

The Web of Medicine.



Medicine and medical research have undergone a rapid evolution. I can only wonder, as I type this editorial on my phone, how it must have been to research or conduct research before current electronics. I cannot imagine having to go to the library to pull out a reference or peer reviewed publication regarding a disease, disease pattern, treatment pattern, or controversies regarding a disease. Without this technology and information, how far along would have certain research groups become in identifying the genomes important for a disease or how would a future scientist, perhaps even a student of mine, and might solve an ailment? This makes me reflect on whether other equally capable health workers may not have the instrumentation or access to the same sort of information that I have. With the development of computers, software engineering, and the Internet exponential rate, so came the introduction of open source, open access medical publication. Authors appreciate the faster turnaround rate for manuscript submission, and readers enjoy the shortened time period from bench to publication. The digital means of storage and reference have obviated the traditional process of paper storage. The amount of times an article is cited may be influenced by whether or not it is an open access article. At this moment in time, most agree that peer reviewed open source journals are the next step in the progression of medicine, and that it will serve to close the gap among countries. It enables researchers, clinicians, and health workers to think about addressing the central idea of global healthcare.

According to a database search for complete registries of open access journals, The Directory of Open Access Journals was found to host the largest collection of open access journals, as compared to PubMed, Medline, and EMBase.^[1] The Directory of Open Access Journals lists 100,486 journals with 1,936,537 articles among 134 countries.^[2] A web search for open source on PubMed yields 11,240 different citations regarding this topic, many of which may not be listed because 'open source' is not included in the title or keywords of an article.^[3] Searching for open sources on Google Scholar lists

5,190,000 citations, however the yield includes articles pertaining to law and research from different scientific fields.^[4] Open access information encourages community participation in the reporting of patterns of disease which can often lead to novel ideas and research.

Publications facilitate the communication among researchers, clinicians, and health workers across all fields of medicine. One such new technology is telemedicine. The need for telemedicine is growing increasingly popular due to the shortage of providers and difficulty of obtaining specialty services in distant areas. Technological advances are allowing doctors to broaden their practice with the ability to communicate with patients and medical professionals through smart phones and computers. Telemedicine is used for a broad range of applications, being most effective in many hospital based and outpatient applications such as in-home monitoring, trauma, emergency care, intensive care, prenatal care, and specialist consultations or second opinions.

Telemedicine is also useful for tele-mentoring and tele-surgery. It is used in lectures, case presentations, and in the operating room to improve clinician education and training. Debra Wood describes tele-surgery as "a viable option for facilitating the transfer of knowledge and skills, as it cost-effectively expands the mentor pool and increases experienced surgeons' availability to assist in educating other surgeons."^[5] Experienced surgeons can monitor other physicians when performing a new technique, or new technology such as Google Glass (Google, Mountain View, CA, US) can allow audiences to view real-time streaming of surgeries from the surgeon's perspective. Tele-mentoring and tele-surgery have the potential to reach global audiences, allowing them access to new procedures and techniques. It also allows multiple physicians to be trained at once, increasing the efficiency of medical training.

Telemedicine has been especially useful in the field of ophthalmology for the care and management of diabetes. It is estimated that 8.3% of adults worldwide have diabetes, with numbers expected to increase over the next 22 years.^[6] It is important to routinely screen and monitor diabetic patients for

diabetic retinopathy and macular edema, which are potentially debilitating diseases that can lead to blindness if not properly treated. Retinal images can be obtained from a medical clinic or office and then transmitted via store-and-forward transmission to reading centers, where ophthalmologists or optometrists can interpret the images and suggest proper treatments for patients. This reduces barriers for patients that do not have easy access to ophthalmology services. It allows a more accurate diagnosis, better treatment outcome, and prevents loss to follow up. Patients are generally satisfied with teleconsultations,^[7] not having to wait or expend a large amount of time traveling. While telemedicine is used to facilitate exams, it is not intended to replace in-person visits. It is always crucial to follow up with a physician or other health care provider when indicated.

While there are many benefits to having this new technology, there are also some concerns. Many issues are in regards to privacy, ease of use, technical quality, and cost of sustaining such a system. Telemedicine procedures must be Health Insurance Portability and Accountability Act (HIPAA) compliant. Each contact point must be encrypted to ensure patient privacy, and the network needs to be able to support large amounts of data being transmitted at high speeds. Once the initial setup is completed, both the patient and doctor need to be willing to use the technology. Adequate training must be performed in order to facilitate the ease of use and quality of the imaging. Occasional technical difficulties may arise, impeding the use of the equipment. Image quality has not been of great concern and the main issues arise from data transmission and networking.^[7] Telemedicine has proven to be cost effective for hospitals. According to Lola Butcher, \$6.4 million has been saved in transport costs to the Portland medical center over the past 8 years that telemedicine has been available. An analysis also showed that an average of \$86.64 is saved for each teleconsultation versus a visit to urgent care, the emergency department, or to a primary care office.^[8]

Overall, telemedicine provides many benefits, and the medical uses for this technology are endless. It will be an increasing part in medicine as it allows for the growth of healthcare informatics and analytics, improving patient care. With great change comes great understanding, and with newfound wisdom comes the ability enhance the life of people. All of which is facilitated by open access to information.

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