Clinical and Experimental Obstetrics & Gynecology

Clin. Exp. Obstet. Gynecol. **2023**; 50(4): 83
https://doi.org/10.31083/j.ceog5004083

Opinion

Possible Implications of Artificial Intelligence on Obstetrics and Gynecology and Medicine in the Next Few Decades

Michael H. Dahan[1,*], David Ardman[2], Seang Lin Tan[1,3]

[1]Department of Obstetrics and Gynecology, Royal Victoria Hospital, McGill University, Montreal, QC H3A 0G4, Canada
[2]Research and Development, Nuance Communications, Division of Microsoft Corp. Montreal, QC H3A 3S7, Canada
[3]Originelle, Fertility Clinic and Women's Health Center, Montreal, QC H4A3J3, Canada
*Correspondence: dahanhaim@hotmail.com (Michael H. Dahan)
Academic Editor: Luca Roncati
Submitted: 7 August 2022 Revised: 28 November 2022 Accepted: 15 December 2022 Published: 19 April 2023

Abstract

Artificial intelligence will change work for most people in significant and unexpected fashions in the next few decades. A change similar to that seen with the industrial revolution of the 19th century. Certain jobs will cease to exist while new employment will be created. The implication of this transformation in medicine and obstetrics and gynecology in particular needs discussion, as it stands it is anxiety-provoking. Artificial intelligence will have implications on the number of physicians needed in certain specialties, the workloads of those physicians, and the ease of accessing information. In the field of reproductive endocrinology, artificial intelligence is already being used to select embryos with the greatest potential for implantation. Who will develop that technology and the drivers for development will also be considered. Physicians, insurance companies, and other funders of health care need to be informed to anticipate and prepare for these changes. As such we will discuss anticipated changes in the near future to be initiated by artificial intelligence, we anticipate physician quality of life will improve while the demonstrated anxiety is unfounded.

Keywords: artificial intelligence; medicine; physician shortage; future; altered workflow; gynecology

1. Introduction

The American Medical Association (AMA), predicts that a significant physician shortage is expected by 2032 [1]. The projected shortfalls range between 21,100–55,200 for primary care, and between 24,800–65,800 for non-primary care specialties [1]. The role of Artificial Intelligence (AI) in reducing this shortage has been minimally considered. Whether this advancement in AI will filter into medicine will depend on the commercial incentive for private industry to invest the time and money, protectionism of medical authorities, health care budgets, and the rate of acceptance by insurance and legal entities. We have written this opinion article to debate some of these issues.

2. Discussion

Several companies are working on automating the physician's workflow starting with document generation after an appointment with a patient. This is referred to as Ambient Clinical Intelligence. Over time such a physician's companion system can be expected to incorporate commands which provide the physicians faster access to knowledge (*i.e.*, physician verbal question to the SIRI-like device: "What antibiotics medication did I prescribe this patient in the past?" and lower risk of infection through the hands-free operation of medical devices in sterile environments. Already, companies are marketing systems that listen to the physician-patient discussion, extract the pertinent information, and generate the note for that visit, automatically. These systems can generate time off work notes for patients or fill in insurance forms. This system as marketed by Microsoft Corporation has recently incorporated treatment decisions, after listening to the physician-patient interaction. As information is gathered by this AI system, its capabilities will grow, possibly the beginning of an artificial physician.

AI may also play a role in modeling outcomes of clinical studies being able to determine the success of experimental medical interventions. However, it will likely be many years before the data sets are sufficiently robust that computers can replace humans as investigational subjects. However, in obstetrics, such findings may be particularly relevant since we cannot justify exposing unborn children to new medications with possible risks of teratogenicity.

Image analysis appears to be a straightforward application of AI. Google developed a method for AI models to spot four findings on human chest X-rays [2]. These findings included pneumothorax, nodules or masses, bone fractures, and airspace opacities. This technology, which was described in the journal Nature, was at least as successful as human radiologists [2]. A second article also published in Nature evaluated an AI-based method of evaluating mammograms. In that study, the AI surpassed human experts in breast cancer prediction [3]. This AI model evaluated a large representative dataset from the UK and a large, enriched dataset from the USA. The AI model demonstrated an absolute reduction of 5.7% and 1.2% (USA and UK) in false positives and 9.4% and 2.7% in false negatives when reading mammograms as compared to radiologists [3]. The AI system was evaluated with a receiver operator curve and outperformed human readers [3] by 11.5% when comparing the area under the curves [3]. The evaluation of adnexal masses by ultrasound is another area where AI will play a role. AI being better able than humans to encompass image parameters (*i.e.*, simple vs complex, and different types of complexities), further factoring in the size of the mass and risk factors of the patient, to generate a risk score of ovarian malignancy. An article suggested that "This overwhelming technological development has not come without the introduction of an element of fear within the field of radiological science" "as some radiology professionals' question whether AI will replace the need for trained radiologists" [4]. The accuracy of the current AI platforms for evaluating imaging studies will only improve. This technology could place radiologists' jobs in jeopardy. Alternatively, AI evaluations of radiograms will free up radiologist time to perform technically challenging procedures including guided biopsies and complex ultrasonography. Current state-of-the-art technologies automate the findings, but not the radiologist's role in making the diagnosis and prescribing follow-up treatment, although this could easily be integrated into AI systems. Clearly, AI-assisted diagnosis will be widely used, such as lung nodule recognition, diabetes retinopathy diagnosis, evaluation of pathology specimens, etc.

However, there will be challenges related to the application of AI in medicine, as the following example illustrates. Usually, the eye examination of diabetic patients is performed by an ophthalmologist analyzing the fundus. To this end, Google researchers created a data set of 128,000 images, each of which records the evaluation results of 3–7 ophthalmologists. The initial result from this data set demonstrated that the diagnostic performance of Google's algorithm could achieve 90% accuracy in diagnosis, which is comparable to ophthalmologists [5]. However, in a second clinical study which was performed in Thailand, the results were severely hampered by local technology which could only generate low-quality fundal images, slow internet speeds, and limited connectivity [6]. Worldwide current system requirements may limit applications of this technology, with wealthier countries more ready to adopt AI in medicine.

AI in reproductive endocrinology is already being used. There are AI platforms using incubators (Embryoscope + Artificial Intelligence system, Vitrolife Group, Göteborg, Sweden) with the capability to image serially the embryos during an *in vitro* fertilization (IVF) cycle and based on parameters including times to cleavage, select the embryos with the greatest potential to generate a pregnancy. There are systems for automated embryo vitrification and intracytoplasmic sperm injection with other systems for automated oocyte vitrification in development.

An AI system with treatment plan capability is currently marketed by IBM corporation, called Watson for oncology [7]. In theory, Watson Oncology would use the capabilities of a supercomputer to evaluate and incorporate massive amounts of research data related to oncology care and outcomes, including clinical guidelines. Watson Oncology is being developed in cooperation with physicians from the Memorial Sloan Kettering cancer center. However, as it stands the computer's recommendations are not based on its own generated recommendations instead it is based on training by human overseers [8]. These overseers inputted information on how patients with certain oncologic profiles should be treated. It currently uses human opinions to come to treatment algorithms that are not always evidence-based [8]. An article states that "STAT found that the system (Watson Oncology) doesn't create new knowledge and is artificially intelligent only in the most rudimentary sense of the term" [9]. The recommendations of Watson Oncology are complicated by regional variations in care and resource allocations, changing algorithms of care when you compare country to country for the same oncologic disease. However, some hope for the future has come out of Watson oncology including a study that demonstrated that when 1000 women in India with breast, lung, or colon cancer were evaluated by Watson oncology the "members of a multidisciplinary tumor board at Manipal Comprehensive Cancer Center changed their treatment decisions in 13.6% of the cases" [9]. The reasons for these changes were evidence for newer treatment in 55% of cases and better-personalized alternatives in 30% of cases [10]. The current limitation seen with Watson Oncology will not remain an issue indefinitely for AI systems. Systems will be developed that can evaluate medical studies and incorporate data analysis developing its own algorithms in oncology among other fields. Without a doubt, these types of AI systems will improve and become at least as competent as living physicians [7]. The ability to integrate large quantities of medical information, review the thousands of articles published in certain medical fields, and based on that data generate a treatment plan, is ideally suited for machine learning.

AI systems could request information on symptoms, which could then be linked to algorithms for testing, and the results of these tests would be introduced into the AI entity to obtain diagnoses. An AI "physician" would then be able to plan care and even print out prescriptions if the local medical authority would permit. Hypothetically, instead of going to see a primary caregiver, a patient could log in to this AI "physician" system and get treated from home, for simple medical issues and be referred to the hospital by the AI system when there is a risk of more significant issues unknown to the patient. Such a system could be available at all hours of the day with minimal wait time for patient access. Time and cost-saving associated with such a system would be extensive, for both the patient and the insurance companies or health care payer. In fact, such a system, be it rudimentary, is already marketed by Microsoft.

The need for care and empathy will not disappear in medicine and will not likely adequately be performed by a robot or a remote projection of a caregiver. This experience was best indicated by what occurred at the Kaiser Permanente group in California which used a robot with a screen hooked up to a projection of a physician in a remote location telling a cancer patient that they had reached the end of treatment options [11]. This was not palatable to either the patient or his family. We believe that the warm touch of a person and their caring presence and attitude is extremely important in these types of situations.

We believe that AI systems will ultimately be less expensive to run and maintain than physicians, much in the same way the automatic teller machine (ATM) has become common. One contentious issue is whether North America or Europe is able to lead in the medical AI field compared to a country like China where the government can drive decisive change and remove administrative barriers. In Western countries controls are in place which will limit the introduction of some of these technologies. However, in a country like China, the centralized government could decide to initiate the use of AI in any medical field with no barriers to stop them.

AI may not so much replace physicians as much as makeup for the gaps in care caused by a lack of medical professionals, as anticipated by the AMA. AI will cut down on medical errors, by cross-referencing physician care plans against standards before it is delivered. AI may print out prescriptions while keeping track of recent local issues related to antibiotic resistance, preventing medication errors related to both the delivery of care and legibility all the while saving the physician time.

In conclusion, a pronounced change in patient care is on the horizon. Almost all the changes listed above could be instituted immediately with the exception of AI replacing patients in clinical trials. Physicians, medical bodies, and insurance companies should be prepared to deal with these changes. Doctors are one of the most expensive and specialized personnel in medicine and are currently burdened with mundane tasks and administrative overhead. Automation will make doctors more efficient, improve the patient's journey and reduce the probability of errors. It is very hard to determine how to prepare for the coming era, especially for younger doctors. It is likely that in the future residents may be trained by AI. Although the current AI platforms do not achieve results as well as physicians, without a doubt with time and more data, they will outperform humans. In no case will the need for physicians as a group disappear. If anything, AI will help bridge the anticipated physician gap.

Author Contributions

The study was initially conceptualized by MHD and DA. MHD, DA, and SLT conceived of the arguments and debates presented in this opinion piece. MHD, DA, and SLT wrote the first draft, which further was reviewed, adjusted, and edited together. All authors have read and agreed to the published version of the manuscript.

Ethics Approval and Consent to Participate

Not applicable.

Acknowledgment

Not applicable.

Funding

This research received no external funding.

Conflict of Interest

The authors declare that the paper was written in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. David Ardman is a senior vice president at Microsoft Corporation in an AI division however, he does not work in their medical AI division.

The authors declare no conflict of interest. Michael H. Dahan is serving as one of the Editorial Board members and Guest editors of this journal. We declare that Michael H. Dahan had no involvement in the peer review of this article and has no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to Luca Roncati.

References

[1] American Association of Medical Colleges updates physician shortage projections. 2019. Available at: https://www.aha.org/news/headline/2019-04-25-aamc-updates-physician-shortage-projections (Accessed: 6 May 2022).

[2] Wiggers K. Google details AI that classifies chest X-rays with human-level accuracy. 2019. Available at: https://venturebeat.com/2019/12/03/google-details-ai-that-classifies-chest-x-rays-with-human-level-accuracy/ (Accessed: 6 May 2022).

[3] McKinney SM, Sieniek M, Godbole V, Godwin J, Antropova N, Ashrafian H, *et al*. International evaluation of an AI system for breast cancer screening. Nature. 2020; 577: 89–94.

[4] Pakdemirli E. Artificial intelligence in radiology: friend or foe? Where are we now and where are we heading? Acta Radiologica Open. 2019; 8: 2058460119830222.

[5] Gulshan V, Peng L, Coram M, Stumpe MC, Wu D, Narayanaswamy A, *et al*. Development and Validation of a Deep Learning Algorithm for Detection of Diabetic Retinopathy in Retinal Fundus Photographs. The Journal of the American Medical Association. 2016; 316: 2402–2410.

[6] Beede E, Baylor E, Hersch F, Lurchenko A, Wilcox L, Ruamviboonsuk P, *et al*. A Human-Centered Evaluation of a Deep Learning System Deployed in Clinics for the Detection of Diabetic Retinopathy. Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems. 2020. Available at: https://doi.org/10.1145/3313831.3376718 (Accessed: 4 May 2022).

[7] IBM. Supporting cancer research and treatment. Available at: https://www.ibm.com/products/clinical-decision-support-oncology (Accessed: 6 May 2022).

[8] Ross C, Swetlitz I. IBM pitched its Watson supercomputer as a

revolution in cancer care. It's nowhere close. 2017. Available at: https://www.statnews.com/2017/09/05/watson-ibm-cancer/ (Accessed: 4 May 2022).

[9] Carvallo J. Confronting the Criticisms Facing Watson for Oncology. A Conversation with Nathan Levitan, MD, MBA. 2019. Available at: https://www.ascopost.com/issues/september-10-2019/confronting-the-criticisms-facing-watson-for-oncology/ (Accessed: 6 May 2022).

[10] Somashekhar SP, Sepúlveda MJ, Shortliffe EH, Rohit Kumar C, Rauthan A, Patil P, *et al*. A prospective blinded study of 1000 cases analyzing the role of artificial intelligence: Watson for oncology and change in decision making of a multidisciplinary tumor board (MDT) from a tertiary care cancer center. 2019 American Society for Clinical Oncology annual meeting. 2019. Available at: https://meetinglibrary.asco.org/record/177645/abstract (Accessed: 6 May 2022).

[11] Andone D, Moshtaghian A. A doctor in California appeared via video link to tell a patient he was going to die. The man's family is upset. 2019. Available at: https://www.cnn.com/2019/03/10/health/patient-dies-robot-doctor/index.html (Accessed: 6 May 2022).