



A REVIEW ON DIGITALIZATION OF HEALTHCARE WITH SWOC ANALYSIS OF DIGITAL PATHOLOGY IN THE BACKDROP OF COVID-19

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ABSTRACT

This is an era where digitalization has crept into every single task that we perform; be it transaction of money online or consulting doctors over online platforms. Although digitalization in healthcare was slightly slow in its progress, the recent pandemic of COVID that hit the world forced everyone in the healthcare industry to adopt digitalization to its maximum potential. Healthcare digitalization has touched upon various aspects viz. medical education, clinical consultations, radiological and pathological diagnosis, and also medical research. However, in spite of its positive impact on the overall healthcare scenario, there are some challenges which need to be overcome. This review discusses the various domains of healthcare where digitalization could be implemented with an additional analysis of the strengths, weaknesses, opportunities and challenges of digitalization in pathology especially in times of the recent pandemic of COVID.

KEYWORDS : digitalization, healthcare, pathology

INTRODUCTION:

The last two years have forced us to change our work pattern and learning behavior. And this has all been due to the COVID-19 pandemic which struck us in the early part of 2020. Every field of work was affected viz. education, industry, agriculture, dairy etc. but the toughest job was probably for the healthcare workers who had to continue to give their support even in the midst of all the chaos around¹. People in different sectors had to plan and implement digitalization in order to help them to work from their homes¹. But the question was whether such kind of digitalization implementable in the healthcare setting? Could we think of any domain of healthcare where we could actually digitalize our work in order to reduce our exposure risks?

Therefore, this review discusses the various domains of healthcare where digitalization could be implemented with an additional analysis of the strengths, weaknesses, opportunities and challenges of digitalization in pathology especially in times of the recent pandemic of COVID.

DIGITALIZATION IN HEALTHCARE:

It is quite a well-known fact that the healthcare industry has been surprisingly slow to join the global digital revolution, ranking in the lowest third of industries when measured for digital maturity in 2015². Compared to the changes we have seen with other industries like finance, media etc over the last decade, the digital breakthrough in healthcare is still in the nascent stage³. However, gradually the new tools and technologies have already started to make waves across the healthcare system and hold great promise to transform the delivery of health services in the near future – improving efficiency of patient care⁴. Like many other fields, healthcare industry also had no other choice but to adopt digitalization to cope up with the pandemic situation, wherever possible. We here highlight a few of the technologies that are making an impact on the various domains of healthcare:

1. Medical education: The onset of digitalization in healthcare started with conducting seminars and conferences using online platforms and calling them webinars. Medical schools had to depend upon various online platforms to conduct classes for their students.⁴
2. Clinical consultation: Clinicians started providing consultation to their patients with the help of telemedicine and online facilities as per guidelines issued from time to

time during the pandemic⁵⁻⁷. Smart phone-based applications also make gathering data and monitoring patients easier and more convenient^{8,9}. Consultations in diabetes management and pain management has proved to be quite beneficial¹⁰⁻¹². The potential for further applications is practically limitless^{13,14}.

3. Diagnosis: Radiologists took to reporting of films using various online softwares mostly for X-ray, CT scan and MRI diagnosis.¹⁵ Computer-aided detection has also shown value in helping radiologists more quickly and accurately analyze images for patterns associated with underlying disease, such as for breast cancer during mammography screening.^{16,17}
4. Medical research: Increased use of technologies such as machine learning may help reverse this trend by allowing the virtual screening of millions of compounds to potentially increase the number of possible drug leads. Digital solutions such as clinical trial simulation, modeling and simulation, computer-assisted trial design, model-based drug development and model-informed drug discovery and development could also begin to replace certain lab experiments, with a goal to reduce the time and resources required to bring a medicine to market¹⁸.

DIGITALIZATION IN PATHOLOGY:

Another very important part of healthcare service which could be partially digitalized was Pathology. Digital Pathology is not a new concept¹. Wilbur et al. (2009) described a pilot study on the effectiveness of digital pathology by comparing the concordance of reporting between digital and glass slide, and they found a fairly good concordance of 91%¹⁹. Therefore, implementing digitalization in the domain of Pathology for reporting slides was not a very difficult thing to achieve. In response to the need of reporting at home during the COVID-19 pandemic and in future, the Royal College of Pathologists had published a guideline for remote reporting of digital pathology slides²⁰. They have recommended a one to two months self-directed validation process by comparing glass and digital slides. The Department of Pathology in Universiti Kebangsaan Malaysia had also set up a computer capable of remote access to facilitate reporting at home^{1,4}.

The main strengths of digitalization in pathology are:

1. Remote reporting: Whole slides can be scanned and sent

anywhere to a pathologist with the help of software without any need for the pathologist to be present physically in the laboratory.

2. Review and second opinion: Slides can be easily shared by the pathologist with his/her peers or colleagues for any second opinion.
3. Storage: Scanned images of the slides can be stored without having to worry about slides getting broken or stains fading away.
4. Ease of reporting intricate details: During reporting, pathologists can accurately measure size of the tumour, microscopic distance from surgical margins, areas of necrosis, mitotic count and many such other important details.

In India, although there have been efforts from many reputed institutions and diagnostic chains to establish the process of digitalizing Pathology for reporting histopathology, but it is still in a very nascent stage and restricted to only those few institutions. It was a matter of concern as to why digitalization could not be fully implemented even after being described way back in 2009^{1,9}. The possible weaknesses/challenges of this technology that needed consideration were:

1. The cost factor: For high throughput conversion of traditional glass slides to digital images requires high end whole slide imaging equipment which is very expensive and a good one costs anywhere between 50 lacs to 1 Cr.
2. The storage factor: As these images are of high resolution, each image file can be up to about a few gigabytes. Hence, storage of these images may be an issue and is also expensive to maintain.
3. The comfort factor: One of the possible reasons include pathologists are used to or prefer glass slide viewing. Many are not tech savvy and therefore prefer the conventional glass slide viewing. Also any requirement for recut/re stain for a particular slide can be immediately ordered in the conventional system of reporting.
4. The technical factor: there is not enough IT support available at every place to help the pathologists troubleshoot with the technical difficulties.

Nonetheless, the current COVID-19 pandemic came as an opportunity to embrace the change. In this pandemic situation for the last two years we have realized that digitalization in pathology can be utilized as an opportunity to 'work from home' for the pathologists^{1,4}. However, things are not that simple and easy as they are thought to be. In spite of this boom in technology which has helped the pathologists to report slides from a remote location, there are few areas where the presence of a pathologist cannot be overruled. These areas pose as additional challenges to digitalization of pathology which need to be looked into:

1. Pathologists still must be physically present for dissection of large tissue samples. We may be able to get away with small biopsies, but large specimens still need to be grossed by pathology trainees or pathologists¹.
2. Procedures like fine needle aspiration cytology (FNAC), bone marrow aspiration and biopsy etc usually require a qualified pathologist or a qualified medical practitioner for that matter.
3. A frozen section biopsy which needs to be reported within 10-15 minutes may not be possible with the help of digitalization.

CONCLUSION:

Digitalization has had significant contributions in majority of the industries, healthcare being one of those. We have seen that digitalization has eased various aspects of healthcare starting from medical education to diagnosis and patient management. However, although the positive impact of digitalization in healthcare, particularly in pathology, is huge; there are definite weaknesses and challenges which need to

be overcome for it to be effective and implementable in developing countries like India. Training of healthcare personnel in digital platforms and availability of cost effective equipments should solve majority of the problems in implementation.

REFERENCES:

1. Geok Chin Tan, Yin Ping Wong. Digital pathology as a solution for working from home. *Malays J Pathol* 2021; 43(2):201
2. Fox B et al. McKinsey & Company. (2016) Report available from <https://www.mckinsey.com/~/media/McKinsey/Industries/Pharmaceuticals%20and%20Medical%20Products/Our%20Insights/Closing%20the%20digital%20gap%20in%20pharma/Closing-the-digital-gap-in-pharma.ashx> [Accessed February 2022].
3. von Eif W, von Eif M. The digitalization of healthcare. *HealthManagement.org The Journal*. 2020; 20 (2):182-187
4. Wong YP Tan GC. Virtual meeting in pathology: Time to adapt to the new norm. *Malays J Pathol*. 2021 Apr;43(1):1.
5. Centers for Disease Control and Prevention 2020. <https://www.cdc.gov/coronavirus/2019-nCoV/index.html>
6. World Health Organization Coronavirus disease (COVID-19) advice for the public. 2020. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public>
7. Ministry of Health and Family Welfare, Government of India Telemedicine practice guidelines. <https://www.mohfw.gov.in/pdf/Telemedicine.pdf>
8. van Galen L.S., Car J. Telephone consultations. *BMJ*. 2018;360:k1047.
9. Greenhalgh T, Wherton J., Shaw S. Video consultations for covid-19. *BMJ*. 2020;368:m998.
10. Ghosh A, Gupta R, Misra A. Telemedicine for Diabetes Care in India during COVID19 Pandemic and National Lockdown Period: Guidelines for Physicians, Diabetes & Metabolic Syndrome: *Clin Res Rev*. 2020; 10.1016/j.dsx.2020.04.001.
11. Ghosh A, Dutta K., Tyagi K., Gupta R., Misra A. Roadblock in application of telemedicine for diabetes management in India during COVID19 pandemic, *Diabetes & Metabolic Syndrome*. *Clin Res Rev*. 2020 doi: 10.1016/j.dsx.2020.05.010.
12. Lal H., Sharma D.K., Patralekh M.K., Jain V.K., Maini L. Outpatient Department practices in orthopaedics amidst COVID-19: the evolving model [published online ahead of print, 2020 May 18] *J Clin Orthop Trauma*. 2020 doi: 10.1016/j.jcot.2020.05.009. 10.1016/j.jcot.2020.05.009.
13. NHS England and NHS Improvement Attend Anywhere. https://england.nhs.uk/attend-anywhere.com/resourcecentre/Content/Public_Topics/Discover.htm
14. Iyengar K, Jain VK, Vaishya R. Pitfalls in telemedicine consultations in the era of COVID 19 and how to avoid them. *Diabetes Metab Syndr*. 2020 September-October; 14(5): 797–799.
15. Shenvi E et al. (2015). *Diagnosis* 2, 3–19
16. El-Kareh R et al. (2013). *BMJ Qual Saf* 22(Suppl 2), ii40–ii51
17. Hadjiiski L et al. (2006). *Curr Opin Obstet Gynecol* 18, 64–70
18. Jadhav S (2017). Article available from <http://www.appliedclinicaltrialsonline.com/mo-delving-and-simulation-clinical-trials-real-potential-or-hype> [Accessed February 2022]
19. Wilbur DC, Madi K, Colvin RB, Duncan LM, Faquin WC, Ferry JA et al. Whole-slide imaging digital pathology as a platform for teleconsultation: a pilot study using paired subspecialist correlations. *Arch Pathol Lab Med*. 2009;133(12):1949-53.
20. Williams BJ, Brett D, Aslam M, Barrett P, Bryson G, Cross S, Snead D, Verrill C, Clarke E, Wright A, Treanor D. Guidance for Remote Reporting of Digital Pathology Slides During Periods of Exceptional Service Pressure: An Emergency Response from the UK Royal College of Pathologists. *J Pathol Inform*. 2020;11:12.