Medical education, professional development and credentialing

Introduction

Almost a decade ago, Peter Densen wrote:

> It is estimated that the doubling time of medical knowledge in 1950 was 50 years; in 1980, 7 years; and in 2010, 3.5 years. In 2020 it is projected to be 0.2 years—just 73 days. Students who began medical school in the autumn of 2010 will experience approximately three doublings in knowledge by the time they complete the minimum length of training (7 years) needed to practice medicine. Students who graduate in 2020 will experience four doublings in knowledge. What was learned in the first 3 years of medical school will be just 6% of what is known at the end of the decade from 2010 to 2020. Knowledge is expanding faster than our ability to assimilate and apply it effectively; and this is as true in education and patient care as it is in research. Clearly, simply adding more material and or time to the curriculum will not be an effective coping strategy—fundamental change has become an imperative.[1]

Since Densen published his predictions, the pace of change in medical education has continued to be a topic of focus and discussion and can be framed as a disruption to traditional instructional methods and timelines. The AMA has long demonstrated a commitment to developing and supporting disruptive advancements in medical education, both autonomously and in partnership with others. This commitment can be seen in the Council on Medical Education's contributions to the 1910 Flexner Report, the establishment of many of the leading U.S. medical education organizations that exist today, the groundbreaking Accelerating Change in Medical Education Consortium, the newly launched Reimagining Residency initiative, and enhanced e-learning content design and delivery. It is therefore appropriate that the AMA now begin work on a body of policy and thoughtful guidance related to AI in medical education, especially as Policy H-480.940, Resolution 317-A-18, and the CLRPD's Primer on Artificial and Augmented Intelligence have clearly demonstrated the urgent need for policy in this area.

Policy

1. Our American Medical Association (AMA) encourages accrediting and licensing bodies to study how AI should be most appropriately addressed in accrediting and licensing standards.
2. Our AMA encourages medical specialty societies and boards to consider production of specialty-specific educational modules related to AI.
3. Our AMA encourages research regarding the effectiveness of AI instruction in medical education on learning and clinical outcomes. (Directive to Take Action)
4. Our AMA encourages institutions and programs to be deliberative in the determination of when AI-assisted technologies should be taught, including consideration of established evidence-based treatments, and including consideration regarding what other curricula may need to be eliminated in order to accommodate new training modules.
5. Our AMA encourage stakeholders to provide educational materials to help learners guard against inadvertent dissemination of bias that may be inherent in AI systems.

6. Our AMA encourage the study of how differences in institutional access to AI may impact disparities in education for students at schools with fewer resources and less access to AI technologies.
7. Our AMA encourage enhanced training across the continuum of medical education regarding assessment, understanding, and application of data in the care of patients.
8. Our AMA encourage the study of how disparities in AI educational resources may impact health care disparities for patients in communities with fewer resources and less access to AI technologies.
9. Our AMA encourage institutional leaders and academic deans to proactively accelerate the inclusion of nonclinicians, such as data scientists and engineers, onto their faculty rosters in order to assist learners in their understanding and use of AI.
10. Policy D-295.328, "Promoting Physician Lifelong Learning," is reaffirmed. (Reaffirm HOD Policy)
11. Our AMA encourages close collaboration with and oversight by practicing physicians in the development of AI applications.

Discussion

As with many previously introduced technologies, the potential benefits, risks, and unknowns of incorporating AI into medical education have yet to be fully revealed. The promise of AI in medical education includes the potential for enhanced learning, ultimately resulting in benefit to patients; efficiency gains achieved via a reallocation of physician time; further development of physicians' emotional intelligence skills due to a reduced need to focus on automatable tasks; and enhanced learner evaluations, including the ability to assess competencies prospectively, accurately, and continuously, leading to greater facilitation of independent learning and an elimination of the "stop and test" mindset. Just-in-time assessments and learning interventions may assist with progression through competencies. In the context of the AMA's current focus on health systems science, AI promises to enable more encompassing systems analyses and quality improvement approaches and to introduce computational modeling that may replace cycles of iterative improvements. Additionally, AI in medicine may aid instruction in and delivery of care to rural or otherwise underserved locations.

Concerns, however, also exist, such as the possibility of physician de-skilling as more cognitive tasks are performed by AI; an unintentional reinforcement of health disparities,[2] both in terms of patient health outcomes and for clinicians practicing in less resourced clinical environments; the potential loss of physician humanism and further deterioration of physicians' bedside skills; and the risk of overutilization of AI-delivered care, such as the use of technology for the sake of using technology and the risk of adding to, rather than replacing items in, the curriculum.

Unknowns range from implications for learner wellness to concerns regarding exposure of gaps in faculty knowledge. Incorporation of AI in medical education may streamline learning and clinical workflow, gifting additional time to learners that can be used to focus on patients and self; however, it also has the potential to do the opposite, disrupting and displacing traditional instructional techniques without clear benefits to learners or patients. Other unknowns include the effects of AI on the teaching/modeling of professional judgment; medicolegal and ethical concerns; and rapidly changing regulatory modernization models.

The exposure of gaps in faculty knowledge of AI is already being documented; these gaps may be inhibiting learners who have an active interest in AI applications but lack exposure to knowledgeable faculty to help them understand, access, and apply them. For example, a 2015 publication[3] noted that 30 percent of U.S. medical student survey respondents had interest in clinical informatics, but were not able to identify training opportunities to assist in meeting this desire to learn. These knowledge gaps, however, should not be solely characterized in a negative fashion, as they also present important opportunities for professional development and pave the way for the introduction of new types of instructors into the medical education environment. Gonzalo et al.[4] acknowledge these points, noting the importance of focusing not only on expanding the knowledge base/skill set of current educators, but also of employing a new cohort of educators with skills in new areas. The Council on Medical Education agrees with this characterization and believes that institutional leaders and academic deans must proactively accelerate their inclusion of nonclinicians, such as data scientists and engineers, onto their faculty rosters.

Investments in AI

Private funding of AI technologies has exploded in recent years. One source estimates that the AI health market will grow to $6.6 billion by 2021 and exceed $10 billion by 2024.[5] Another estimate places AI-driven GDP growth at $15.7 trillion by 2030.[6]

The U.S. House of Representatives' Committee on Oversight and Reform, Subcommittee on Information Technology, has specifically noted that one of the benefits of increased U.S. funding for AI research and development would be the ability to fund more graduate students, which in turn would expand the future U.S. AI workforce. On February 11, 2019, President Donald J. Trump issued an Executive Order on Maintaining American Leadership in Artificial Intelligence, which, acknowledges that "[c]ontinued American leadership in AI is of paramount importance to maintaining the economic and national security of the United States and to shaping the global evolution of AI in a manner consistent with our Nation's values, policies, and priorities," and notes that the United States "must train current and future generations of American workers with the skills to develop and apply AI technologies to prepare them for today's economy and jobs of the future." This training will be achieved through "apprenticeships; skills programs; and education in science, technology, engineering, and mathematics (STEM), with an emphasis on computer science, to ensure that American workers, including Federal workers, are capable of taking full advantage of the opportunities of AI."[7]

Additionally, the Centers for Medicare & Medicaid Services has recently committed to investment in this area and has launched an Artificial Intelligence Health Outcomes Challenge,[8] with the goal of "exploring how to harness AI to predict health outcomes that are important to patients and clinicians, and to enhance care delivery."

AI and Education

At the practical level, it is important to distinguish between AI as a topic of study itself and in the instruction of learners regarding use of existing tools and applications. Furthermore, it is important to acknowledge that educating students and physicians in the practical use of specific AI technologies is not necessarily equivalent to educating students and physicians to understand how the technology works or how to evaluate its applicability, appropriateness, and effectiveness with respect to patient care.

An additional consideration will be the need for learners and physicians to adjust their receptivity to machine-recommended learning or clinical actions. The need for this receptivity may in turn spark a discussion regarding the kind of student who should be recruited to enter the profession. Traditionally, while multiple domains of ability have been valued, a premium has been placed on individual mastery of knowledge. Learners who excel at this type of knowledge, however, may not be the same kind of learners who interact effectively with AI systems. Even if learners are receptive to this type of practice, a rise in learning and practice that is less supervised by human instructors and colleagues and more interactive with non-human technologies may negatively impact patient care if recruits to the profession are not able to maintain patient communication and develop critical evaluation skills.

Recent scholarly work has documented this shift in thinking with respect to the goals of medical education.[9] Newer thinking acknowledges the rapid pace of change and emphasizes the need for physicians to analyze, categorize, contextualize, seek, find, and evaluate data and place these data in clinical context, and highlights the position that critical reasoning skills are imperative. Wartman and Combs argue that the physician of the future will require a shift in professional identity, which must be embraced early on in medical education.11 Furthermore, the dawn of precision medicine introduces treatment possibilities that require physicians flexible enough to think beyond established treatment protocols.11 These changes require parallel changes in the way medical students, residents, fellows, instructors, and practicing physicians are taught and, in turn, teach.

Accreditation and licensure implications

Profound changes to established medical educational content, as well as to methods of instruction, necessitate considered and reflective responses from those organizations that focus on accreditation and licensure. Yet the response in this area regarding the implications of AI in medical education has been varied.

The Liaison Committee on Medical Education (LCME) does not specifically address AI, but several of its standards relate to these concepts:

- Standard 4.1, Sufficiency of Faculty, requires that "A medical school has in place a sufficient cohort of faculty members with the qualifications and time required to deliver the medical curriculum and to meet the other needs and fulfill the other missions of the institution."
- Standard 4.5, Faculty Professional Development, notes, "A medical school and/or its sponsoring institution provides opportunities for professional development to each faculty member in the areas of discipline content, curricular design, program evaluation, student assessment methods, instructional methodology, and research to enhance his or her skills and leadership abilities in these areas."
- Standard 5.4, Sufficiency of Buildings and Equipment, states that "A medical school has, or is assured the use of, buildings and equipment sufficient to achieve its educational, clinical, and research missions."
- Standard 5.6, Clinical Instructional Facilities/ Information Resources, requires that "Each hospital or other clinical facility affiliated with a medical school that serves as a major location for required clinical learning experiences has sufficient information resources and instructional facilities for medical student education."
- Standard 5.9, Information Technology Resources/ Staff, states that "A medical school must provide access to well-maintained information technology resources sufficient in scope to support its educational and other missions." Further, information technology staff must have "sufficient expertise to fulfill its responsibilities and is responsive to the needs of the medical students, faculty members, and others associated with the institution."
- Standard 6.3, Self-Directed and Life-Long Learning, requires that "The faculty of a medical school ensure that the medical curriculum includes self-directed learning experiences and time for independent study to allow medical students to develop the skills of lifelong learning. Self-directed learning involves medical students' self-assessment of learning needs; independent identification, analysis, and synthesis of relevant information; and appraisal of the credibility of information sources."

Commission on Osteopathic College Accreditation (COCA) standards are similar:

- Standard 4, Facilities, states that "A COM [college of osteopathic medicine] must have sufficient physical facilities, equipment, and resources for clinical, instructional, research, and technological functions of the COM. These resources must be readily available and accessible across all COM locations to meet its needs, the needs of the students consistent with the approved class size, and to achieve its mission."
- Element 4.3, Information Technology, states that "A COM must ensure access to information technology to support its mission."
- Element 4.4, Learning Resources, requires that "A COM must ensure access to learning resources to support its mission."
- Element 6.7, Self-Directed Learning, requires that "A COM must ensure that the curriculum includes self-directed learning experiences and time for independent study to allow students to develop skills for lifelong learning. Self-directed learning includes students' self-assessment of learning needs; independent identification, analysis, and synthesis of relevant information; and appraisal of the credibility of sources of information."
- Element 7.1, Faculty and Staff Resources and Qualifications, states that "At all educational teaching sites, including affiliated sites, a COM must have sufficient faculty and staff resources to achieve the program mission, including part time and adjunct faculty, and preceptors who are appropriately trained and credentialed. The physician faculty, in the patient care environment, must hold current medical licensure and board certification/ board eligibility. The non-physician faculty must have appropriate qualifications in their fields."
- Element 7.6, Faculty Development, states that "A COM must develop and implement an ongoing needs-based, assessment-driven, faculty development program that is in keeping with the COM's mission."

Licensing exams of the National Board of Medical Examiners and the National Board of Osteopathic Medical Examiners do not specifically cover AI.[10] However, the benefits of AI-driven assessments for test preparation and scoring should be further explored, and their potential impacts on costs and student travel/time calculated, in addition to consideration of their inclusion as a topic area in exam content.

The Federation of State Medical Boards (FSMB) recently hosted a conference related to AI and potential impacts on state medical boards. AI can potentially be used to improve physician verification of licensing and credentials. Changes to state medical practice acts and/or model legislation may need to be studied to prepare for AI-driven changes to the practice of medicine.

The Common Program Requirements of the Accreditation Council for Graduate Medical Education (ACGME) do not specifically identify AI, but, as with UME standards from the LCME and COCA, related topics are addressed. Section VI.A.1.b).(2) notes that "access to data is essential to prioritizing activities for care improvement and evaluating success of improvement efforts." Also, Section VI.A.1.b).(2).(a) notes that "residents and faculty members must receive data on quality metrics and benchmarks related to their patient populations." Perhaps a more natural fit for addressing AI at the GME level could be applied through the pathways framework of the ACGME's Clinical Learning Environment Review (CLER) program, which offers programmatic feedback on the topics of patient safety, health care quality, care transitions, supervision, duty hours and fatigue management/mitigation, and professionalism.[11] Data science could be integrated into pathways for each focus area to support learners' exposure to AI-driven changes in clinical practice. Additionally, individual specialty milestones may be an appropriate location for introduction of artificial/augmented intelligence-driven technologies, many of which are specialty-specific.

None of the member boards of the American Board of Medical Specialties (ABMS) currently require education in AI activities for continuing certification credit. However, five boards[12]—the American Board of Anesthesiology, American Board of Emergency Medicine, American Board of Nuclear Medicine, American Board of Obstetrics and Gynecology, and American Board of Pathology—do accept simulation-based activities for their continuing certification Improvement in Medical Practice requirements (although it is important to note that simulation can be conducted without AI algorithms). In addition, the American Board of Family Medicine has several optional online simulated cases that can count toward meeting Lifelong Learning and Self-Assessment activities. The American Board of Internal Medicine also recognizes some simulation activities for Improvement in Medical Practice through a collaboration with the Accreditation Council for Continuing Medical Education. Finally, the ABMS has established a new pathway for a subspecialty fellowship in clinical informatics, which is hosted through the American Board of Preventive Medicine.

At the continuing professional development level, AI offers great potential to create precision education via further investments in the adaptive quizzing model, which builds upon current trends in digital portfolios to support responsive assessments and prompts learners to assess specific skills at desired time points. Tailored educational content can be delivered to clinicians at precise moments in time, and AI-driven technologies may better identify the learning needs of busy clinicians than the clinicians themselves.

AI in medical education: A current snapshop

An LCME survey from the 2016-2017 academic year included a question asking institutions to indicate whether computer-based simulators (such as virtual dissection simulation) were used in various disciplines to assist students in learning or reviewing relevant anatomy. Of 145 respondents, 78 indicated simulators were used in gross anatomy, 65 in neuroanatomy/neurosciences, 42 in general surgery, 40 in obstetrics-gynecology, and 26 in surgical subspecialties (respondents could select more than one option).

Multiple forms of AI have been incorporated into medical education training, ranging from basic introductory courses in core data science and algorithm fundamentals to artificial intelligence certificate programs and dual areas of study (MD/DO plus data science, programming, statistics, informatics, or biomedical engineering). The overall extent to which these topics currently have been incorporated into medical education, however, is more difficult to quantify. The following list of examples, while not comprehensive, is meant to highlight the breadth and depth of current/planned utilization of AI in medical education today.

- The Duke Institute for Health Innovation (DIHI), which includes an incubator for health technology innovation, involves medical students in a program that joins clinical, quantitative, and data expertise to create care-enhancement technologies. DIHI students and instructors also work to ensure that AI innovations are not being applied to physicians, but rather developed by and for physicians, and that such innovations support improved models of care and incorporate machine learning into clinical processes. One example of an AI application is early identification of disease progression (such as kidney failure or sepsis).

- The radiology department at the University of Florida has entered into a partnership with a cancer-focused technology firm to develop computer-aided detection (CAD) tools for mammographers. Radiologists, including resident physicians, will be involved in the evaluation of trial technologies, which are intended to flag areas of interest in breast imaging. Residents also will participate in training and validating algorithms.
- The Carle Illinois College of Medicine in Urbana-Champaign, self-described as the first engineering-based college of medicine, seeks to leverage technology by offering a curriculum in which all courses are designed by a scientist, a clinical scientist, and an engineer. Engineering and technology comprise components of all classes, and clinical rounds are completed with both clinical and engineering faculty. The inaugural class will graduate in 2022.
- The Sharon Lund Medical Intelligence and Innovation Institute (MI3) at Children's Hospital of Orange County (CHOC) seeks to cultivate artificial intelligence methodologies and advances in genomic medicine, regenerative medicine, robotics, nanotechnology, and medical applications/devices. The MI3 Summer Internship Program at CHOC offers immersive experiences in genomic and personalized medicine, regenerative medicine and stem cells, nanomedicine, robotics and robotic surgery, artificial intelligence and big data, medical devices and mobile technology, and innovations in health care delivery. This program directly supports the pipeline of clinicians with exposure to AI technologies by inviting high school, college, graduate school, and medical school students to apply.
- The Institute for Innovations in Medical Education at New York University (NYU) Langone Health supports a multidisciplinary team of educators, scientists, informaticians, and software developers who apply informatics to teaching, learning, and assessment. NYU's technology-based Health Care by the Numbers curriculum trains students in the use of "big data" to provide holistic, population health management that improves quality and care coordination.
- The Machine Learning and Healthcare Lab at Johns Hopkins uses statistical machine learning techniques to develop new diagnostic and treatment planning tools that provide reliable inferences to help physicians make individualized care decisions.
- Stanford University's Center for Artificial Intelligence in Medicine and Imaging develops, assesses, and disseminates artificial intelligence systems to benefit patients. Graduates and post-graduates are involved in solving imaging problems using machine learning and other techniques. Stanford also offers a mini-curriculum leading to an Artificial Intelligence Graduate Certificate.
- The Human Diagnosis Project, a partnership of the AMA, the ABMS, and multiple academic centers, is an educational collaboration that sources knowledge via the submission of clinical cases from international medical professionals to create models of care that can be accessed by clinicians and learners worldwide.
- Addressing the paradigm shift in medical education, the University of Texas Dell Medical School does not support a chair of radiology or pathology; rather, leadership has identified and employed a chair of diagnostic medicine.
- The University of Virginia Center for Engineering in Medicine works, as stated in its mission, to generate and translate innovative ideas at the intersection of engineering and medicine. In this collaborative training environment, medical and nursing students are embedded in engineering labs, and engineering students are embedded in clinical environments.
- The College of Artificial Intelligence at the Massachusetts Institute of Technology focuses on interdisciplinary artificial intelligence education in biology, chemistry, history, linguistics, and ethics and is intended to bridge gaps between computer science and other areas.
- The AMA is expanding its educational resources related to AI in medicine to offer an educational module that provides the history, definitions, and components related to AI in health care, as well as a newly developed and continuously evolving website related to augmented intelligence in medicine, which provides resources, insights, and education. Furthermore, the February 2019 Issue of the AMA's Journal of Ethics was devoted entirely to the ethical implications of AI.

International Attitudes

Steps also are being taken internationally to support the use of AI in medical education. For example, virtual patients are currently being used in medical schools in a number of European countries,[13] and individual schools offer programming in AI, such as the University of Toronto's elective, 14-month Computing for Medicine certificate course.[14]

It is interesting and important to note that attitudes regarding and progress toward use of AI in medical education and clinical treatment vary significantly internationally. Vayena et al. note a recent United Kingdom survey reporting that "63% of the adult population is uncomfortable with allowing personal data to be used to improve healthcare and is unfavorable to artificial intelligence (AI) systems replacing doctors and nurses in tasks they usually perform. Another study, conducted in Germany, found that medical students—the doctors of tomorrow—overwhelmingly buy into the promise of AI to improve medicine (83%) but are more skeptical that it will establish conclusive diagnoses in, for instance, imaging exams (56% disagree). When asked about the prospects of AI, United States decision-makers at healthcare organizations are confident that it will improve medicine, but roughly half of them think it will produce fatal errors, will not work properly, and will not meet currently hyped expectations."[15]

According to a recent survey[16] of general practitioners in the United Kingdom, 68 percent felt that "future technology" would never fully replace human physicians in diagnosis of patients, 61 percent said this technology would never fully replace human physicians when referring to specialists, 61 percent said this technology would never develop personalized treatment plans, and 94 percent said it would never deliver empathetic care. A higher percentage (80 percent) did believe, however, that future technology would be able to replace human physicians to perform documentation.

A 2018 survey of German medical students found that 68 percent were unaware of the specific technologies being used in radiology AI; 56 percent thought AI would not perform well enough to establish a definite diagnosis; 86 percent thought AI would improve radiology, and 83 percent disagreed that AI would replace human radiologists (96.6 percent disagreed that AI would replace human physicians generally). Further, 70.1 percent felt AI should be included in training (interestingly, 20.5 percent mostly disagreed with this statement, and 4.9 percent disagreed entirely).[17]

While European mores may not be translatable to faculty, learners, and patients in the United States, these findings are excellent reminders that different populations—in terms of race, ethnicity, gender, age, socioeconomic background, level of education, and geographic location—not only may have different levels of familiarity and comfort with these new technologies, but also may have different expectations and desires with regard to how or even whether these technologies should be applied. Physicians will need to augment their communication skills to help patients receive the best, personalized treatments that may be enhanced or delivered entirely by AI technologies.

Review of additional research

A paper regarding the biannual Artificial Intelligence in Medicine (AIME) conference in Europe, established in 1985, analyzed the content of papers published in AIME's proceedings; the first six years the topic of knowledge engineering appeared most frequently. Post-2000, machine learning and data mining were covered most frequently. Natural language processing was covered more frequently moving towards 2010, as was research related to ontologies and terminologies.[18]

Kolachalama and Garg note that between 2010 and 2017, relatively little research was published on this topic related to UME and GME. They describe a combined search using the MeSH terms "machine learning" and "graduate medical education" between 2010 and 2017, which resulted in 16 publications, and note, "Detailed review of these papers revealed that none of them were actually focused on ML education for medical professionals."[10]

More research can be found related to virtual reality and augmented reality. A 2016 paper[19] found that learning outcomes improved more for students utilizing an online three-dimensional interactive learning tool (when compared to gross anatomy resources) for neuroanatomy education. Virtual reality and augmented reality have been found to enhance neurosurgery residents' skills while reducing risk to patients, and are also helpful for preoperative planning. Virtual reality and augmented reality also can increase learner engagement and enhance spatial knowledge.[20]

Relevant AMA policy

AMA policy H-480.940, "Augmented Intelligence in Health Care," asks our AMA to promote development of thoughtfully designed, high-quality, clinically validated health care AI that encourages education for patients, physicians, medical students, other health care professionals, and health administrators to promote greater understanding of the promise and limitations of health care AI.

Policy D-295.330, "Update on the Uses of Simulation in Medical Education," encourages ongoing research and assessment regarding the effectiveness of simulation in teaching and assessment, and encourages accrediting bodies to ensure their policies are reflective of appropriate simulation use.

See the Appendix for a full list of relevant policies.

Summary and recommendations

As stated in BOT Report 41-A-18, "To reap the benefits for patient care, physicians must have the skills to work comfortably with health care AI. Just as working effectively with EHRs is now part of training for medical students and residents, educating physicians to work effectively with AI systems, or more narrowly, the AI algorithms that can inform clinical care decisions, will be critical to the future of AI in health care." While it is certainly true that physicians and physicians in training must embrace the skills and attitudes that will allow them to care for patients with assistive technologies, it is also true, as noted by Patel et al., that "[a]ll technologies mediate human performance. Technologies, whether they be computer-based or in some other form, transform the ways individuals and groups behave. They do not merely augment, enhance or expedite performance, although a given technology may do all of these things. The difference is not one of quantitative change, but one that is qualitative in nature. Technology, tools, and artifacts not only enhance people's ability to perform tasks but also change the way they perform tasks."[21]

Appendix: Relevent AMA Policy

D-295.328, "Promoting Physician Lifelong Learning"

1. Our AMA encourages medical schools and residency programs to explicitly include training in and an evaluation of the following basic skills:
   (a) the acquisition and appropriate utilization of information in a time-effective manner in the context of the care of actual or simulated patients;
   (b) the identification of information that is evidence-based, including such things as data quality, appropriate data analysis, and analysis of bias of any kind;
   (c) the ability to assess one's own learning needs and to create an appropriate learning plan;
   (d) the principles and processes of assessment of practice performance;
   (e) the ability to engage in reflective practice.

2. Our AMA will work to ensure that faculty members are prepared to teach and to demonstrate the skills of lifelong learning.

3. Our AMA encourages accrediting bodies for undergraduate and graduate medical education to evaluate the performance of educational programs in preparing learners in the skills of lifelong learning.

4. Our AMA will monitor the utilization and evolution of the new methods of continuing physician professional development, such as performance improvement and internet point-of-care learning, and work to ensure that the methods are used in ways that are educationally valid and verifiable.

5. Our AMA will continue to study how to make participation in continuing education more efficient and less costly for physicians.

D-295.313, "Telemedicine in Medical Education"

1. Our AMA encourages appropriate stakeholders to study the most effective methods for the instruction of medical students, residents, fellows and practicing physicians in the use of telemedicine and its capabilities and limitations.

2. Our AMA will collaborate with appropriate stakeholders to reduce barriers to the incorporation of telemedicine into the education of physicians and other health care professionals.

3. Our AMA encourages the Liaison Committee on Medical Education and Accreditation Council for Graduate Medical Education to include core competencies in telemedicine in undergraduate medical education and graduate medical education training.

D-295.330, "Update on the Uses of Simulation in Medical Education"

Our AMA will:

1. continue to advocate for additional funding for research in curriculum development, pedagogy, and outcomes to further assess the effectiveness of simulation and to implement effective approaches to the use of simulation in both teaching and assessment;
2. continue to work with and review, at five-year intervals, the accreditation requirements of the Liaison Committee on Medical Education (LCME), the Accreditation Council for Graduate Medical Education (ACGME), and the Accreditation Council for Continuing Medical Education (ACCME) to assure that program requirements reflect appropriate use and assessment of simulation in education programs;
3. encourage medical education institutions that do not have accessible resources for simulation-based teaching to use the resources available at off-site simulation centers, such as online simulated assessment tools and simulated program development assistance;
4. monitor the use of simulation in high-stakes examinations administered for licensure and certification as the use of new simulation technology expands;
5. further evaluate the appropriate use of simulation in interprofessional education and clinical team building; and
6. work with the LCME, the ACGME, and other stakeholder organizations and institutions to further identify appropriate uses for simulation resources in the medical curriculum.

H-315.969, "Medical Student Access to Electronic Health Records"

Our AMA:

(1) recognizes the educational benefits of medical student access to electronic health record (EHR) systems as part of their clinical training;

(2) encourages medical schools, teaching hospitals, and physicians practices used for clinical education to utilize clinical information systems that permit students to both read and enter information into the EHR, as an important part of the patient care team contributing clinically relevant information;

(3) encourages research on and the dissemination of available information about ways to overcome barriers and facilitate appropriate medical student access to EHRs and advocate to the Electronic Health Record Vendors Association that all Electronic Health Record vendors incorporate appropriate medical student access to EHRs;

(4) supports medical student acquisition of hands-on experience in documenting patient encounters and entering clinical orders into patients' electronic health records (EHRs), with appropriate supervision, as was the case with paper charting;

(5) (A) will research the key elements recommended for an educational Electronic Health Record (EHR) platform; and (B) based on the research--including the outcomes from the Accelerating Change in Medical Education initiatives to integrate EHR-based instruction and assessment into undergraduate medical education--determine the characteristics of an ideal software system that should be incorporated for use in clinical settings at medical schools and teaching hospitals that offer EHR educational programs;

(6) encourage efforts to incorporate EHR training into undergraduate medical education, including the technical and ethical aspects of their use, under the appropriate level of supervision;

(7) will work with the Liaison Committee for Medical Education(LCME), AOA Commission on Osteopathic College Accreditation (COCA) and the Accreditation Council for Graduate Medical Education (ACGME) to encourage the nation's medical schools and residency and fellowship training programs to teach students and trainees effective methods of utilizing electronic devices in the exam room and at the bedside to enhance rather than impede the physician-patient relationship and improve patient care; and

(8) encourages medical schools and residency programs to: (a) design clinical documentation and electronic health records (EHR) training that provides evaluative feedback regarding the value and effectiveness of the training, and, where necessary, make modifications to improve the training; (b) provide clinical documentation and EHR training that can be evaluated and demonstrated as useful in clinical practice; and (c) provide EHR professional development resources for faculty to assure appropriate modeling of EHR use during physician/patient interactions.

H-480.940, "Augmented Intelligence in Health Care"

As a leader in American medicine, our AMA has a unique opportunity to ensure that the evolution of augmented intelligence (AI) in medicine benefits patients, physicians, and the health care community.

To that end our AMA will seek to:

1. Leverage its ongoing engagement in digital health and other priority areas for improving patient outcomes and physicians' professional satisfaction to help set priorities for health care AI.
2. Identify opportunities to integrate the perspective of practicing physicians into the development, design, validation, and implementation of health care AI.
3. Promote development of thoughtfully designed, high-quality, clinically validated health care AI that:

   a. is designed and evaluated in keeping with best practices in user-centered design, particularly for physicians and other members of the health care team;
   b. is transparent;
   c. conforms to leading standards for reproducibility;
   d. identifies and takes steps to address bias and avoids introducing or exacerbating health care disparities including when testing or deploying new AI tools on vulnerable populations; and
   e. safeguards patients' and other individuals' privacy interests and preserves the security and integrity of personal information.

4. Encourage education for patients, physicians, medical students, other health care professionals, and health administrators to promote greater understanding of the promise and limitations of health care AI.
5. Explore the legal implications of health care AI, such as issues of liability or intellectual property, and advocate for appropriate professional and governmental oversight for safe, effective, and equitable use of and access to health care AI.

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