

## Chapter 1 : ATTD - Advanced Technologies & Treatments for Diabetes | Berlin

*Treatments and Technology Our Radiation Oncology team uses the most advanced technology and innovative therapies to effectively evaluate and treat patients. We are committed to advancing the science and practice of radiation oncology and developing novel treatment approaches so that patients have the best opportunity for positive outcomes with.*

Chapter 5 Science and Technology for Disease Control: As we move into the new millennium it is becoming increasingly clear that the biomedical sciences are entering the most exciting phase of their development. Paradoxically, medical practice is also passing through a phase of increasing uncertainty, in both industrial and developing countries. Industrial countries have not been able to solve the problem of the spiraling costs of health care resulting from technological development, public expectations, and “in particular” the rapidly increasing size of their elderly populations. The people of many developing countries are still living in dire poverty with dysfunctional health care systems and extremely limited access to basic medical care. Against this complex background, this chapter examines the role of science and technology for disease control in the past and present and assesses the potential of the remarkable developments in the basic biomedical sciences for global health care. From ancient times to the Renaissance, knowledge of the living world changed little, the distinction between animate and inanimate objects was blurred, and speculations about living things were based on prevailing ideas about the nature of matter. Advances in science and philosophy throughout the 16th and 17th centuries led to equally momentous changes in medical sciences. The elegant anatomical dissections of Andreas Vesalius swept away centuries of misconceptions about the relationship between structure and function of the human body; the work of Isaac Newton, Robert Boyle, and Robert Hooke disposed of the basic Aristotelian elements of earth, air, fire, and water; and Hooke, through his development of the microscope, showed a hitherto invisible world to explore. In 1628, William Harvey described the circulation of the blood, a discovery that, because it was based on careful experiments and measurement, signaled the beginnings of modern scientific medicine. After steady progress during the 18th century, the biological and medical sciences began to advance at a remarkable rate during the 19th century, which saw the genuine beginnings of modern scientific medicine. Charles Darwin changed the whole course of biological thinking, and Gregor Mendel laid the ground for the new science of genetics, which was used later to describe how Darwinian evolution came about. Louis Pasteur and Robert Koch founded modern microbiology, and Claude Bernard and his followers enunciated the seminal principle of the constancy of the internal environment of the body, a notion that profoundly influenced the development of physiology and biochemistry. With the birth of cell theory, modern pathology was established. These advances in the biological sciences were accompanied by practical developments at the bedside, including the invention of the stethoscope and an instrument for measuring blood pressure, the first use of x-rays, the development of anesthesia, and early attempts at the classification of psychiatric disease as well as a more humane approach to its management. The early development of the use of statistics for analyzing data obtained in medical practice also occurred in the 19th century, and the slow evolution of public health and preventive medicine began. Significant advances in public health occurred on both sides of the Atlantic. After the cholera epidemics of the mid 19th century, public health boards were established in many European and American cities. The Public Health Act, passed in the United Kingdom in 1848, provided for the improvement of streets, construction of drains and sewers, collection of refuse, and procurement of clean domestic water supplies. Equally important, the first attempts were made to record basic health statistics. For example, the first recorded figures for the United States showed that life expectancy at birth for those who lived in Massachusetts in 1780 was 43 years; the number of deaths per 1,000 live births in the same population was 25. At the same time, because it was becoming increasingly clear that communicable diseases were greatly depleting the workforce required to generate the potential rewards of colonization, considerable efforts were channeled into controlling infectious diseases, particularly hookworm and malaria, in many countries under colonial domination. However, until the 19th century, curative medical technology had little effect on the health of society, and many of the improvements over the centuries resulted from higher standards of living, improved nutrition, better hygiene, and other environmental modifications. The

groundwork was laid for a dramatic change during the second half of the 20th century, although considerable controversy remains over how much we owe to the effect of scientific medicine and how much to continued improvements in our environment Porter This balance between the potential of the basic biological sciences and simpler public health measures for affecting the health of our societies in both industrial and developing countries remains controversial and is one of the major issues to be faced by those who plan the development of health care services for the future. Science, Technology, and Medicine in the 20th Century Although rapid gains in life expectancy followed social change and public health measures, progress in the other medical sciences was slow during the first half of the 20th century, possibly because of the debilitating effect of two major world wars. The position changed dramatically after World War II, a time that many still believe was the period of major achievement in the biomedical sciences for improving the health of society. This section outlines some of these developments and the effect they have had on medical practice in both industrial and developing countries. More extensive treatments of this topic are available in several monographs Cooter and Pickstone ; Porter ; Weatherall

**Epidemiology and Public Health** Modern epidemiology came into its own after World War II, when increasingly sophisticated statistical methods were first applied to the study of noninfectious disease to analyze the patterns and associations of diseases in large populations. The emergence of clinical epidemiology marked one of the most important successes of the medical sciences in the 20th century. Up to the s, conditions such as heart attacks, stroke, cancer, and diabetes were bundled together as degenerative disorders, implying that they might be the natural result of wear and tear and the inevitable consequence of aging. However, information about their frequency and distribution, plus, in particular, the speed with which their frequency increased in association with environmental change, provided excellent evidence that many of them have a major environmental component. For example, death certificate rates for cancers of the stomach and lung rose so sharply between and that major environmental factors must have been at work generating these diseases in different populations. The first major success of clinical epidemiology was the demonstration of the relationship between cigarette smoking and lung cancer by Austin Bradford Hill and Richard Doll in the United Kingdom. This work was later replicated in many studies, currently, tobacco is estimated to cause about 8. Despite this information, the tobacco epidemic continues, with at least 1 million more deaths attributable to tobacco in than in , mainly in developing countries. The application of epidemiological approaches to the study of large populations over a long period has provided further invaluable information about environmental factors and disease. One of the most thoroughâ€”involving the follow-up of more than 50, males in Framingham, Massachusettsâ€”showed unequivocally that a number of factors seem to be linked with the likelihood of developing heart disease Castelli and Anderson Such work led to the concept of risk factors, among them smoking, diet especially the intake of animal fats , blood cholesterol levels, obesity, lack of exercise, and elevated blood pressure. The appreciation by epidemiologists that focusing attention on interventions against low risk factors that involve large numbers of people, as opposed to focusing on the small number of people at high risk, was an important advance. Later, it led to the definition of how important environmental agents may interact with one anotherâ€”the increased risk of death from tuberculosis in smokers in India, for example. A substantial amount of work has gone into identifying risk factors for other diseases, such as hypertension , obesity and its accompaniments, and other forms of cancer. Risk factors defined in this way, and from similar analyses of the pathological role of environmental agents such as unsafe water, poor sanitation and hygiene, pollution, and others, form the basis of The World Health Report WHO c , which sets out a program for controlling disease globally by reducing 10 conditions: These conditions are calculated to account for more than one-third of all deaths worldwide. The epidemiological approach has its limitations, however. Where risk factors seem likely to be heterogeneous or of only limited importance, even studies involving large populations continue to give equivocal or contradictory results. Furthermore, a major lack of understanding, on the part not just of the general public but also of those who administer health services, still exists about the precise meaning and interpretation of risk. The confusing messages have led to a certain amount of public cynicism about risk factors, thus diminishing the effect of information about those risk factors that have been established on a solid basis. Why so many people in both industrial and developing countries ignore risk factors that are based on solid data is still not

clear; much remains to be learned about social, cultural, psychological, and ethnic differences with respect to education about important risk factors for disease. Finally, little work has been done regarding the perception of risk factors in the developing countries WHO c. A more recent development in the field of clinical epidemiology—one that may have major implications for developing countries—stems from the work of Barker and his colleagues, who obtained evidence suggesting that death rates from cardiovascular disease fell progressively with increasing birthweight, head circumference, and other measures of increased development at birth. Further work has suggested that the development of obesity and type 2 diabetes, which constitute part of the metabolic syndrome, is also associated with low birthweight. The notion that early fetal development may have important consequences for disease in later life is still under evaluation, but its implications, particularly for developing countries, may be far reaching. The other major development that arose from the application of statistics to medical research was the development of the randomized controlled trial. The principles of numerically based experimental design were set out in the s by the geneticist Ronald Fisher and applied with increasing success after World War II, starting with the work of Hill, Doll, and Cochrane see Chalmers ; Doll Variations on this theme have become central to every aspect of clinical research involving the assessment of different forms of treatment. More recently, this approach has been extended to provide broad-scale research syntheses to help inform health care and research. Increasing the numbers of patients involved in trials and applying meta-analysis and electronic technology for updating results have made it possible to provide broad-scale analyses combining the results of many different trials. Although meta-analysis has its problems—particularly the lack of publication of negative trial data—and although many potential sources of bias exist in the reporting of clinical trials, these difficulties are gradually being addressed Egger, Davey-Smith, and Altman More recent developments in this field come under the general heading of evidence-based medicine EBM Sackett and others Although it is self-evident that the medical profession should base its work on the best available evidence, the rise of EBM as a way of thinking has been a valuable addition to the development of good clinical practice over the years. It covers certain skills that are not always self-evident, including finding and appraising evidence and, particularly, implementation—that is, actually getting research into practice. Its principles are equally germane to industrial and developing countries, and the skills required, particularly numerical, will have to become part of the education of physicians of the future. However, evidence for best practice obtained from large clinical trials may not always apply to particular patients; obtaining a balance between better EBM and the kind of individualized patient care that forms the basis for good clinical practice will be a major challenge for medical education. Partial Control of Infectious Disease The control of communicable disease has been the major advance of the 20th century in scientific medicine. It reflects the combination of improved environmental conditions and public health together with the development of immunization, antimicrobial chemotherapy, and the increasing ability to identify new pathogenic organisms. Currently, live or killed viral or bacterial vaccines—or those based on bacterial polysaccharides or bacterial toxoids—are licensed for the control of 29 common communicable diseases worldwide. The highlight of the field was the eradication of smallpox by In , the disease was endemic in more than countries. After a resurgence in , when the number of cases rose to 1,, the numbers dropped again in to ; by March , only 32 cases had been confirmed Roberts Hepatitis B is added at different times in different communities. Indeed, among 12 million childhood deaths analyzed in , almost 4 million were the result of diseases for which adequate vaccines are available WHO a. The development of sulfonamides and penicillin in the period preceding World War II was followed by a remarkable period of progress in the discovery of antimicrobial agents effective against bacteria, fungi, viruses, protozoa, and helminths. Overall, knowledge of the pharmacological mode of action of these agents is best established for antibacterial and antiviral drugs. Antibacterial agents may affect cell wall or protein synthesis, nucleic acid formation, or critical metabolic pathways. Because viruses live and replicate in host cells, antiviral chemotherapy has presented a much greater challenge. Essentially, those agents interfere with critical self-copying or assembly functions of viruses or retroviruses. Knowledge of the modes of action of antifungal and antiparasitic agents is increasing as well. Resistance to antimicrobial agents has been recognized since the introduction of effective antibiotics; within a few years, penicillin-resistant strains of *Staphylococcus aureus* became widespread and penicillin-susceptible

strains are now very uncommon Finch and Williams At least in part caused by the indiscriminate use of antibiotics in medical practice, animal husbandry, and agriculture, multiple-antibiotic-resistant bacteria are now widespread. Resistance to antiviral agents is also occurring with increasing frequency Perrin and Telenti , and drug resistance to malaria has gradually increased in frequency and distribution across continents Noedl, Wongsrichanalai, and Wernsdorfer The critical issue of drug resistance to infectious agents is covered in detail in chapter In summary, although the 20th century witnessed remarkable advances in the control of communicable disease, the current position is uncertain. The emergence of new infectious agents, as evidenced by the severe acute respiratory syndrome SARS epidemic in , is a reminder of the constant danger posed by the appearance of novel organisms; more than 30 new infective agents have been identified since Effective vaccines have not yet been developed for some of the most common infectionsâ€”notably tuberculosis, malaria, and HIVâ€”and rapidly increasing populations of organisms are resistant to antibacterial and antiviral agents. Furthermore, development of new antibiotics and effective antiviral agents with which to control such agents has declined. The indiscriminate use of antibiotics, both in the community and in the hospital populations of the industrial countries, has encouraged the emergence of resistance, a phenomenon exacerbated in some of the developing countries by the use of single antimicrobial agents when combinations would have been less likely to produce resistant strains. Finally, public health measures have been hampered by the rapid movement of populations and by war, famine, and similar social disruptions in developing countries. In short, the war against communicable disease is far from over. Pathogenesis, Control, and Management of Non-communicable Disease The second half of the 20th century also yielded major advances in understanding pathophysiology and in managing many common noncommunicable diseases. This phase of development of the medical sciences has been characterized by a remarkable increase in the acquisition of knowledge about the biochemical and physiological basis of disease, information that, combined with some remarkable developments in the pharmaceutical industry, has led to a situation in which few noncommunicable diseases exist for which there is no treatment and many, although not curable, can be controlled over long periods of time. Many of these advances have stemmed from medical research rather than improved environmental conditions. In , Beeson published an analysis of the changes that occurred in the management of important diseases between the years and , based on a comparison of methods for treating these conditions in the 1st and 14th editions of a leading American medical textbook. He found that of conditions for which little effective prevention or treatment had existed in , at least 50 had been managed satisfactorily by Furthermore, most of these advances seem to have stemmed from the fruits of basic and clinical research directed at the understanding of disease mechanisms Beeson ; Comroe and Dripps Modern cardiology is a good example of the evolution of scientific medicine. The major technical advances leading to a better appreciation of the physiology and pathology of the heart and circulation included studies of its electrical activity by electrocardiography; the ability to catheterize both sides of the heart; the development of echocardiography; and, more recently, the development of sophisticated ways of visualizing the heart by computerized axial tomography, nuclear magnetic resonance, and isotope scanning. These valuable tools and the development of specialized units to use them have led to a much better understanding of the physiology of the failing heart and of the effects of coronary artery disease and have revolutionized the management of congenital heart disease.

## Chapter 2 : 3 Ways Technology has Changed Healthcare | University of Illinois at Chicago

*Technology and Treatments Even before a patient with signs of stroke arrives in the Silver Cross Emergency Department, a Code Stroke protocol is activated utilizing a team approach. Our goal is to make sure that every patient receives the right treatment at the right time.*

We are getting a lot out of technology today. We use computers and smartphones to stay in touch with each other, buy things and conduct serious business. Technology is also getting smarter and smarter; recently a computer successfully masqueraded as a year-old boy. Psychotherapy, on the other hand, seems like one of the most human of all activities, where personal interactions, either between patient and therapist, or between patient and patient, constitute the very core of the activity itself. The future in which technology can help us think about and address problem alcohol and drug use seems far-fetched and distant. In fact, technology-assisted treatments are showing great promise. Furthermore, as the Mental Health Parity and Addiction Equity Act and its extension in the Affordable Care Act are implemented, demand for substance use treatment is likely to increase. Luo We know how to use psychotherapy to treat substance use disorders. A number of psychotherapies, such as Cognitive Behavioral Therapy CBT , motivational enhancement therapy MET and contingency management with money or prize-based incentives, are effective and often short-term treatments. Taking them into the community, nevertheless, has been hard for a number of reasons. There is often a lack of resources “ time and money ” for training, as well as for ongoing supervision to maintain adequate skill-levels. There are also limits on when and how often patients and providers can meet. The Rise of Technology-Assisted Care The National Institutes of Health have recently supported a number of studies to design and test computerized systems to assist and augment in-person clinician provided treatments and help support recovery management. The most impressive result appears to be the proportion of patients who were able to achieve sustained abstinence from cocaine Luo The program is intuitive, user friendly and just makes a lot of sense: The most impressive result appears to be the proportion of patients who were able to achieve sustained abstinence from cocaine i. What About Online Education? TES is a package intervention consisting of 62 interactive multimedia modules Luo TES is a package intervention consisting of 62 interactive multimedia modules grounded in the Community Reinforcement Approach “ a cognitive-behavioral intervention aimed at increasing positive reinforcement for non-drug using activities ” plus prize-based motivational incentives. The modules also include relapse prevention skills and knowledge in preventing HIV, hepatitis, and other sexually transmitted infections. The TES system includes incentives for abstinence and module completion: In the study, patients with a variety of substance use disorders received usual treatment or usual treatment plus TES. Overall, TES improves abstinence in these patients, but most dramatically, TES improves abstinence among the subgroup of patients who are actively using drugs at study entry i. After three months of treatment, around 40 percent of the patients in TES who were positive for drugs at study entry achieved abstinence. In contrast, in the usual care group, only around 26 percent of the patients were able to achieve abstinence. What About Smartphone Apps? David Gustafson and colleagues from the University of Wisconsin [3] make the observation that patients exiting residential care for alcohol use disorders are generally not offered comprehensive aftercare. This seems to run contrary to the idea of alcohol use disorder as a chronic, relapsing-remitting illness. They hypothesize that a treatment system overburdened by labor intensive programs and poor funding produces significant attrition in treatment Luo They hypothesize that a treatment system overburdened by labor intensive programs and poor funding produces significant attrition in treatment: For example, the Global Positioning System can initiate an alert when the patient is close to a bar or other designated high-risk area and ask the patient if she wants to be there. The addition of the smartphone application improves a number of clinical outcomes , but what is most surprising is that the effect size increases in time “ while at 4 months A-CHESS has an 8 percent improvement in absolute prevalence of achieving abstinence not statistically significant over usual care, at 12 months, A-CHESS has a 12 percent advantage that is both statistically and clinically significant. Given the promise of these computerized interventions, we feel encouraged that technology has become mature enough to capture at least some aspect

of psychotherapy Luo These treatments have a common trait: Given the promise of these computerized interventions, we feel encouraged that technology has become mature enough to capture at least some aspect of psychotherapy that is sufficient to improve clinical outcome. Nevertheless, computer programs have their limitations. Their use still requires distribution and education, there are numerous outstanding questions about how best to integrate technology into existing treatment frameworks, and they cannot easily handle urgent and unusual situations. Skilled therapists provide a warm, connected treatment context that can never be fully replicated by devices alone. However, given the limitations on resources as well as certain advantages, such as potentially increased privacy and autonomy afforded by the computerized treatment options, we believe that these interventions can become a routine part of care delivery and implementation. Computers may not constitute the entirety of a comprehensive treatment plan for substance use disorders, but they can help in getting someone to quit.

### Chapter 3 : Use of technology in treatment of mental disorders - Wikipedia

*Technology has opened a new frontier in mental health support and data collection. Mobile devices like cell phones, smartphones, and tablets are giving the public, doctors, and researchers new ways to access help, monitor progress, and increase understanding of mental wellbeing. Mobile mental health.*

In order to accomplish this we must efficiently scale up a combination of prevention, testing ,and treatment. Using effective treatment can help individuals to live normal lives. We now know that it can also prevent transmission. An individual can benefit by easily finding out if they need a test. Institutions can also implement HATS to realize large savings while scaling up testing services. Without having to make large investments to grow testing programs including hiring and training new employees, HATS offers these organizations a rapid low cost alternative. In addition, it can be used to increase the efficiency of existing programs. Also, some patients may choose to not be tested because they feel uncomfortable discussing embarrassing details about their private lives. Prevention by Treatment When individuals are treated early their viral level can remain at very low or undetectable levels. The rate of infection highly correlates with the viral load the amount of virus in a sample of blood in the host. To bring this to scale will require improving the process of early identification of those infected, linking them to care and effective follow up to ensure that patients continue taking their medication. Technology to Enhance Communication Problems often start with poor communication. Communication is key, and the best part of using technology is our ability to connect with others. Technology can have profound effects in education, communication, and linking individuals to care. The Internet for Education We live in a technology age. It is often the first place people turn with questions regarding health and well-being. The Internet offers an excellent opportunity for educating individuals in many ways, including healthcare. Overall, getting the right information to the right people though can be a challenge. Someone searching for health information online must be careful to filter through any misleading search results. Information provided needs to be accessible, accurate, and easily understood. Today there are a multitude of websites that enable individuals to learn more about HIV and ways to prevent the disease. Applications that can notify individuals anonymously of an exposure to HIV or another STD enhance patient to patient communication. Patients who feel stigmatized by simply showing up at an HIV clinic for care might use technology to keep it confidential. Conventional applications which enhance communication such as instant messaging, email, or video chat can be helpful in these circumstances. Further, widgets exist to easily insert many of these applications onto other websites to reach new audiences. Recent research has investigated the use of anti-AIDS microbicides. These gel, foam, or liquid compounds can be used preventatively to selectively kill HIV after an exposure. Researchers have also been looking for ways to embed these molecules into rings that females might insert monthly, similar to some birth control, to offer sustained protection. Currently, the microbicides are in development but not available for use.

*The use of electronic and communication technologies as a therapeutic aid to healthcare practices is commonly referred to as telemedicine or eHealth. The use of such technologies as a supplement to mainstream therapies for mental disorders is an emerging mental health treatment field which, it is argued, could improve the accessibility, effectiveness and affordability of mental health care.*

The healthcare industry was no exception to the rise in disruptive technology changing the way people are impacted. Read the version: Want to be featured as a top health IT company? Without a doubt the pace at which new technology is impacting our everyday lives is increasing at lightning speeds. These technologies are starting to allow healthcare practitioners to offer cheaper, faster and more efficient patient care than ever before, which is certainly a step in the right direction. The healthcare industry has long been overburdened by a slow moving innovation due to the complexity of the medical ecosystem, but due to this technology the industry has finally seen some far reaching changes. Everything from new artificial hearts to electronic aspirin, the healthcare industry is slowly but surely becoming more agile, effective and cost-effective for patients looking for care. Of the many disruptions reaching the masses this year, here are some of the biggest innovations in healthcare technology with far reaching impacts:

**Microchips Modeling Clinical Trials** The potential to streamline, improve, and perhaps transform the current healthcare system is huge. Microchip modeling clinical trials aim to replace the use of animals in clinical trials to more accurately test the safety and efficacy of treatment for human patients and spare the lives of countless animals typically used in testing. These microchips are smaller than a human thumb, can reconstruct the complicated interface between organs and capillaries, which is similar to the idea of microfabrication, the process of making structures on a micrometer scale. By eliminating animal models in certain circumstances, scientists and doctors have been able to reconstruct organs like the human lungs by focusing on the use of complicated systems of microchips to emulate these bodily systems. Microchips more closely resemble live tissue, cell types and realistic three-dimensional interactions occurring in the human body than do other forms of clinical testing to date.

**Wearable Technology like Google Glass** Wearable technology is still in its infancy but has already started to have widespread influence across many industries. Rafael Grossmann was the very first surgeon to use Google Glass or wearable technology in general while performing a surgery. As wearable technology continues to improve to better meet the needs of its users, healthcare providers continue to hope that its use will impact both the experience of patients and practitioners to better receive and administer care. He sees this new technology as allowing a doctor to someday interact with a patient, while simultaneously pulling up their medical history using Google Glass. The surgery performed using Google Glass could serve as an example of real-time education for medical students and other professionals alike. There are even telemedicine opportunities with Google Glass as well, allowing doctors and other medical professionals to provide clinical care in certain capacities from a distance. He argues that with the continued adoption of wearable tech like Google Glass, more lives will be saved since communication between medical professionals and patients will continue to improve to the next level. Here are seven applications of 3D printers in healthcare that could have an important impact in the future: These cells have already been successfully printed in a lab and could be one-day use to create tissue that could help test drugs and assist in the growth of new organs. There have been many advances in the areas of developing skin to help burn victims and skin disease patients, 3D printers can help further jumpstart these advances with the addition of laser-printed skin cells. Organovo is a company that has already successfully printed blood vessels and sheets of cardiac tissue that actually beat along just like a real heart. Printing cancer cells is a way of growing these cells on tissue in a lab to study, test drugs on and to eventually find a cure for. Printing cells with a 3D printer proves useful in a recent study of rats that had previously suffered heart attacks and were given these patches of cells to help slowly help improve their heart function overtime. Printing new part for organs or entire organs all together will help solve an ongoing medical need and help save hundred of thousands of people every year waiting for an organ donation to come thru. Optogenetics A new technology has jump-started the technique in neuroscience known as optogenetics

where neuroscientists target a single neuron in the brain of a mouse merely by turning on a light. This is done by using a light activated gene and inserting it into the genome of a mouse to be able to easily identify when the particular neuron is firing in the brain. Optogenetics is a hot topic amongst the medical community today, surrounded by both praise and criticism. This could have far reaching benefits with humans to help better understand the complex network of neurons that make up the brain. A stronger understanding could help humans better grasp how we create thoughts, emotions and behaviors. By controlling the activity of specific neurons, neuroscientists will begin to learn how each type of neuron contributes to the overall functions of the brain. The firing of a neuron through lighting may someday be a technique to finding the answers to some of the many open questions mankind has wondered about themselves both medically and physiologically since the dawn of time or this technique may not be able to work with humans due to its invasive nature in its current applications with rats. Time will tell as to whether this approach is effective, but nevertheless, the study of the human brain using light will help neuroscientists on the path to better understanding the neurons and how they work across this complex organ. This is a difficult task for healthcare professionals due to the complexities of the systems, technologies and operations currently in place at all healthcare facilities, hence why this industry is often the slowest moving when it comes to impactful change. A hybrid operation room is a new innovation where a traditional OR is outfitted with advanced medical technology to improve the care delivered to patients and enhances the skill-sets of medical practitioners when it comes to administering treatment. The Lakeland Regional Media Center is an example of a hybrid operating room, one of the first in its area, but definitely an indicator of more widespread changes to come to operating rooms around the country innovating on existing processes and technologies with traditional surgical procedures and treatment options. Technologies used in hybrid operating rooms have typically helped reduce trauma, scarring, spurred faster rehabilitation and has helped decrease hospital stays. Digestible Sensors Approved in , digestible sensors will continue to provide healthcare professionals with more information about the human body and how various treatment solutions affect each system of organs. A digestible sensor is a sensor that transmits information about a patient to medical professionals to help them customize the care to the individual as well as the care provided to other individuals experiencing similar health conditions or ailments. This technology would eventually allow an individual to swallow a pill provided by their doctor and skip their physical because the digestible sensors, that look like regular pills, could perform all the same functions a doctor typically handles in a standard physical and then some. An innovation of this nature could have far reaching effects for healthcare by helping detect diseases and conditions at earlier stages in people digesting these sensors that are in turn, constantly monitored wirelessly. From referrals, progress updates, and insurance authorizations; these types of communications result in huge amounts of money and time being wasted and a liability to every healthcare provider. Patients are stuck in the middle as doctors still communicate with antiquated systems ex. As many as 50 percent of referrals are not received by the specialty care provider causing patients to miss treatment and healthcare providers to lose money.

### Chapter 5 : Treatments and Technology | SoutheastHEALTH | Cape Girardeau, MO

*Browse science publications on Health and Medicine - Medical Technologies and Treatments from the National Academies Press.*

Specific technologies[ edit ] Traditional methods of helping people with a mental health problem have been to use approaches such as medication, counselling, cognitive behavioral therapy CBT , exercise and a healthy diet. New technology can also be used in conjunction with traditional methods. The VR system offers a sense of realism in a safe environment. By gradually exposing the person to their fear with a Virtual Environment the patient becomes accustomed to the trigger of their problem to an extent that it no longer becomes an issue. This form of treatment has also been applied to other mental health problems such as phobias where anxiety is triggered by a certain situation. For example, fear of flying or arachnophobia fear of spiders. Computer games have also been used to provide therapy for adolescents. An example of a computer game that provides such therapy is SPARX , which has notably been shown to be about as effective as face-to-face therapy in a clinical trial. Another way to lift the mood of patients are subliminal relaxing music on an mpg file to get rid of the noise of everyday living. As technology improves, it may soon be possible for mobile phones or other devices to sense when sufferers are changing state e. It may also become possible to measure physical evidence of levels of distress and suffering, such as changes in hormones or adrenalin in blood, and changes in brain activity. Apps may also be able to predict high stress situations, based on location, time, activity e. The technology could then send calming messages to sufferers, automatically alert carers and even automatically administer meds. This streamlines therapist-client communication. The system provides real-time data, automated communication tools, and alerts. Technology can therefore be used in innovative ways to provide support for those with mental health problems. However, one size does not fit all and some technologies may not be suitable for certain people. The death of telemedicine? Journal of Medical Internet Research. Towards a culture of sharing and trust]. *Revue medicale de Bruxelles in French. The Use of Technology in Mental Health: Applications, Ethics and Practice.*

**Chapter 6 : Will Technology Change the Future of Addiction Treatment? | Drug Rehab Options**

*All of the technology is compiled and coordinated by a data management system that stores each patient's information, including demographics, simulation, and treatment planning, to ensure treatment parameters are always accurately matched to the patient's treatment plan.*

Meniscal tears are one of the most common injuries among athletes and traditionally demanded long recovery periods. Surgeons are now finding that even relatively little meniscal damage can put patients in a lot of pain. Robert Marx, MD, an orthopedic sports medicine physician at Hospital for Special Surgery in New York City, recently published an article in the journal *Arthroscopy and Related Surgery* about small meniscal capsular separation among young female athletes. For a long time, surgeons ordered MRIs for these athletes, which came back negative because the detachment was so minor. However, after treating injuries in several girls who had persisting symptoms for more than six months, he decided to operate. Although the injury was small and subtle in some cases it was clearly causing the pain because after recovering from the procedure, the patients were pain free. His practice recently opened the first dedicated meniscal transplant center in the country, which allows surgeons to treat the damaged compartment of the knee without performing a full artificial knee replacement. The new meniscus transplantation center has changed my practice quite a bit. Sports medicine physicians around the country have incorporated platelet-rich plasma injections into their practice, either as standalone treatment for partial ligament tears or as growth-enhancer during larger repairs. PRP burst onto the scene a few years ago and showed a great deal of healing promise, but recent studies shed doubt on its actual healing ability and no long-term data is available. Coupled with a musculoskeletal ultrasound for injection guidance, he has seen excellent results from PRP. Bowen also performs PRP injections for patients with partial tears in the hip abductor muscle tendons, Achilles tendons and rotator cuffs. Bowen says the injections have helped of his patients with partial tears from throwing injuries, including one athlete who had a tear in the ulnar collateral ligament. The transition to using stem cells in joint procedures has been slow. One of the issues with developing biologic healing is moral and legal objection to using embryonic stem cells for research in the United States. Although there is a high success rate in the literature for the single-bundle anterior cruciate ligament repair, there is also a high post-surgery attrition rate for athletes because the single bundle limits rotational ability. As a result, new technology and advancement in surgical technique make anatomically correct procedures possible. Some surgeons have learned a double-bundle technique, which strengthens rotational and front-back stability. Athletes who receive double-bundle ACL reconstruction are able to perform cutting and pivoting motions at a reduced risk of re-injury. Unfortunately, the significant learning curve associated with the double-bundle procedure makes it inaccessible to many surgeons. Adnan Cutuk, MD, and Scott Kaar, MD, both orthopedic surgeons at Saint Louis University Hospital, perform a variation on the single-bundle procedure where they drill the femoral tunnel through the medial portal, as most surgeons do, but use flexible remers instead of rigid remers to achieve a more natural knee. Cutuk predicts the procedure will become more pervasive. Over time, the information we receive at meetings and discussions will persuade others to learn the technique as well. This technology allows sports medicine physicians to see how injuries occur and could be crucial to preventing injuries in the future. Some of the biggest advancements in this technology include multiplane ultrasound and fluoroscopy as well as digital videotape technology. Some of the new technology is helping us understand and diagnose what the pathologic motions are that cause the injury. Athletes who have injury to one knee are also more likely to re-injure that knee or injure their other knee than athletes who have no injuries at all. We are using really modern technology to study these functions. One of the developments Dr. ElAttrache is most excited about today is the application of safer methods to remove injured tissue during a less invasive surgery. He is studying ultrasound waves to remove injured and damaged tissue, which can have better outcomes for the patient. The stem cells or plasma elements promote regeneration of normal tissue after removal. ElAttrache sees this continuing as a big trend over the next few years. Hip impingement is a common condition among high-level athletes. The severity of the disorder depends on the rotation of the acetabulum – whether it is tilted, the amount of coverage on the socket, the

rotation and the amount of bone on the femoral head in junction with the femur, says Dr. Now there is a proliferation of arthroscopic procedures. Ultrasound technology has been around for decades, but its use in the musculoskeletal and pain management specialties is just beginning to spread. Most sports medicine physicians learned to administer blind injections to a troubled joint in their residencies, becoming more successful with experience. However, once ultrasound technology was adapted for joint injections, physicians were able to administer the injection to the right spot on a more regular basis “ which is supported by literature published in the American Journal of Sports Medicine. The Navigator DS is designed to make the delivery of injections more efficient by automating the preparation of the medicine for the injection. As a result, contaminated needles are never an issue. The Navigator DS also has practice management advantages. The equipment is portable, which means it can be taken from one exam room to another and used on the sidelines at sporting events. Ultrasound is also advantageous because you can view the anatomy in action to assess the biomechanics of the problem. The needle visualization technology is also better, and the technology is becoming less expensive for physician offices to purchase. New computer-guidance and robotic technology is on the market for partial knee and hip replacement procedures. The plans are then translated to the robot, which guides surgeons in the operating rooms. However, these images only allow for viewing the aligned knee in one position; the robotic technology allows for viewing the alignment while the knee is in motion during the preplan stage. Before, your assessment was much more subjective. There is also little clinical evidence to show the technology provides significant improvement in outcomes, despite the increased equipment cost. However, surgeons who use the technology often report, anecdotally, better surgical technique that could lead to a sturdier long-term outcome. While the transition to robotic technology may be slow, Dr. Grewe sees this technology expanding to new applications. Software for guiding the robot during hip procedures was released earlier this year, and the software could grow to include other applications, such as shoulder surgery. Athletes place a great deal of stress on their spinal cords, which can lead to fractures or other painful conditions. In the past, surgeons treated these conditions with disruptive open procedures and recovery was slow; there was little chance of returning to play. However, new technology has made it possible to perform minimally invasive surgical correction and return athletes to play within a year. When athletes incur a spinal cord injury, they are able to receive a diagnosis and treatment much faster than they did in the past, which increases chances of recovery. From high school through professional sporting events, trained medical staff members stand on the sideline to orchestrate an initial assessment of the injury, and in serious cases athletes can be airlifted to a hospital. Once at the hospital, a CT scan is taken in the emergency room and results are almost instantaneous. We want to reduce the injury zone, and treatment is moving that way. The question is whether these treatments will be safe. Concussion management and prevention: There has been a boom in concussion awareness among athletes as a result of studies showing the correlation between multiple concussions and severe neurological issues. Major professional athletic leagues have made changes in game regulations to prevent and better identify concussions over the past few years. For example, hockey players are no longer allowed to blindside an opposing player because the risk of concussions is so high. The concern about concussions was seen as unnecessary even five years ago, and the only tools available for assessing the damage was based on symptoms; players were allowed back on the field if they were feeling well enough to play. Athletes who return to play too quickly are at greater risk of re-injury because concussions negatively impact balance and biomechanics, and if the player incurs a second concussion, the implications could reach far beyond that game. Some young athletes who suffer multiple concussions have trouble completing school work and that head trauma could lead to depression and symptoms of amyotrophic lateral sclerosis later in life. Most states recently passed legislation to protect young athletes from returning to play too soon. Concussion legislation often requires athletes to obtain clearance from medical professionals before returning to play and prevents them from returning the same day as the injury. Bodine says there are several steps athletes must complete before they are considered fit for play. In these situations, we are still seeing a lot of misunderstanding about concussions. My next coordinated effort is working with some of the club sports to educate their members about concussion management and prevention.

### Chapter 7 : Technology to fight AIDS | Medwiser

*Technology in Cancer Research & Treatment (TCRT) is an open access, peer-reviewed journal which focuses on developments in the prevention, diagnosis, treatment, and monitoring of cancer. Please see the Aims and Scope tab for further information.*

No Comment Water management and treatment is crucial as it delivers guaranteed access to potable water in water-deficient areas and ensures sustainability in areas with limited sanitation. From public water supply to effluent treatment and sewage treatment, water management processes not only help maintain the cycles of nature but address water scarcity problem efficiently. In this blog, we are covering how Blockchain in water industry can be fruitful for every deprived. However, the process of maintaining health, hygiene and productivity of the community by constantly supplying clean water is not easy. This complete process of water management and treatment is expensive and complicated, and it is vital to carry these activities without harming the environment. In such a scenario, can Blockchain technology help address these issues!!

DropforDrop Digital Tokens for Water System A new cryptocurrency can help supply continuous funding to reverie of little, decentralized water treatment system. In fact, several companies are putting up some serious effort to realize this dream and developing model for seed funding. Water treatment and management is a costly affair and demands millions and billions of dollars to work out. Also, Maintenance of sewage system is inevitable for maintaining environmental cycles and ecology health. Water and waste production is part and parcel of every industry, whether it is real estate or food industry. However, it is unfortunate that the world ignores this sector and hence, receives limited investment opportunity. Blockchain can deliver a financial platform as a new token or cryptocurrency can be launched for funding especially to private water treatment systems. Also, this industry can digitalize itself by implementing some cutting-edge technology and establish partnership with other essential industries. Let us understand by an example. LongHash For instance, Real estate industry is booming, and agents are investing heavily in this sector. Here, maintenance of water and sewage system is unavoidable. They have two options, either to tie up with sewage system to run sewage line, where both blackwater and greywater are washed out to municipality for water and sewage treatment or developing an on-site Blockchain water management system. Hence, you are protecting environment as well as minimizing the cost of recycling. Also, you are no longer dependent on central municipality system for water supply. Undoubtedly, water treatment and management are coming to an edge and Blockchain is helping it to decentralize and reducing the cost involved along with dependency. With Blockchain technology, it would be rather possible for industries, consumers, households, and water managers, to retrieve treasured information about water quantity and quality and help make well-versed decisions. Also, these data empower users to make better decisions about water usage and conversation. This technology will diminish cost, enhance efficiency and help people realize the importance of this precious commodity. However, this technology cannot measure or track the accurate water flow but definitely provide assistance in the development of smart cities and tackle water scarcity issue with ease. There are different opinions on how will Blockchain change the world. We love Blockchain technology and as a tech community, Pioneers WaterChain They intend to harness the potential of Blockchain technology by launching a new cryptocurrency and tackle the problem of water crisis. They are planning to develop a decentralized water funding platform that can help augment the quality of water and avail portable water to all. For this purpose, they have already built a water purification system and is currently working on a system called the Internet of Things water quality system that can store water quality records on Ethereum blockchain. This will help world to be more confident about the water quality, they are using on regular basis and can notify officials, whenever the water quality deteriorates. Conclusion Last decades have witnessed abuse of most limited yet precious resource of earth i. Now, the world is realizing its worth after watching thousands of people dying due to contaminated water. Water crisis is a reality and we urgently need a solution. Blockchain in water management has turned out to be a blessing for most of the industries, whether it is real estate that is allowing agents to construct homes or food industry, where every stage is monitored and recorded. Blockchain can help world restore water balance by

## DOWNLOAD PDF TECHNOLOGY AND TREATMENTS

giving techniques of harvesting clean water while making this domain more profitable. Get the latest buzz in your inbox! Subscribe Now Just one more step to go!

## Chapter 8 : A Brief History of Medical Technology

*The International Conference on Advanced Technologies & Treatments for Diabetes has become synonymous with top calibre scientific programs that have provided participants with cutting edge research and analysis into the latest developments in diabetes-related technology.*

Technological Breakthroughs in Medical Technology written by: The ophthalmoscope allows the interior of the eye to be viewed. At about the same time, Willhelm Roentgen, a professor of physics in Bavaria, discovered that radiation can penetrate solid objects of low density. This led to the invention of x-ray, which allowed physicians to view the inside of the body without surgery. X-rays became popular in World War II. They were used to diagnose pneumonia, pleurisy, tuberculosis, and to help doctors before surgery. The biochemical assay was also developed during this period to be used as a diagnostic tool for diabetes, kidney disease, anemia, diphtheria, and tuberculosis. Technology also made a great impact on medical procedures and allowed for complex surgical procedures to be developed. In , the respirator was introduced. In , the first heart-lung bypass machine was introduced. The origin of physical therapy can be traced back to Elizabeth Kenny, an Australia nurse, who used hot packs for treatment of polio and muscle rehabilitation in the early 20th century. The growth of medical technology in the past 50 years has exceeded all advances made during the previous years. For instance, microscopic devices have evolved from an optic microscope to an electron microscope which allows three-dimensional visualization of intracellular space. In the s computer technology merged with medical technology. Medical researchers now use computers in all activities, ranging from performing complex calculations, storing medical records, to controlling instruments. Computers can now be programmed to perform robotic surgeries with great precision. A key contribution to the growth of medical technology is the application of basic science and engineering. For instance, magnetic resonance imaging MRI is an amazing engineering feat that brings physics principles into reality. MRI is now widely used for medical imaging. Technology also makes great breakthroughs in improving quality of life of patients by providing prosthetic body parts such as artificial heart valves, blood vessels, limbs, and reconstructive skeletal joints.

**Chapter 9 : The Impact of Technology on Healthcare | AIMS EDUCATION**

*Journal of Water Technology and Treatment Methods also provides the state of the art of the technologies in water production and treatment and focuses on environmental aspects. Journal of Water Technology and Treatment Methods invites authors to submit high quality articles with significant novelty and impact for publication.*

According to the statistics reported by the CDC, that means over 20, children are born each year who will be diagnosed with ASD and remain functionally non-verbal. When individuals have severe speech and language disabilities, augmentative and alternative communication strategies AAC can provide them with an opportunity to express themselves and have a voice. AAC services developed from the most basic desire to help individuals who were unable to speak or express themselves. In the earliest form, eye gaze, letter, and picture displays were included as AAC. In order to utilize these early forms, face-to-face interaction was required, and the interaction was usually slow. These systems were often heavy, cumbersome, and expensive. Personal computers PC and standard operating systems became another option for AAC and opened up a new world for developers. Not only could consumers use the technology for face-to-face interactions, but they could also use the technology to write, create and give presentations, and more readily participate in their home, school, work, and community environments. The PC devices were more portable and a little less expensive than the previous dedicated AAC devices. The proliferation of inexpensive mobile technology has dramatically changed how service providers deliver educational and behavioral services to individuals with ASD. From touch screen phones to tablet devices, mobile computing devices have never been more user friendly, cheaper, or universally available. This is often true for our students with ASD. In addition, many individuals are visual learners and have strong technological skills. Usually, these bites have focused upon a child who could not communicate and often had behavioral issues due to the frustration of not being able to communicate. Once introduced to a communication app on the iPad, the child was able to communicate eloquent thoughts and behaviors disappeared. Therefore, due to the media hype, many consumers began to purchase an iDevice and a certain communication app at an alarming rate, because they were sure that an iPad was a panacea for every individual with ASD. Like all technologies and techniques, certain things work for certain people. Not all individuals with ASD need the iPad for a communication system, but they could have used the technology to increase another skill. However, the consumer who purchased the iPad did not know how to evaluate what app to purchase, what app was appropriate, etc. Therefore, the majority of the iPads were used for entertainment and game playing. People with ASD have a need for, and a right to, the same range of communication options available to everyone else. Today, most people use multiple devices to address their communication needs. The idea that only ONE communication device can meet all the needs no longer makes sense. Some needs may be met by the mainstream device, while others may require accessories and techniques specifically designed for them e. Multiple use technology extends past our current AAC technology and at a significant lower cost. A growing concern for all individuals with ASD is employment and having skills to live independently. National data indicates that the majority of adults with autism are unemployed or underemployed Institute for Community Inclusion, Employment is a critical component for having a productive adult life. Individuals living with autism deserve the opportunity to contribute as productive workers in appropriate employment settings; paying taxes and improving their quality of life. The use of mobile technology can address some of these barriers. So why is technology helpful in treating individuals with ASD? Using devices like tablets and other hand-held devices are useful tools, because they are flexible and portable unlike other dedicated AAC devices that often can be heavy and cumbersome. The touch screen and layout are more accessible for individuals with coordination or learning difficulties—sliding and tapping are easier than typing. Technology can improve communication with others by the timely use of email or texting, which has a cost and time savings. Technology allows for adaptability and motivation. Many people with ASD are visual thinkers. According to Temple Grandin, author, speaker, and an individual with ASD, pictures are their first language, and words are their second language. As concrete, literal, visual thinkers, individuals with autism can process information better when they are looking at pictures or words to

help them visualize information. Technology just makes visual images more accessible to the individual with ASD. Computer graphics capture and maintain their attention. Some individuals may have auditory sensitivity and are better able to respond to lower sounds. An individual with ASD or their family may use an app like Noise Down, which will automatically sound an alarm when the decibel level gets too high, or Too Noisy Pro to indicate to the individual that they are being too loud. Some individuals with autism are unable to sequence. Technology can reduce the number of steps required for the completion of a task or give a visual representation of the task steps in sequence. An example of a use app for sequencing tasks is Sequencing Tasks: Often individuals with ASD have difficulty with fine motor skills making handwriting difficult. Technology helps reduce the frustration with handwriting or drawing. Considering the national data on employment for individuals with autism, teaching technology for skills such as writing needs to be employed as early as possible. Yes, knowing how to write your signature and other information is important, especially when technology is not available; however, when looking at what handwriting skills are currently being utilized today versus keyboarding, dictation, or writing on a screen with a stylus or your finger, we clearly see the current skills needed. In addition, there are many apps that allow individuals to practice fine motor skills in other areas besides handwriting or keyboarding. Some individuals do not use speech for communication. They can use technology as a voice output device to speak for them and help them express themselves more fluently. Nonverbal children with autism find it easier to associate words with pictures if they see the printed words and a picture together. The web can give unlimited access to pictures and words! There are numerous AAC apps, from low- to high-tech, that can be used by individuals living with autism. It is thought that some individuals with autism cannot look and listen at the same time. Their immature sensory system cannot process simultaneous visual and auditory input. Some children with autism will learn to read phonetically, and others will learn visually with whole words. Voice output helps with the auditory reinforcement, and computer graphics can help the students visualize the words and, therefore, increase their reading skills. Many individuals with autism have difficulty with executive functioning and struggle with organizational and self-management skills. Again, there are several apps that will assist with organization and self-management with calendars, schedules, work systems, etc. Today, there are over one million apps available, and the number continues to grow daily. The apps range in price from free to several hundred dollars. There is an app for anything and everything. However, caution must be used. Assessment and data are necessary before making a decision about any technology used. What skills do you want to target? How do these skills compare with their peers? What will be the outcomes you are expecting? Two good search engines for finding appropriate apps are Autism Apps and i. Autism Apps links to reviews by parents, specialists, and other users, usually from first-hand experience; it also has links to video demonstrations or video reviews of the app when available. AM Search allows you to create a profile for an individual by supplying the age, gender, and level of dependence of the individual on others to level of independent use of technology. Once the information is entered, it will do a quick search for appropriate apps fitting that profile for review. Some websites for looking for apps include: Smart apps for Special Needs.