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The pharmacists' guide to the future: Are we there yet?

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ABSTRACT

The future of community pharmacy has always been a matter of concern for academics and practitioners alike. Recently, a paper published in this Journal brought to the discussion the importance of new technologies, such as Artificial Intelligence and Blockchain, and the emergence of market forces like Amazon or Google, to the future of the pharmacy profession. In this commentary, we offer our view about the subject, specifically focusing in the practice area of Community Pharmacy. Our choice takes into account the fact that this by far the most numerous group within the profession, and where the fear of redundancy has always been looming since the start of the Industrial Revolution. Envisioned technologies will become a reality, but by now are not mature enough to be the disrupters everyone expects. Moreover, without major shifts in the legal environment regulating the organization of health care and the provision of medicines, big players will find it difficult to substitute pharmacies. As for pharmacists, they have always adapted to the challenges presented by technological revolutions. We argue that for the coming Patient Centred era, it is more important to continue to focus on the sustainability of an enhanced role for community pharmacists, providing services that highlight pharmacists' social role, measuring outcomes, and managing populations' health.

Introduction

A recent commentary paper "The Fourth Industrial Revolution: Will it change pharmacy practice?" by Baines et al.[1] has once again brought our attention to the future of pharmacy practice. We agree with the importance and relevance of the topic and wish to share our perspective. Firstly, we feel that it is necessary to frame "where" this future is. Baines et al.[1] avoid the use of a time horizon, which makes any discussion on these topics more of an exercise in speculation. As some authors note, the pharmacy profession evolves in eras of 30 years.[2] We propose that "near future" or "foreseeable future" should be read as the next 10–15 years, which one might argue are the transitioning from the Post Pharmaceutical Care Era to a new Patient Centred Care Era.[2,3] Moreover, we would like to focus on one area of activity, since pharmacy is a multilevel practice. It is not expected that the eminent revolution will affect all areas of pharmacy simultaneously, nor to the same extent. In this commentary, we adopt the view that "pharmacy practice" or "pharmacy profession" concerns community pharmacy practice and the community pharmacist's role since this is by far the most numerous group within the profession in most countries.[4]

Technological developments and innovation

There is no doubt that Industrial Revolutions (IR) have shaped pharmacy practice, and the fourth (4IR) will be no exception. This fourth industrial revolution revolves around the use of information and computer science, mostly represented by Artificial Intelligence (AI) in all its forms. While AI in its early forms is already a reality in alert systems for drug-drug interaction checkers,[5] and drug design and development,[6] the most promising field that may impact Pharmacy is Machine Learning (ML), with its ability to use algorithms to find patterns in sets of data aiming to aid decision making.[7] Another emergent technology is Blockchain which, according to Mackey et al.,[8] is "a new type of digital architecture, consisting of a shared, immutable ledger that can better ensure the resilience, provenance, traceability, and management of health data." It promises to make health data communication more secure, which may have an impact on health information sharing between different healthcare providers (e.g. sharing of Electronic Health Records) or in the pharmaceutical supply chain.[9] However, both ML and Blockchain applications for pharmacy are in their infancy, in the early stages of proof-of-concept.[9–11] Both technologies need much technical development, addressing questions of privacy, safety, and ethical issues.[7] Gartner's Hype cycle model[12] shows

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that these technologies, envisioned as a possible threat to pharmacists, are more than 10 years from their maturity, residing on the "Peak of inflated expectations", still having to go through the "Trough of disillusionment".[12–14] Another diffusion of innovations models, such as the one developed by Greenhalgh et al.,[15] identify several characteristics that need to be present for an innovation to be successfully disseminated. Some of these characteristics are not yet present in the aforementioned technologies: they are not absent of adding risks (e.g. potentially wrong drugs dispensing; consent and privacy violations) and are inconsistent with adopters' values, norms, and needs (adopters here being pharmacists). And it is not yet certain that they may significantly reduce costs.[16] Moreover, health systems are usually resistant to change, which will extend the period that innovations need to reach the market.

Pharmacists' role evolution

It is recognized that within the health sector, Pharmacists and General Physicians are the two cadres that probably have more tasks ready to be automated, with pharmacists' tasks having a higher probability of computerization.[17] However, despite many changes, technology facilitated work but did not change the fundamental role of pharmacists in the past 40 years. For instance, mail-order pharmacies exist for decades in several countries, while inexistent in others, and this did not change the essential role of pharmacists anywhere. On the other hand, Pharmaceutical care did change the role, as is thoroughly recognized.[1,2] It is with the emergence of Pharmaceutical Care concepts, first envisioned in the seminal paper of Hepler and Strand,[18] that pharmacists have begun to provide more than medicines. This was the beginning of the "Pharmaceutical Care Era".[2] This era was characterized by the development of several services that focused on improving how medicines were used instead of simple dispensing. However, the movement that initially started in the USA and then spread to the rest of the world was not homogenous and most pharmacies around the world still lag behind. As a consequence, this slow shift has been the focus of pharmacy practice research and the cause of attention within the profession for years. Pharmacy Professional Services (PPS) have been a matter of debate and multiple definitions,[19] and probably will continue to be. There is now a constellation of services provided in the community pharmacy, from immunizations to smoke cessation or needle exchange programs and even some that are provided by other professionals such as nurses or nutritionists.[20,21] As we enter the "Patient Centred Care Era", these services will continue to be developed, giving pharmacists the role of managing their populations' health care needs on top of medicine provision. Evidence associating the provision of these services to decreased health system spending, along with the matching financing (through either reimbursements or other types of payments), will be the real driver behind the evolution of the pharmacist's role. As health systems increasingly adopt value-based healthcare concepts,[22,23] pharmacists must focus on consistently measuring humanistic and clinically relevant outcomes enabling the demonstration of pharmacy services impact.[24–27] Technology may provide a way to assist in this development, but it is only a tool.[28,29]

So, what now? How will the future look like?

As the future is non-predictable, it is obvious that several possible paths exist for pharmacists' future in the new "Patient Centred Care Era". We would like to suggest that to provide a clearer view of the future, a scenario exercise similar to others already performed,[30–32] should be again endeavored by professional organizations, both at the national and international levels. AI, Blockchain, and other technologies are novelties that should be acknowledged in such exercises.

For the time being, the use of robots to aid dispensing in community pharmacy is the only technology already in place. However, to become a serious threat the use of robots has yet to be enhanced since the evidence of its use points to no significant effect in pharmacists' productivity.[33] One can imagine how automation and AI will substitute pharmacists. Most probably, we will assist a long period where these technologies will slowly permeate pharmacy practice and other health professions, becoming increasingly useful in the substitution of a series of tasks mature for automation (e.g. filling prescriptions; ordering medicines; diagnostics).

As long as legislation in most countries is guaranteeing, community pharmacies will still be the main provider of prescription medicines to the public. Many legislative changes would have to be produced, at least in Europe, to support the development of medicine delivery by new players. However, patients and their expectations have the power to demand the legislative changes that will unlock the potential threats: if patients want home delivery at no cost, society and the public opinion will pressure to obtain the necessary legislative changes. Pharmacists should be vigilant and aware of recommendations on competition and legal frameworks for self-regulated professions. Recently, OECD has produced a report where it recommends abolishing barriers to some reserved activities for pharmacists, like interpretation and evaluation of medical prescriptions among others.[34] Hence, asking pharmacists to disrupt its role may not seem a great idea.

As for the new services being improved by technology, other conditions have to be in place. For example, to achieve optimum management of a population's health care needs, all the Health Information Systems (HIS) used in the health system (from Electronic Health Records to personal wearables) must be interoperable. Information systems interoperability is the capacity of different HIS to communicate with each other. Interoperability has been a central discussion on health information systems for many years and has the potential to be the "game-changer" because, without it, the unlocking of AI's potential will be hampered. However, for HIS to become interoperable, the complex network of HIS developers need to reach an agreement as to open their software. Moreover, Interoperability also translates into allowing players outside the health professions to have access to patients' Electronic Health Records, in which case, other questions arise: will the society, public and patients, lightly admit persons or companies, not necessarily accountable, accessing sensitive information? Some discussion around this topic is already emerging. Accountability of the "big players" is the pressing issue of our collective future.[35] Leaving the high-tech companies alone in developing and carrying healthcare into the future is full of risks, namely aggravating inequalities in healthcare access.[36] Therefore, challenges related to data privacy and insufficient or inadequate regulation will hamper the development of new solutions and services supported by these technologies.[35,37,38]

In the meantime, global pharmacy workforce is expected to grow by 40% until 2030.[39] In low and middle-income (LMI) countries lacking a pharmacist workforce and where the growth of pharmacy professionals has been slower,[39] technological solutions assisting the delivery of medicines have the potential to bridge the gap of pharmacists' scarcity. But these technologies will only become a real solution to LMI countries' health systems when supply chain issues and sustainability are addressed.[40] In high-income countries, pharmacists' future role seem to depend on the provision of some form of pharmaceutical care, and pharmacists' attitudes towards service innovation and outcome measurement. Although automated solutions (e.g. Kiosks or Alexa) providing answers to health questions could potentially bypass pharmacists' role in medicine and health counseling, evidence suggests that patients receiving telehealth care still prefer access at the providers' locations than at home.[41–43] The usual recipients of these services are mostly frail and older patients. Older patients require more personal attention, having little to no skills with computer interfaces. Of course, this picture is poised to shift gradually, but it will be a slow shift, generation bounded.

Another issue in countries with slowing economies, which is poised to be a likely scenario in a post-pandemic world,[44] is the increase in the available workforce that will inevitably lead to pharmacists' low wages

and job losses, which in turn may lead to a decrease in the attraction of the pharmacy profession. In a context of high availability of professionals, and high pressure of on-demand services, it is not hard to imagine an Uber for pharmacists as another form of Uber for health services.[45] Professionals would use this app to provide their services in different pharmacies for a fraction of the price: locum pharmacists available through an app. And after that, the toll communication technologies have, with their intrusion from professional to personal lives, leading to concerns on health and wellbeing,[46,47] will also be a concern for community pharmacists.

Finally, imagining a more distant future, where the high-tech provision of health care is a reality, would it be necessary to have pharmacists? Or even physicians? In a full high-tech future, the fusion of the two professions (a return to a distant past!) could be a possibility. The skills envisioned for this new professional would include things like programming, decision-making, soft skills, such as communication skills and empathy, alongside with basic science knowledge and a deep understanding of physiology and pharmacology. Maybe this new professional will be some form of an empathetic biomedical engineer.[48] It would probably be enough since everything needed for decision-making will be laid out in front of them.

Conclusion

So, will technological developments affect the profession in the next decade? In our view, no. There is no point in being afraid of AI in a near future, since it is far from being a mature technology, and it will make its way into health professions gradually, largely dependent on the political and economic environment. The main issue for the future of pharmacy is the development of a health care role rooted in the community, gaining their role as a population health manager, gatekeeper of pharmacy services, and main advocate of patients' rights. Of course, communication technologies will play a part in this development, but only if they are embedded in the service design from the beginning to be useful.

Technologies will have a role to play, but there are other pressing issues outside the pharmacy universe. Utilization and sharing of health information will be the most important issue of our collective future. Regulatory responses must take into account the current positioning of "big players" and act swiftly to prevent them to take unleashed control of health systems and public health. Defining Pharmacy's institutions' position towards these issues is essential to the profession. Pharmacists, having sensed the peril that lies on the horizon, should be at the forefront of this struggle, laying the path to become patient's ally in assuring equity of care and access to medicines, fully embracing their healthcare and social role responsibly.

Declaration of competing InterestCOI

The authors declare that there is no competing interests.

CRediT authorship contribution statement

João Gregório: Conceptualization, Investigation, Writing - original draft, Writing - review & editing. **Afonso Cavaco:** Writing - review & editing.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.sapharm.2020.05.029.

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