

The Influence of Technology: the Past, the Present, the Future

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ABSTRACT

Technology has been integrated into many facets of our lives, including medicine, education, and socialization. This is true of the past, the present, and most likely, the future. As time goes on, our reliance on and usage of technology increases. This paper discusses how technology has been assimilated into our lives and the trend for it to continue to do so.

Keywords: Technology; Telemedicine; Education; Socialization

INTRODUCTION

Technology has greatly influenced our society in many different ways. As technology became more and more integrated into society, so did the uncertainty of how it would alter our way of life. This paper addresses three aspects of the change in our culture and habits promoted by the use of technology: health, education, and social interaction. It discusses these topics in a time-based fashion.

LITERATURE REVIEW

The past

Prior to the COVID-19 pandemic, technology was incorporated into our lives, but for some, there was skepticism concerning how widespread its use should be. Institutions of higher learning offered courses online, but there were those who felt remote courses could not replace onsite courses. The fallacy in the logic here, of course, is that the latter venue was not meant to replace the former; rather it was an alternative means of education, to be offered in conjunction with and not in lieu of onsite education, with the obvious benefits of flexibility with regard to time commitment and geographic location. Remote learning provided a great opportunity for many who would not be able to further their education otherwise [1].

The technology was and is the foundation of social media, which was and is heavily used. Facebook, Instagram, and FaceTime are just some of the examples. People were not only interacting with

their friends, but were able to communicate with family, and network with peers with whom they may have lost contact over the years [2].

The most dramatic use of technology was in the field of telemedicine. Telemedicine, telehealth, or E-health is the remote diagnosis and delivery of healthcare using telecommunications technology. It was readily accepted in remote areas, where the population was generally of lower socioeconomic status, as it provided medical aid where it was available only on a limited basis or not at all. It was used for making appointments, transfer of files, medical diagnosis, and treatment in its early stages [3].

Some of the more recent technologies that have been integrated into the field include the following:

- On-site kiosks located in a clinic or at a job site. They comprise a computer interface and medical devices to measure vital signs, e.g. blood pressure. The computer provides communication with a physician if necessary
- Mobile Apps can be accessed from a smartphone or mobile device. The capability of contacting a physician is possible
- Secure email provides a way of receiving reminders about preventive care and appointments. Medical data can be shared if the transmission is secure
- The Internet has websites that provide vast information about symptoms and diseases and medical treatment
- Online video conferencing
- A telephone is a technological tool that cannot be overlooked. Patients can speak with physicians who, in turn, can speak

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with pharmacists, and physicians can consult with each other using this device [4]

- Smartwatches and, by extension, wearable trackers that can interact with other devices have become common. As a relatively simple example, these could measure weight gain, calories consumed, and calories burned [5]

The Center for Disease Control and Prevention provided the following statistics for 2007: 12.7% of live births were preterm and 70.5% of pregnant women had access to adequate prenatal care. The latter statistic has significant health consequences for both mother and child. This obviates the need for some type of intervention and obstetrical telemedicine will help with the issues of pre-and post-natal care, labor, and delivery of babies [6]. Telemedicine has been a critical tool for women and their unborn children worldwide. Without going into detail, we mention some of its many worldwide applications.

Telecolposcopy, or the integration of technology and colposcopy, was being used in the diagnosis of abnormal cervical cytology or cells. Telepsychiatry is being used specifically in women's health care to help women who need counseling and support, for any number of reasons. Fetal care in remote areas relies on telemedicine as well [7].

Telemedicine is used in fetal care. A telesurgical and ultrasound consultation from the United States was used to assist in performing operative fetoscopy, a procedure during pregnancy that gives access to the fetus, the amniotic cavity, the umbilical cord, and the fetal side of the placenta, for the correction of birth defects in a pregnancy involving an acardiac twin. Acardiac twin is a situation where the blood systems of the twins are connected rather than independent. The pump twin faces the excess burden of having to send and receive blood to the acardiac twin. This added stress can cause heart failure in the normal twin, who can be monitored with ultrasound and echocardiography [8].

Telemedicine is used in fetal monitoring throughout the world. In China, pregnant women are able to send their pregnancy non-stress tests over standard phone lines for remote fetal evaluation. Preterm labor for high-risk patients has been ongoing for a number of years. As early as 1979 fetal monitoring was ongoing by means of Xerox telecopy to tertiary healthcare environments. In countries like Asia, Europe, and America, home monitoring is customary [7].

An integral part of women's healthcare is the annual mammogram. Teleradiology is the rubric for Telemammography. Research is ongoing for the real-time evaluation of mammogram images. Navaho women in the western United States can obtain results before they return to their nation, most of which have limited if any means of communication capabilities. Telemammography for women is becoming a standard in today's world [9].

Critical use of telemedicine in this field involves the direct health of the baby or mother. In rural America, pregnancy-related complications have risen over the past few years. Specialists, unfortunately, do not usually practice in small towns and the use of telemedicine consultations is consequently often lifesaving. In rural Georgia, Dr. Joy Baker, a local ob-gyn,

arranges for her patients to have appointments with specialists affiliated with Women's Telehealth in Atlanta. One of her patients started having special ultrasounds administered by local technicians who were trained by Women's Telehealth. Then, video consultations took place with Dr. Patterson, a specialist in Atlanta. In spite of the fact that the vital signs of the fetus were normal, the blood was not flowing properly through the umbilical cord, i.e. the baby was not receiving adequate oxygen or nutrients. The outcome was that Dr. Baker delivered the baby via emergency cesarean section, and both mother and child were fine [10].

The statistics are alarming. About 70% of Dr. Baker's patients are at high risk for issues based on their diabetes, obesity, or other risk factors. Dr. Baker is one of two obstetric-gynecologists serving eight different counties. Before the installation of the videoconferencing equipment, Dr. Baker's patients who needed to consult with specialists had to travel an hour or more to meet with a specialist. Unfortunately, many of them did not have access to the necessary transportation, could not afford the gas, or could not take time off from work to keep such an appointment [10].

In Arkansas, there is a statewide telemedicine program for high-risk obstetrics, Antenatal and Neonatal Guidelines, Education and Learning Systems (ANGELS). Dr. Curtis Lowery is the director of the University of Arkansas for Medical Services for Distance Health, which is in charge of this program. Federal funding has supported the building of T1 Internet lines that allows the center to connect to more than 400 hospitals, clinics, and other medical facilities across the state. Realizing how critical this type of medical service is, the University of Arkansas is expanding its technological capabilities to reach patients at home and providers for whom the more expensive equipment is too great a financial reach [10]. Over 1500 patients have received genetic counseling through the ANGELS network. Approximately 2500 ultrasounds were performed via telemedicine in the ANGELS network over a two year period [6].

Dr. Adair of Regional Obstetrical Consultants, a maternal-fetal medical practice in Chattanooga Tennessee, acknowledges the need for telemedicine practices as well. He started the telemedicine program, Solutions to Obstetrics in Rural Counties (STORC) in 2009. The statistics show that two-thirds of Tennessee counties have no private provider of prenatal care. Video conferences now take place via video. STORC expects to supply telemedicine equipment to hospitals as well [10]. Under this program, 24-hour access to a maternal-fetal medicine specialist is available. A practical nurse and sonographer make weekly visits to the hospitals involved in this program [6]. Avera eCare in Sioux Falls, South Dakota is going to add ob-gyn telemedicine consultations to its list of services. It, too, has recognized the need for consultations in rural areas [10].

An interesting and effective program that helps women is the text4baby program that is sponsored by the National Healthy Mothers Healthy Babies Coalition that has been in existence since 2010. If a woman signs up for this program, she receives three informative text messages weekly for the duration of her pregnancy and throughout the first year of her child's life. The

underlying goal of this program has been to reach out to women in the early stages of their pregnancies, especially those in low-income or poverty areas. The more involved the women have been in this program, the more they have kept to their scheduled appointments with their doctors [6].

Telemedicine is particularly critical for areas where mortality rates are high for both infants and mothers. These areas are usually remote and poor. The Mobile Alliance for Maternal Action supports health information for pregnant mothers and those with infants. In Bangladesh, India and South Africa inexpensive cell phones are given to the women and information about healthcare is transmitted via voicemail and text messages. There are also messaging services to transmit information for the preventions of mother-to-child transmission of HIV. Cell phone usage was implemented in rural Africa to report postpartum hemorrhaging [6].

3D imaging is directly related to telemedicine practice; it allows the storage of large datasets without loss of information and can therefore be analyzed off-line and referred to in a future consultation. 3D ultrasound has been used to diagnose uterine anomalies, assess tubal patency and to exclude intrauterine and ovarian pathology. 3D sonography has the capability of showing the endometrial cavity and the myometrium simultaneously in the coronal plane. Congenital uterine irregularities are linked to a greater risk of first and second trimester miscarriages and preterm delivery. With the use of 3D sonography, healthcare providers can identify those patients at risk and surgical intervention can be performed.

The thought of the major benefits of 3D is its ability to illustrate the three orthogonal planes of the coronal view of the uterus. This allows for the diagnosis of uterine anomalies, including the locations of fibroids and polyps. The fact that images obtained by 3D ultrasound can be stored and reviewed at a later time allows the healthcare provider to give further thought to the diagnosis without the patient having to be on site [11]. For women who are having difficulty conceiving or bringing a pregnancy to term successfully, 3D ultrasonography is a boon.

Technology is ever progressing and now there is 4 Dimensional Ultrasonography (4DUS) with Spatio-Temporal Image Correlation (STIC). It is used for fetal echocardiography. Congenital heart defects in the United States are the most common birth defects. They are also a leading cause of infant mortality and morbidity. Diagnosis before birth allows for counseling and management. Examining the four chambers of the fetal heart and the outflow tract are considered standard during the second trimester [6].

Telemedicine is being used to set up forums for questions posed by pregnant women. These questions range from needing moral support in general to questioning the medical opinion of their own ob-gyn doctors. The former type of question reflects the fact that the primary healthcare providers did not meet the need for emotional support [12].

The benefits of telemedicine in the field of obstetrics and gynecology are universally acknowledged. The technology coupled with trained healthcare providers is used to read ultrasounds, interpret non-stress tests, counsel patients, manage

diabetes, ameliorate postpartum depression, and provide remote support for parents. Reductions in time lost from work, transportation costs, and more efficiency for the health care providers, and reducing medical costs have all been suggested as benefits of telemedicine. The future of technology and medicine hold great promise for women's health. At present, research is being done on whether using a robot instead of a sonographer at distant sites will be comparable [6]. Technology research will produce faster, safer and clearer transmissions of video. A company called Cambridge Temperature Concepts, started by a chemist, Shamus Hasheer, has invented a fertility monitor, called DuoFertility. Their claim based on data that was published in a peer-reviewed journal is that it is as effective as conventional IVF and very much cheaper [13]. Medical research has already succeeded in the first birth of a baby resulting from a womb transplant in the United States. A woman who was born without a uterus gave birth to a baby at Baylor University Medical Center in Texas [14]. Only the future will tell how telesurgery and telemedicine will be involved in this aspect of women's healthcare.

The present

Years ago, technology was integrated into different aspects of our lives as previously described. Online courses have been offered at most institutions of higher learning for some time but students were offered the possibility of studying onsite if they so opted. Some faculty shied away from teaching remotely in the past and for them there was a timed steep learning curve with the outbreak of COVID-19. Recent events offered no choice to students and faculty.

Younger children were adept at using technology but not learning on ZOOM sessions. Elementary and high school education has undergone a significant transformation. For older students this will hopefully motivate them to begin their independent, lifelong learning path. Discussions are continuing with respect to increasing the effectiveness of online learning for children with special needs.

Teachers and professors are online using the aforementioned tools as well as the Learning Management systems like Blackboard, Talent LMS, Google Classroom and others [15]. Different models are on the top of the list of discussion topics for the fall semester. Flexibility is the norm at present. Some of the approaches other than completely online or onsite are the following:

- Block or Module Courses-course material would be divided into blocks or modules and as the need arises each block or module could be online or onsite
- Structure Gap Year/Semester-provide the students with a hiatus in their studies
- Onsite classes for residential students-this would facilitate social distancing
- Offer multiple sections of courses, both online and onsite
- Lecture material can be videoed and then recitation sections can be limited to a smaller number of students
- Combination of Onsite and Online-a traditional class can have the student body divided in two groups; each group attends onsite every other week or one of two days/week and

the other group the other days; lectures can be posted online via notes or videos

- Onsite courses can be synchronous with ZOOM and students can be in the classroom or off campus as they so opt. [16]

With regard to telemedicine, technology has been a strong support for quite some time. As previously described, it has been a lifesaver in remote areas. In developed society, many doubters felt they needed to see their physician in person. With social distancing and the number of individuals with medical concerns on the rise, those doubters have moved to become users and believers in remote medical care.

It is clear that the use of technology has pervaded aspects of people's lives in multifarious ways. People are working remotely, sharing files and information and using video conferencing tools such as ZOOM, Cisco Webex Meetings, GoToMeeting, Google Hangouts and others more than ever [15].

Young children are particularly rising to the occasion. Lacking the adult concern of "not looking smart," they are using their phones, iPads and computers for school sessions and communication with their friends as well as playing the usual video games online.

The future

Although it is difficult to predict the future, based on the response to the pandemic, life situations from the perspectives of careers, education, and socialization will never be the same. In many cases, employers are finding their employees have proven to be more productive working online from home. Nothing can replace face-to-face interaction, but the new norm may be the five-day workweek divided into two days remote working and three days on site.

Education was forced to go totally online during the spread of COVID-19. This transition was quite abrupt. At the early education levels, it entailed teachers, parents and students becoming familiar with the technology. Parents, for the first time in a long time had to become more directly involved with their children's education. In the scheme of life, this is a positive.

At the college and university levels, most institutions had a component of online or remote learning. Those that did not or had faculty that did not teach remotely were caught unawares and were compelled to learn quickly. Many students were familiar with the online platforms and adapted quickly, especially with the help institution's IT department, if necessary. Continuing with remote learning provides the students with the flexibility of studying more independently and at their own pace. From a pedagogical perspective, we want our students to become life-long learners as well as independent learners. We want to spark their intellectual curiosity so they will be motivated to increase their knowledge base. An educated society makes a stronger and more productive society.

The reliance on social media will increase in the future. Young children have become proficient with using the Internet as a

tool to communicate with their friends. The senior generation has become adept as well so they can communicate with their family [17].

CONCLUSION

Telemedicine will become a way of life. People can contact their physicians more quickly and the doctors will be able to see more patients than ever before. One of the future models may involve augmented technology developed by Microsoft that allows anyone in effect to be anywhere and speak any language. Microsoft, by combining Mixed Reality Hologram Technology with Azure AI neural text to speech technology, has created a hologram that transforms someone into a digital speaker of another language, which both looks and sounds like the actual person.

It is evident that the spread of the virus has considerably influenced our lives from different perspectives. We need to embrace the changes and incorporate the alternatives as a way to enhance our lives.

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