], cannot be replicated by machines or robots. Hence, emotional and communication skills will remain essential for future doctors.

Therefore, when selecting medical school applicants, consideration should be given not only to their academic grades but also to their interpersonal abilities. This change may pose challenges for the upcoming generation of medical students, known as Generation Z and Generation Alpha. Those generations are growing up in a world increasingly dominated by electronic technology, media, and social networks. Studies have suggested that this screen-dependent generation may have weaker communication skills [17]. Therefore, there should be an emphasis on assessing communication and emotional skills during medical school admissions.

In addition, medical students should spend time with patients starting from their first year of medical school to enhance their emotional and communication skills. They should also participate in courses designed to improve these communication abilities.

As future patients become more informed and active participants in their care, these interpersonal skills will become even more critical. Physicians will be required not only to communicate clearly and empathetically but also to guide conversations with patients who arrive armed with online information, AI-generated insights, and heightened expectations for shared decision-making. Therefore, training programs must dedicate focused time and structured educational strategies to prepare students for these evolving dynamics, ensuring that communication excellence remains a core competency of the future doctor.

**HISTORY TAKING AND PHYSICAL EXAMINATION**

While technological development and data-driven decision-making are essential skills for the doctor of the future, traditional clinical skills must remain at the core of medical education. Recently, Rosenbaum [18] described the gradual decline in students’ ability to take a comprehensive medical history and perform a high-quality

physical examination, skills that have anchored clinical practice for centuries. These skills not only enable accurate diagnosis but also foster trust, communication, and meaningful doctor–patient relationships. Therefore, in addition to training in advanced digital tools, medical curricula must reinforce structured bedside teaching, physical examination techniques, and medical history taking. The future doctor must integrate technological skills with strong foundational clinical skills, ensuring that innovation enhances rather than replaces the human elements of medicine.

**TEAMWORK AND LEADERSHIP**

Much has changed since the time when one doctor was expected to know and handle all disciplines [1]. Currently, most doctors specialize through residency in a particular field, and many, especially surgeons, also undergo subspecialty training to become experts in specific areas [19].

Today’s doctors need to collaborate with physician assistants, nurses, nursing assistants, research collaborators, and secretaries. Therefore, one of the most crucial skills for future doctors will be the ability to be a team player, adept at working in multidisciplinary teams both within their own specialty and across different specialties, as well as with various professionals and disciplines. Patient-centered care necessitates a deep understanding of teamwork, including leadership across professional boundaries, tailored to the individual patient and clinical situation [19].

Medical students should learn about the different professions within the healthcare system and their roles. Courses should emphasize and encourage teamwork and leadership skills. Doctors typically receive their education in isolation from other healthcare professionals such as nurses, physiotherapists, and occupational therapists, only meeting for the first time in the medical department. This approach needs to be changed. In addition, students should engage with various communities to understand their unique healthcare needs and recognize their leadership role as future doctors.

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**COMMITMENT TO THE PROFESSION AND FLEXIBILITY**

Future doctors will come from Generation Z and Generation Alpha. These generations are independent and entrepreneurial, unafraid to take career risks and switch jobs. They prioritize work–life balance and are already

**ADAPTABILITY IS THE NEW PROFESSIONALISM: MEDICAL CAREERS MUST BALANCE DEEP COMMITMENT TO PATIENT CARE WITH FLEXIBLE PATHWAYS THAT ALLOW FOR LIFELONG LEARNING, CAREER BREAKS, AND ADAPTABILITY TO MEET FUTURE HEALTHCARE CHALLENGES.**

influencing the workforce [19]. They are driving changes in workplace culture and communication, prompting employers to reconsider their hiring practices and work culture [19].

For years, medicine has been viewed not just as a job but as a way of life [19]. Physicians cannot easily switch from one job to another. They must be dedicated to their patients and colleagues and be committed to continuous learning and development [20]. Those fundamental aspects have not changed, and during medical school admissions, candidates must show that they genuinely want to pursue a medical career and understand its demands. Thus, future doctors should be fully committed to their profession.

Conversely, troubling trends such as depression, burnout, and declining empathy have been observed among residents and consultants [21]. Thus, future physician training should encourage flexibility in work patterns and training pathways. A model that allows doctors to step away from the training path, take breaks to acquire other competencies, and pursue different interests or responsibilities, and only then resuming training should be considered. Education and training for future doctors should align with the expectations of a flexible medical career, as this is crucial for fostering adaptive change and retaining the medical workforce.

#### SUMMARY

Health systems worldwide are under pressure due to an aging population, shortages of physicians and nurses, and the economic challenges of healthcare [22-24]. Future doctors will need to address those issues [25].

Determining who will be the doctor of the future is a question that concerns not only physicians but also policymakers, universities, and hospital administrators [26-28]. In a constantly changing world, it is clear that tomorrow's doctors will not be the same as those of today. Accordingly, medical schools, residency programs, and health policies need to evolve to meet these changing needs [29,30].

In our opinion, future doctors will need strong cognitive abilities to effectively utilize technological advancements, but they will remain the decision makers. In addition, living in an era of continuous evolution in clinical practice, research, and innovation, they will be lifelong learners. While their ability to use AI, machines, and robots will be valuable, their emotional and communication skills will set them apart and make them superior to machines. Moreover, to provide patient-centered

care, they will have to be team players and leaders within their teams and communities. On one hand, they should be committed to their medical career, but on the other hand, their career path will offer more flexibility, allowing them opportunities to take breaks and pursue further learning.

In Israel, many of these modern educational principles are already being integrated into medical training. Several medical schools have adopted CBME elements, early clinical exposure, simulation-based learning, and longitudinal clerkships that strengthen history-taking, physical examination, and clinical reasoning. In addition, national initiatives such as digital health innovation programs and structured research tracks reflect the growing emphasis on training future physicians to operate effectively in data-rich, technology-enhanced healthcare environments.

#### CONCLUSIONS

Doctors of the future will require high cognitive abilities and a commitment to lifelong learning. In addition, they will need high emotional intelligence, leadership capabilities, and the ability to work well in teams. While they should be committed to their role as a doctor, they should also maintain flexibility in their career path. These qualities will help future doctors to navigate the evolving changes and challenges of the future healthcare system. Therefore, medical students and residents should be chosen and educated accordingly.

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**We're here to put a dent in the universe.**

Steve Jobs, entrepreneur and inventor (24 Feb 1955-2011), American businessman, co-inventor, and investor. Co-founder of Apple Inc.

**Capsule**

**Taking the CAR to astrocytes**

Immunotherapies targeting amyloid-β (Aβ) hold promise for the treatment of Alzheimer’s disease. **Chen** et al. developed an anti-Aβ strategy based on a chimeric antigen receptor (CAR) system called CAR-A, in which astrocytes are genetically engineered through adeno-associated viruses to express single-chain variable fragments of anti-Aβ antibodies conjugated to the intracellular domains of phagocytic receptors. In vitro and mouse in vivo testing

demonstrated the efficacy of CAR-A in reducing Aβ plaque formation through the coordinated activity of astrocytes and microglia. These results suggest that CAR-A could be effective in reducing disease progression in Alzheimer’s disease.

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