In the Era of Artificial Intelligence, What Will the Destiny of Doctors Be?

En los tiempos de la inteligencia artificial, ¿cuál será el destino de los médicos?

Virchow proclaimed that while the microscope is capable of serving clinical practice, it is up to clinical practice to enlighten the microscope. GEORGES CANGUILHEM

INTRODUCTION

Artificial intelligence (AI) today -and even more so, in the next 20 years- has become a powerful means for making diagnoses, indicating treatments and predicting prognosis. This growing digitalization of AI leads us to wonder what it will mean to be a doctor today and in the years to come.

Some think that AI will replace complete specialties based on imaging diagnosis, as radiology or dermatology. (1)

Sasank Chilamkurthy et al. published results of IA learning to interpret critical findings of head computed tomography (CT) scans which were similar to the interpretation of a radiologist, with 80% - 90% sensitivity and around 90% specificity. (2) As can be seen, it presents a considerable and similar rate of false negatives (FN) and false positives (FP), which implies that, as usual, the physician must weigh the information and the particular context of the patient in order to make a decision.

"Integrating these technologies safely into practice will also take time. Clinical trials should demonstrate that the use of AI for screening or triage does not lead to overdiagnosis as a result of identifying false positives or to delayed or missed medical care due to false negatives. Cost-benefit analyses and demonstration of generalization to different populations and healthcare services are also necessary." (3)

In other words, AI is not the new universal panacea that will immediately solve the medical problems we currently have. We should assess its strengths and unavoidable weaknesses. We can start with digitalization in medicine.

DIGITALIZATION OF MEDICAL RECORDS

Over the past 20 years, the electronic health record (EHR) has increasingly become an important tool for physicians, and is being progressively and widely adopted throughout the country.

Undoubtedly, EHR has great potential in health care improvement, since it allows doctors to have the multiple simple or complex data of each patient available at any time. Although some authors have described perverse effects – the best known being that some physicians spend much more time in the doctor's office interacting with the computer on their desk than in the face-to-face interview with patients – few or none would return to the paper version after using the EHR.

Different strategies have been used to reduce the time of face-to-face data entry, thus preventing the physician from becoming an employee who enters administrative data needed only for billing services. This is the reason why American physicians have an average time around 4 times longer with their patients than in other countries with non-fragmented health systems. (4) Also, the idea of using employees as 'scribes' significantly improves physician satisfaction. (5)

To prevent the EHR from providing meaningless data that unnecessarily overloads physicians, it is important to know what users think about eliminating some of these tasks and reducing the unintended burden imposed by the EHR. For that purpose, a health system launched a program called "Getting Rid of Stupid Stuff." (6)

Starting by the end of 2017, they asked all employees to look at their daily documentation experience and name those actions they thought were poorly designed, unnecessary, or just plain stupid.

The author expresses: "The first thought we shared as we kicked off this effort was, 'Stupid is in the eye of the beholder. Everything that we might now call stupid was thought to be a good idea at some point."

We thought we would probably receive nominations in three categories: documentation that was never meant to occur and would require little consideration to eliminate or fix; documentation that was needed but could be completed in a more efficient or effective way with new tools or better understanding; and documentation that was required but for which clinicians did not understand the requirement or the tools available to them.

For example, the requirement of three clicks to change a diaper to a newborn was removed because the nurse had to reply about the baby's alleged incontinence! In other units, the amount of evaluation and documentation required was reduced, recovering thousands of nursing hours for direct work with the patient.

Although they were not formally submitted as nominations, 10 of the 12 most frequent alerts for

physicians were removed because they were simply ignored and not used.

THINKING ABOUT NEW EHR DEVELOPMENTS

The ability to search and share EHR records should have to be improved for both physicians and patients.

Many companies are designing electronic medical record softwares. Apple, for example, had launched a health application to download their medical records. In January 2018, Amazon, Berkshire Hathaway, and JP Morgan Chase announced they would join together to "discontinue" health sector softwares, perhaps because they find it difficult to obtain regulatory approval. (7)

The regulations determined by current law require that these programs and devices have U.S. Food and Drug Administration (FDA) approval before they can be launched onto the market. For example, if the AI offers guidelines directly to individuals, it would be violating laws on what is considered to be medical practice and even the information privacy requirements.

But in the future, there will be an ever-increasing flow of automated and democratized information, and physicians will no longer be the only repository of medical knowledge; at the same time, however, this implies new dangers. Therefore, digital health services and interventions must meet acceptable quality standards and perhaps an update of more adequate regulatory conditions to new technologies.

If the EHR were not only used by the doctor but also by patients, the information should be intuitive, easy to retrieve and focused on the technology that is commonly used by consumers. The new technology would make it possible to create groups of peers with similar pathologies, who did not know each other before, and who, by sharing their experiences, might encourage each other and not feel alone. (8)

The enormous amount of data generated will allow many patients to participate voluntarily in follow-ups and even in pragmatic randomized clinical trials for still unsolved clinical practice problems.

IN TIMES OF BIG DATA, LET US IMPROVE OBSERVATIONAL ANALYSES

Over the past years, with the predominance of the EHR, there has been widespread enthusiasm to draw quick conclusions from big data as opposed to the much more laborious, typical randomized controlled trials.

Three fundamental limitations, including residual confounding, time-zero issues, and multiplicity should be acknowledged and managed to perform observational studies using big data. (9)

We are well aware that randomized clinical trials allow the equal distribution of known and unknown confounders in groups that are compared by an exclusive characteristic (e.g. drug and placebo).

In observational studies, the same is attempted by adjusting the covariates, which are distributed differently, with multivariate statistical regression analyses. But, even if the adjustment adequately corrected the known confounders, the unknown ones would remain and -on top of that- it would be unknown to us. The strongest unknown confounder is "why did some receive an intervention and others did not?"; most likely because the medical conditions of the patients were different (either healthier or sicker), but we do not know it.

Another great advantage of clinical trials is that the starting time is clearly established; conversely, in observational studies, zero time is incorrect, which in some cases leads to the bias of the so-called immortal time, which is when after a study has begun during an initial stage, events are not assigned in the treated group. In that case, an extended Cox model would have to be used as a covariable with the time variant.

The third problem is easy to demonstrate. It refers to the number of hypotheses that are tested, which leads to multiplicity and the possibility of finding nonreal associations, because of the unknown repetition of statistical tests.

Therefore, we should give more importance to observational studies included in registered repositories, with protocols designed with defined endpoints. In this way, transparency would be given to observational studies, and "fishing data", with multiple nonestablished comparisons, would be avoided.

Recognizing possible "traps" in the big data observational studies will allow an approach that reinforces the power and validity of conclusions. (9)

RATIONAL ANALYSIS OF ARTIFICIAL INTELLIGENCE

Artificial intelligence should be considered as a Rorschach blot upon which we see things we imagine, but in fact we transfer our own anxiety due to illusory technological dreams. (3)

We have already mentioned in the introduction that AI algorithms –like any other test– have a certain sensitivity to detect a diagnosis or prognosis, but also false positives that lead to overdiagnosis in normal subjects. In turn, specificity is counterbalanced by false negatives, which prevent the diagnosis of a real disorder.

However, everything we perceive as a hard routine today may be the goal of AI-based machine management in the future, which we will welcome.

We must -as we have always done- adapt to the inevitable changes it will introduce in our clinical practice, in some specialties more than in others, such as imaging services. It is obvious that clinical education will also have to adapt to the digital world of AI.

As stated: "Clinicians will have a greater role to play in the digital world, because they will be the safety network when technology fails.

Patient safety training should consider the new risks when machines increase human decisions. One of the most important risks is automation bias, i.e. when clinicians accept machine advice without questioning rather than keep monitoring or validating that advice." (3)

CONCLUSION

Diagnostic algorithms alone do not care for or advice patients in their intricate personal contexts, but would save clinicians' time because they summarize complex data that usually required consultations with different multidisciplinary groups. Enrico Colera thinks: "As AI becomes a routine, clinicians would also have more time to involve themselves with the art of medicine. The discomfort caused by the disease forces the patient to make complex, personal, ambiguous choices. To navigate those uncertainties, we still need a doctor who has contemplated mortality deeply." (3)

While medicine will not disappear, what will our role with generalization of AI be? The only thing we do know is that it will change, but how and in what way cannot be predicted, because that role will emerge from the interaction between AI and medical practice.

What Colera says at the end comforts us: "It matters little, however, whether in some far time we are still called doctor, if a discipline disappears, or machines do the work once the domain of human beings, so long as illness is healed, patients are comforted, and life is lived long." (3)

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