DOWNLOAD PDF TECHNOLOGY AND THE COST OF HEALTH CARE

Chapter 1 : The Effects of Health Information Technology on the Costs and Quality of Medical Care

Business Report The Costly Paradox of Health-Care Technology In every industry but one, technology makes things better and cheaper. Why is it that innovation increases the cost of health care?

Tables Number as Table 1, Table 2 etc, and refer to all of them in the text. Each table should be provided on a separate page of the manuscript. Tables should not be included in the text. Each table should have a brief and self-explanatory title. Column headings should be brief, but sufficiently explanatory. Standard abbreviations of units of measurement should be added between parentheses. Vertical lines should not be used to separate columns. Leave some extra space between the columns instead. Any explanations essential to the understanding of the table should be given in footnotes at the bottom of the table. Place citations as numbers in square brackets in the text. All publications cited in the text should be presented in a list of references at the end of the manuscript. List the references in the order in which they appear in the text. Only articles published or accepted for publication should be listed in the reference list. Submitted articles can be listed as author s , unpublished data. If an article has a DOI, this should be provided after the page number details. Manuscripts will not be considered if they do not conform to the Vancouver citation guidelines. References must be listed in Vancouver style: Regulation of interstitial excitatory amino acid concentrations after cortical contusion injury. The Merck manual of diagnosis and therapy. Merck Research Laboratories; Chromosome alterations in human solid tumors. Vogelstein B, Kinzler KW, editors. The genetic basis of human cancer. The Society; [updated May 12; cited Oct 17]. Footnotes Footnotes should only be used if absolutely essential. In most cases it is possible to incorporate the information in the text. If used, they should be numbered in the text, indicated by superscript numbers and kept as short as possible. Although in general an author may quote from other published works, he should obtain permission from the holder of the copyright if he wishes to make substantial extracts or to reproduce tables, plates or other figures. If the copyright holder is not the author of the quoted or reproduced material, it is recommended that the permission of the author should also be sought. Material in unpublished letters and manuscripts is also protected and must not be published unless permission has been obtained. Submission of a paper will be interpreted as a statement that the author has obtained all the necessary permission. A suitable acknowledgement of any borrowed material must always be made. Costs arising from such corrections will be charged to the authors. This PDF copy is watermarked and for personal use only. A free PDF copy will not be provided for conference proceedings and abstract issues. An order form for a PDF file without watermark, reprints or additional journal copies will be provided along with the PDF proof. If you wish to order reprints of an earlier published article, please contact the publisher for a quotation. Kudos is a service that helps researchers maximize the impact and visibility of their research. It allows authors to enrich their articles with lay metadata, add links to related materials and promote their articles through the Kudos system to a wider public. Authors will receive no more than three emails: Using and registering for Kudos remains entirely optional. Please consult our Promotional Toolkit for Authors for tips.

Chapter 2 : Technology: The Cure for Rising Healthcare Costs? - MIT Technology Review

Health care costs are increasing at an annual rate of 7% a year, which if sustained will bankrupt Medicare in nine years and increase the nation's overall annual health care tab to $4 trillion in 10 years.

A Cure for Health-Care Costs. In a financially stretched healthcare market, medical technology is sometimes seen as an expensive luxury. But use of the RIGHT technology can actually cut the overall cost of medical treatment and improve patient outcomes. These long-term degenerative diseases place a high cost burden on our healthcare systems. Global healthcare markets are experiencing significant cost constraints, and for new products to be taken up by healthcare providers, they will need to actively justify their cost against the measurable improvement they can provide to patient health. The difficulty is that new breakthrough technologies often take time to deliver benefit, with cost savings spread over the lifetime of the patient or the course of the disease. For example, imagine medical device A, a new, innovative device that allows early diagnosis of chronic degenerative disease X. Our example may be hypothetical, but convincing healthcare providers and payers of these types of efficiency savings is a very real challenge. In healthcare, this challenge is compounded by the possibility that the savings could be passed to another healthcare provider or payer if the patient moves to another geographic region or changes their health insurer. So how can medtech companies navigate this complicated market dynamic? For a start, patient outcomes and health economics need to be considered at a much earlier stage, and each opportunity may need to take into account quite different variables. One example would be insulin delivery for diabetes patients: Using technology to enhance healthcare delivery Now back to the technology and some examples of areas that we think are of particular interest. Because we passionately believe that science and technology are key enablers in finding new ways to reduce costs and increase the efficiency and quality of care, we spend a lot of time keeping an eye on what is out there. Reducing time in the hospital through improved surgical outcomes A new generation of battery-powered tools that use ultrasonic, radiofrequency, laser, or light energy is enabling a whole new range of minimally invasive surgical procedures. This has become a reality due to advances in low-power electronics, electronics miniaturization, and battery energy density. These smaller, self-powered instruments not only are less invasive but also have potential to improve infection control and patient outcomes. In some cases, this means procedures can be done in a clinic rather than a hospital. So, while the actual initial instrument cost might be higher, the lifetime costs can be lower, and these instruments reduce not only the time that patients spend in hospital but also, in some cases, the postoperative treatments that are required. Improving and expediting diagnosis Diagnosis and pathology are changing. In the past, to make a diagnosis, a clinician might have conducted a biopsyâ€”an invasive and time-consuming procedure that can require multiple appointments. Optical coherence tomography OCT is a three-dimensional imaging system similar to ultrasound that uses light instead of sound to see below the surface of tissue in great detail. Until now, OCT has primarily been used in ophthalmology to detect abnormalities beneath the surface of the retina. However, with developments in laser technology, light sources, miniature actuators, and processing power, OCT is ripe for use in other applications, such as in the imaging of vascular disease or cancer detection. Advances in processing power are also negating the need for invasive endoscopies and colonoscopies. CT- or MRI-based virtual colonoscopies provide a more comfortable, patient-friendly alternative for early detection of colon cancer. But the important enablers, aside from smart phones and tablets, are smart sensing technologies, low-power connectivity, and developments in user interfaces, storage, data processing, and analytics. These connected health technologies could help reduce healthcare costs by improving patient compliance and reducing office visits. Here are two examples: Senseonics is developing a continuous glucose monitoring system consisting of three major components: The concept uses a novel acoustic detection technology, together with a cloud-based server and mobile app, to monitor and interpret whether a patient is administering doses properly. The system could warn the patient that a dose was taken incorrectly, coach the patient to improve dosing technique, and provide the doctor with a historic record of treatment adherence to determine the context of an asthma attack and options for improved treatment going forward. Advancing disease prevention A final example is third-generation DNA sequencing technologies. These have the potential to reduce the overall cost of treating a patient by both improving prevention and enabling more personalized and targeted therapies, reducing drug waste and associated time and cost. Key technology enablers are groundbreaking single-molecule detection technologies and data analytics, which have enabled the conversion of vast amounts of raw data into reliable sequences, with fewer errors. No barrier to innovation As these examples demonstrate, the increasing focus on cost reduction and value in healthcare does not have to be a barrier to innovation. Instead, with the right technology insight, medical device developers can provide the healthcare system with cheaper, faster, and more effective treatments. It just takes a solid approach to front-end innovation that combines structured methodologies with a multidisciplinary perspective and an eye for how to adopt new technology advances in ever-more-clever ways. But it can be done! Will you lead or follow? Join us at EmTech Digital

Chapter 3 : Information Technology: Not a Cure for the High Cost of Health Care - Knowledge@Wharton

technology and costs of pediatric heart care Pediatric heart care is iconic of the situation in today's healthcare environment. The individual specialties of pediatric cardiology, pediatric cardiac surgery and intensive care are very much technology-dependent.

Open in a separate window Notes: All summary statistics are calculated on an annual basis for the base year. HIT is defined here as the adoption of at least one of the following technologies: A shortcoming of the data is that although it differentiates the adoption of many different software types, it does not record information on the quality of the HIT systems or the precise functionalities they include. I turn to the survey conducted by the American Hospital Association, reported by Jha et al. This smaller survey covers hospitals, as compared to the hospitals included in the broader HIMSS data, and provides a snapshot of HIT installations in the survey year, a few years after the end of my study period in The most common features of CDS are drug allergy alerts fully implemented in at least one unit at 68 percent of surveyed hospitals and drug-drug interaction alerts. Roughly half of the CDS systems includes clinical guidelines and reminders, such as reminders to prescribe beta blockers after a myocardial infarction 30 percent or provide pneumonia vaccines The Medicare claims data allows me to construct measures of patient health, medical expenditures, and the quality of hospital care. Because HIT adoption is observed at the hospital-level, I cannot observe which outpatient care providers are linked to an interoperable HIT system. For this reason, my analysis focuses on patients receiving inpatient care. The sample includes patients admitted to a hospital with a primary diagnosis of acute myocardial infarction, stroke, hip fracture, lung cancer, colon cancer, gastrointestinal hemorrhage, or pneumonia. This set of diseases was chosen following previous work such as Baiker and Chandra a because hospitalization for these conditions is likely to be a good proxy for disease incidence. I follow all inpatient and outpatient Medicare claims for these patients for one year following their first in-sample hospital admission. If HIT has heterogeneous effects which depend on patient age, then a limitation of this analysis is that it only identifies effects on the elderly Medicare population. The benefit of using Medicare data is that it allows me to measure the effects of HIT on a broad range of relevant outcome variables, in a panel data setting. In addition, Medicare enrolled 15 percent of the US population and accounted for 20 percent of total health spending in , fractions that are likely to grow as the population ages. Elderly patients are highly likely to have multiple medical problems, putting them at greater risk for the coordination failures and medical errors that HIT is specifically designed to prevent. The AHA survey allows me to measure several key hospital characteristics, including hospital investments in other diagnostic and therapeutic technologies, staffing levels, and total number of patient admissions. HIT adoption status is observed for a sample of hospitals. I am able to match 90 percent of Medicare inpatient stays to the IT adoption status of the admitting hospital. There are a total of 2. Adopting hospitals are larger on average than non-adopters, with twice as many inpatient beds, and an average of annual admissions compared to admissions for non-adopters. New scanners and new HIT systems both require large fixed cost investments, which may be more profitable for larger hospitals. Patient characteristics do not differ as dramatically across hospitals. Comparing columns 1 and 2 , adopters serve a slightly younger and more racially diverse population. Consistent with the younger population, adopters have a 0. Total medical expenditures in the one year following an inpatient admission are 30 percent higher for patients at adopting hospitals. Adopting hospitals offer more intensive treatment in the pre-period along a number of margins, including longer hospital stays, and more physicians evaluating each patient. The pre-period differences between adopters and non-adopters suggest that it will be important in the remaining analysis to control for baseline differences and allow for the possibility of differential trends across hospitals with different adoption statuses. In addition, I will show that my results are robust to omitting the set of non-adopting hospitals from the estimation sample. I will further discuss the strategies I use to account for this heterogeneity in Section 4. Two striking characteristics of this population indicate that it is particularly well-suited to identifying the impact of HIT. First, these patients are quite ill, with a 10 percent mortality rate in the baseline year. Thus, improvements in health may well be expected to occur along the margin of one year mortality, making survival a reasonable indicator of health in this sample. Second, a patient in this sample sees over ten unique physicians on average during their admission and the year following. The large number of providers per patient suggests that there is significant scope for coordination failures within this population. HITht is a binary variable equal to one if a hospital has contracted either a clinical decision support or an electronic medical records system in the current year or in an earlier year. Included patient characteristics are 1-year age bins, race, sex, and primary diagnosis. Adopterh is a dummy variable which equals one if the hospital has adopted HIT by the end of the study period in ; this variable is interacted with a linear time trend. Lastly, Qh is a vector of hospital size dummy variables, indicating which quartile the hospital falls into according to number of inpatient admissions in the base year; these variables are also interacted with the time trend. Observations are at the hospital-year level based on the annual average of each variable across all in-sample patients admitted to that hospital. Accordingly, observations are weighted by the number of in-sample patients. There are 27, observations in total. Standard errors are clustered at the hospital level. This specification is analogous to a difference-in-differences framework. I compare the outcome variable within an adopting hospital before and after HIT adoption, controlling for the estimated counterfactual time trend the hospital would have experienced, had it not adopted HIT. Included state-year fixed effects capture state-specific shocks and trends in medical practice patterns or unobserved characteristics of the patient population. Identification of equation 1 is based on the assumption that adoption of HIT is not coincident with other discontinuous changes in hospital ownership, provider quality, or unobserved patient characteristics that would affect the measured outcome variables. Hospitals of the same size quartile, same eventual adoption status, and in the same state must be on parallel trends in the absence of HIT adoption, after controlling for observable changes in patient diagnoses and demographics. To illustrate the importance of controlling for flexible time trends, I report additional results for my two main outcome variablesâ€”medical expenditures and mortality ratesâ€”that begin with a simple difference-in-differences specification and add controls. The simple difference-in-differences specification controls only for hospital fixed effects and uniform year fixed effects. From that baseline, I sequentially add: As we add controls, the estimated impact of HIT adoption on medical expenditures attenuates. I discuss these findings further in section 3. One way to assess the success of these control variables for differential time trends is through the related set of graphical results. The main results are displayed in graphs based on regressions which include the same set of fixed effects and controls listed in Equation 1 , but replace the key independent variable with a series of dummy variables indicating the year in normalized time. The coefficients on these normalized year dummy variables provide a year-by-year estimate of the treatment effect in event time. In the graphs, we can see that medical spending and mortality risk appear stable at adopting hospitals in the years prior to HIT adoption. In addition to allowing an assessment of pre-trends, this series of graphs provides a nonparametric way of assessing how the outcome variable evolves after HIT adoption. The HIMSS survey data measures the year in which HIT was first contracted from the software vendor; installation and implementation may be rolled out gradually in the year or two following the initial contract. Thus, these figures are useful for assessing whether the full impact of HIT is not realized until a few years after adoption. Each of these specifications remains vulnerable to the possibility that some unobserved characteristic of the hospital or its patients changed right at the time of HIT adoption, thus confounding the estimated treatment effects. I deal with this threat to validity in three ways. First, I directly control for observed patient and hospital characteristics that may be evolving at the time of HIT adoption. Second, in Section 3. However, both of these approaches are vulnerable to the possibility that unobserved patient characteristics are changing at the time of HIT adoption. To address potential changes in patient sorting, I have tested specifications that change the unit of observation from the hospital to the county to account for the possibility that patient sorting may be more severe across hospitals within a county, rather than across counties. I show that the conclusions do not change in the county-aggregated specifications. My primary outcome variables are patient mortality and 1-year medical expenditures. In addition to these outcomes, I report results on a number of auxiliary measures, including length of stay, number of physicians seen, readmission rates, complication rates, and adverse drug events. To improve the power of my tests and reduce the rate of false positive results, I group these auxiliary outcome variables into two conceptual categories and create standardized effect measures across outcomes. The two domains are: These groupings allow me to perform omnibus tests analyzing whether HIT is affecting treatment patterns in a particular direction within a domain. I report separate results for each outcome variable, as well as the aggregated standardized effect. I account for the cross-equation covariance structure of the error terms when estimating standard errors for each outcome within a domain. Standard errors remain clustered at the hospital level. The standardized effect is constructed by combining the estimated coefficients across each outcome variable within a domain. In particular, the standardized effect equals:

Chapter 4 : Technology and healthcare costs

Higher prices and greater use of technology appear to be the main factors driving the high rates of U.S. spending on healthcare, rather than greater use of physician and hospital services, according to a new study from the Commonwealth Fund.

New medical technology affects health in many ways. The benefits of these new technologies are the most well-known but there is a cost effect that underlines each successful break through. New technologies in the medical field are always welcome because they help to transform lives and safe lives. This is because they have made it possible to treat diseases and conditions that were considered terminal. The device has increased the chances of cardiac arrest survival from five percent without it to 98 percent if used. Furthermore, technology has made it possible to manage terminal diseases such as diabetes. Using the available technologies, a patient can accurately monitor the glucose levels in the body effectively and thus, avoid complications of diabetes such as peripheral nerve damage or blindness. New medical technologies have also improved efficiencies in medical institutions by reducing the time needed to treat a single patient and hence improve their quality of life. Some diseases that used to take a few days to treat can now be treated in a single day. New medical innovations and technologies affect health costs How new technologies affect the cost of medical treatment depend on several factors. The greatest impact of new technology is the cost of treating a single patient. The cost of treating a single patient will depend on whether the technology is supplementing an already existing treatment or it is an alternative or a partial substitute. How these changes affect the cost of treatment is what determines whether the technology increases or reduces the initial cost of treatment. It is also important to check whether the costs of the technology have any direct impact on the cost of other hospital services. Another factor that determines the cost of any new medical technology is the level of use. The number of times a technology is used has a great impact on the cost of treatment. The total cost of a technology that is widely used will tend to be low due to the economies of scale unlike the cost of a technology used to treat a rare condition or disease. Determining how new technology affects health cost may be complicated. This is because it is highly likely that a single technology can cut the cost of treatment in one area and increase the cost in another. For example, in the treatment of anesthesia, new medical applications and technologies have made it possible to treat the condition without undergoing a surgery procedure. This has reduced the cost needed for treatment as compared to the cost of surgery. However, these new technologies have also made it possible to treat patients previously thought too weak to undergo surgery, which increases the total cost of spending. This proves it is very difficult to measure the total cost of new technology especially when the changes interrelate with other treatments. The above is not a paid post.

Chapter 5 : The Costly Paradox of Health-Care Technology - MIT Technology Review

Health care economists estimate that 40 to 50 percent of annual health care cost increases can be traced to new technologies or the intensified use of old ones. That makes the control of technology the most important factor in bringing the costs down.

Why is it that innovation increases the cost of health care? September 5, Health-care costs would drop if we stuck to technologies with proven benefits. As an economist who studies health care, I find it hard to know whether to welcome or fear new technology. Surgeons can replace a heart valve with a plastic and metal one that unfolds once threaded through arteriesâ€”repairs that used to be made by cracking open the chest. Customized cancer drugs hold the promise of making fatal diseases treatable. Even a recent slowdown in spending growth simply postpones the inevitable date when Medicare goes bankrupt. A patient is positioned to receive proton beam therapy at a facility in Boston. The devices use a beam of radiation to destroy cancer tissue. It may surprise you to learn that economists agree on why the fiscal outlook for health care is so dismal: Improvements in computers provide better products at lower prices, and automobiles are an equally good example: We came up with two basic causes. The first is a dizzying array of different treatments, some that provide enormous health value per dollar spent and some that provide little or no value. The category with the greatest benefit includes low-cost antibiotics for bacterial infection, a cast for a simple fracture, or aspirin and beta blockers for heart attack patients. Not all treatments in this category are inexpensive. A second category of technology includes procedures whose benefits are substantial for some patients, but not all. Angioplasty, in which a metal stent is used to prop open blocked blood vessels in the heart, is very cost-effective for heart attack patients treated within the first 12 hours. But many more patients get the procedure even when the value for them is less clear. A third category includes treatments whose benefits are small or supported by little scientific evidence. These include expensive surgical treatments like spinal fusion for back pain, proton-beam accelerators to treat prostate cancer, or aggressive treatments for an year-old patient with advanced heart failure. The prevailing evidence suggests no known medical value for any of these compared with cheaper alternatives. And hospitals are loading up on such technology; the number of proton-beam accelerators in the United States is increasing rapidly. Much of the increase in observed longevity is generated by the first category of treatments. Most of the spending growth is generated by the third category, which the U. Unlike many countries, the U. This is why, since , health-care spending as a percentage of gross domestic product has grown nearly three times as rapidly in the United States as it has in other developed countries, while the nation has lagged behind in life-expectancy gains. Other researchers have found that just 0. The nearly complete isolation of both physicians and patients from the actual prices paid for treatments ensures a barren ground for these types of ideas. Why should a patient, fully covered by health insurance, worry about whether that expensive hip implant is really any better than the alternative costing half as much? And for that matter, physicians rarely if ever know the cost of what they prescribeâ€”and are often shocked when they do find out. The implications for innovation policy are twofold. First, we should pay only for innovations that are worth it, but without shutting out the potential for shaky new ideas that might have long-term potential. Two physicians, Steven Pearson and Peter Bach, have suggested a middle ground, where Medicare would cover such innovations for, say, three years; then, if there is still no evidence of effectiveness, Medicare would revert to paying for the standard treatment. Like many rational ideas, this one may fall victim to the internecine political struggles in Washington, D. For this reason, the best way technology can save costs is if it is used to better organize the health-care system. Doing so requires a greater emphasis on organizational change, innovations in the science of health-care delivery, and transparent prices to provide the right encouragement. The overall benefits from innovation in health-care delivery could far exceed those arising from dozens of shiny new medical devices.

Chapter 6 : Health Care Technology, Innovation and Costs: Who Decides?? | The O'Connor Report

Technological innovation in health care is an important driver of cost growth. Doctors and patients often embrace new modes of treatment before their merits and weaknesses are fully understood.

This article has been cited by other articles in PMC. Abstract Medicine in the 21st century is increasingly dependent on technology. Unlike in many other areas, the cost of medical technology is not declining and its increasing use contributes to the spiraling healthcare costs. Many medical professionals equate progress in medicine to increasing use of sophisticated technology that is often expensive and beyond the reach of the average citizen. Pediatric heart care is very technology-intensive and therefore very expensive and beyond the reach of the vast majority of children in the developing world. There is an urgent need to address this situation through development and use of appropriate technology in accordance with the needs and priorities of the society. A number of simple and inexpensive quality measures that have the potential of improving outcomes substantially without the need for expensive equipment should be instituted before embracing high-end technology. Innovations to reduce costs that are commonly used in limited resource environments should be tested systematically. Accessibility, health economics, outcomes It is nearly 20 years since market liberalization was introduced in India. This has ushered in an era of unprecedented economic growth and many benefits have reached the common man. More recently the tremendous growth in the information technology sector in India has empowered the average Indian in a variety of ways. The growth in this sector has been truly staggering and clearly everyone has benefited. In the last 12 years mobile charges have nosedived, allowing almost everyone to own a mobile phone. There are more mobile phones today then there are toilets in India. Most consumer goods that are essentially the products of digital technology laptops, cameras, DVD players, television sets, etc. Additionally, progressive miniaturization of the components of digital technology has allowed most gadgets to become smaller with time. Most companies that manufacture these products recognize the value of reducing costs to reach out to more and more people. The economics of scale allows substantial profit generation in spite of a relatively smaller profit margin for an individual item. Let us look at the situation in healthcare. Today, healthcare is increasingly driven by digital technology. Most medical equipments today run on digital platforms. Hospitals, clinics and many other healthcare facilities are increasingly dependent on hospital information software. Yet, healthcare is becoming increasingly expensive and out-of-reach for the common man. Clearly, there are many other elements that contribute to the spiraling healthcare costs. Digital technology does not seem to empower the average patient. Rather it sometimes does the reverse. It makes them more vulnerable and helpless. Two examples are worth studying, especially because they represent applications in digital technology that have tremendous potential to meet the needs of the common man. However, they have not developed along the lines that would have improved their reach Echocardiography: The potential of ultrasound technology to diagnose a number of ailments is immense. Almost all organ systems use ultrasound imaging. It is safe and lends itself to miniaturization. A variable amount of training is necessary to acquire the expertise to obtain and interpret images obtained through ultrasound. Echocardiography involves ultrasound technology to diagnose a variety of heart ailments. The technology has rapidly evolved over the last 35 years and grown exponentially in sophistication. A limited number of multinational companies dominate the market for echocardiography. They have all sought to incorporate advances to improve the quality of images accuracy. Additionally, a lot of efforts of these companies relate to providing many features to score over their competitors. Unfortunately, these matter very little in day-to-day decisions. There is very little focus on making this technology widely accessible and inexpensive. Ultrasound technology can be easily miniaturized without additional cost. Portable echo machines can provide the basic information required to make most decisions. While leading companies that make echo machines have sought to make portable machines, they have not sought to make them inexpensive. In the same time period that we have seen an exponential decline in cell phone costs, the cost of obtaining an echocardiogram has not changed. In many instances, the costs to the patient have increased. Today we have the technology to transfer large amounts of digital information effortlessly at relatively low costs. While telemedicine holds considerable promise we have not done enough to translate this powerful tool to help the common man. While this technology has been available for at least 10 years very little systematic effort has been made to use it to make a real difference in the lives of people in India and much of the developing world. The technology is used on the consumer and not by the consumer: This is particularly true in most of the developing world where healthcare delivery is completely disorganized with a very tiny proportion of the population having health insurance. While the patient consumer pays for the product to the manufacturer and the service to the health professionals , the demand is not necessarily created by the consumer. When the demand is artificially created to justify the use of technology, it becomes exploitative. Further, with time the cost of service often increases. A bottom of the pyramid BOP model[1] has not been developed for many medical specialties. Pediatric cardiac care is perhaps an example where the BOP approach may be difficult with the available technology. Novel approaches will be needed to deliver heart care in large numbers using inexpensive models. This requires the collective will of a large number of committed individuals that includes those developing technology, entrepreneurs and health professionals. Visionary leadership, teamwork and external support such as from the government are also vital requirements. Most multinational companies that manufacture echo machines and other equivalent digital products are not convinced about the BOP approach. They do not seem to be inspired by the success story of the cell phone technology. A generous profit margin for every individual item is still the most important strategy used to offset research, development and marketing costs. They often use similar strategies as they would in developed countries and essentially concentrate on selling their products to select affluent facilities in metros. What about doctors and health administrators? Most doctors are looking to do better and better for the individual patient who comes to them. They often do not think of those who do not reach them. Progressive improvements in outcomes require increasing resource deployment. The relationship is exponential. Initially, small investments in basic resources result in impressive improvements in outcomes. But after a certain level considerable material equipment and infrastructure and human personnel resources are required to accomplish small improvements in outcome. Indeed the poorest are seriously intimidated and are completely excluded from the ambit of these facilities. Pediatric cardiologists and cardiac surgeons who spend most of their lives inside hospital environments often completely lose sight of the situation in the community. We need to rethink about how we should define progress in the healthcare sector. We should find a way to measure the proportion of patients who are excluded from a healthcare facility because of costs of care and this parameter should perhaps be a part of the evaluation process for accreditation of institutions that aspire to meet acceptable standards of healthcare. A paradigm shift in healthcare delivery is desperately needed. The facts and figures on the actual proportion of patients that are being excluded from access to available technology will need to figure in the collective consciousness of doctors, entrepreneurs, policymakers and members of the healthcare industry. Realistic business models that are aimed at least a part of the population that is completely excluded and marginalized will need to be pursued recognizing that there are vast numbers that can allow the economics of scale to become operational. The individual specialties of pediatric cardiology, pediatric cardiac surgery and intensive care are very much technology-dependent. This technology is becoming increasingly sophisticated and expensive and can only be made available through massive investments that only few organizations can now afford. The overhead costs are considerable and it is becoming increasingly challenging to deliver affordable care to the average child with heart disease without additional subsidy. Despite impressive economic growth in recent times in India and many other developing nations , the overwhelming majority of Indian families will be severely burdened in the event a child requires congenital heart surgery or catheter intervention. While a considerable proportion of the expense relates to service costs, there are areas that we can all address through conscious efforts. As a first step we need not embrace technology that comes at an extremely high cost with a marginal impact on overall outcomes without serious thought. Hybrid catheterization labs-operation rooms, three-dimensional echocardiography, extra-corporeal membrane oxygenation ECMO , and robotic surgery are all examples of high-end technology that are not indispensable. Consistently excellent outcomes can be accomplished without them. We need to avoid the trap of equating progress with acquisition of sophisticated technology. As pediatric cardiac professionals, we specially run into the danger of getting seduced by high-end and expensive technology and lose sight of the big picture of trying to reach out to the average child in our country. Doing heart transplantation and staged palliation for hypoplastic left heart syndrome often figure prominently as important benchmarks of progress of pediatric heart programs in India. A number of very simple and inexpensive measures can substantially improve outcomes after congenital heart surgery and catheter interventions. These include basic infection control practices, establishing a cohesive team, meticulously adhering to a surgical checklist, and robust vigilance in postoperative intensive care through nurse training. Most of us who take care of children with heart disease with limited resources are often forced to innovate. A number of cost-effective practices that help reduce healthcare expenses are widely used for catheter interventions, cardiac surgery and intensive care. True progress is perhaps best measured by outcomes. In the truest sense, however, we can actually claim to have progressed only if the average child in India has access to centers with comprehensive pediatric cardiac services. This may appear to be a distant dream but may well be the most worthwhile goal for us to pursue. Footnotes Conflict of Interest: Fortune at the bottom of the pyramid: Eradicating poverty through profits. University of Pennsylvania, USA: Wharton School Publishing;

Chapter 7 : 7 Biggest Innovations in Health Care Technology in [INFOGRAPHIC]

The Impact of Technology on Healthcare April 24, Bianca Banova Continuous technological developments in healthcare have saved countless lives and improved the quality of life for even more.

The Diffusion of New Technology: Technologies are extolled for saving lives, improving health status, and improving the quality of care. At the same time technology is vilified as one dominant factor responsible for the continuing escalation of medical costs. Five facts about new medical technology underlie this paper. First, new technologies do, on average, improve the quality of medical care by improving health outcomes. This is not true of every technology in every clinical use, but it is true on average. Second, many new technologies are ineffective or redundant and do not improve health outcomes. The trouble is that it is not always easy to discriminate between effective and ineffective technologies at the time they are introduced. Third, new technologies do, on balance, add to health care costs. Some technologies may actually reduce costs by replacing more expensive alternatives or preventing expensive health consequences, but the overall effect is to increase costs. Fourth, the incentives and regulations built into the American health care sector lead to inappropriate diffusion of technologies, both underdiffusion of effective and cost-effective technologies, and overdiffusion of ineffective and cost-ineffective technologies. Reimbursement systems, professional reward structures, legal considerations, and patient demands all contribute to the problem. The fifth inescapable fact about new medical technology is that the American public cannot get enough of it. We demand the best and newest from our providers, and they are, in general, happy to oblige. Page 22 Share Cite Suggested Citation: Costs and Benefits to Health Care. The Changing Economics of Medical Technology. The National Academies Press. American society is approaching, or may have reached, the point at which it is not possible to provide the best available health care to every American, regardless of cost. The de facto solution has been to restrict access to health care for a growing segment of the populationâ€"the uninsuredâ€"while preserving the myth of best available care for those fortunate enough to have coverage. Upward pressures on health care costs will only increase in the s. A growing array of new technologies will claim an increasingly large share of national resources. Universal health insurance, in some form, may well be adopted. This paper addresses four aspects of the relationship between new medical technology and costs. First, we review the evidence regarding the contribution of new technology to the aggregate cost of health care. Second, we review a normative model of optimal diffusion of technologies, based on evaluation of their cost effectivenessâ€"that is, the ability of a technology to improve health outcomes. Third, we examine the influence of economic incentives that affect adoption of new technology in the U. We examine incentives for hospitals, fee-for-service physicians, and managed care organizations. We cite examples of incentives for underdiffusion of cost-effective technologies and overdiffusion of cost-ineffective ones. Finally, we comment on future policy options for achieving a more cost-effective pattern of technology diffusion. Researchers generally agree that medical technology has contributed to rising health care costs Health insurance removes financial barriers to consumers, thus raising demand for technology and inducing providers to offer a more expensive mix of services. But researchers have struggled to measure how much technology has contributed to increasing costs. Part of the difficulty lies in defining medical technology. The term is commonly defined broadly to include drugs, devices, surgical procedures, and organizational support systems within which medical care is delivered 4. Identifying the changes in cost attributable to these items in any given period is virtually impossible. Even if the more important innovations could be listed, it would be extremely difficult to trace their overall economic impact. Page 23 Share Cite Suggested Citation: The total impact of a technology on health care costs is much broader than that and may include offsetting savings as well as induced costs. The direct cost of a capital-embodied technology includes not only the capital cost itself but also the operating costs required to implement it. The operating costs of even the most capital-intensive technologies may be greater than anticipated because of the need for operating and supervisory personnel, training, insurance, supplies, and space. A new drug or device, on the other hand, may be more expensive to purchase but less expensive to administer than its alternatives 5. Furthermore, a new technology may affect the utilization of other health services. A new imaging device may lead to increased utilization of other tests for confirming a diagnostic hypothesis that would not otherwise have arisen, or the new technology may make other diagnostic procedures unnecessary. Treatments that would not have been considered may be induced by a new diagnostic test 6 , or treatments may be avoided because the new technology offers an alternative course of action. Technologies and their induced procedures may lead to side effects and complications requiring further tests and treatments, or side effects and complications may be avoided if the new technology leads to a safer clinical strategy than was possible in its absence. Technology that extends life may require more extended periods of care, often at great expense and in institutional settings. Technology that prevents disease may save resources that would otherwise be required for diagnosis and treatment, although few preventive technologies are cost saving on balance 7,8. Some researchers have tried to estimate the effect of technology on U. The portion of the increase in health expenditures not accounted for by these explanatory variables is attributed to technology. Such research does not draw distinctions between expanded applications of existing technologies and introduction of new technologies. Other researchers have sought to measure changes in the cost of treating certain illnesses over time 2, Still others have used case studies to analyze the impact of important technologies such as intensive care units and computed tomography 15, All three approaches suffer from a variety of problems. For our discussion of the economics of new technology, these approaches are problematic because they do not distinguish between the impacts of new and existing technologies. In general, residual approaches do not pinpoint the precise cause of increases. In addition, these studies do not easily identify indirect costs of using new technologies, such as the need for more skilled hospital nurses and technicians, nor do they identify induced costs. Although the specific illness and case study approaches do analyze the impacts of particular technologies, it is difficult to generalize from them. Unlike cost-effectiveness research, to which we will return, this body of research does not attempt to relate cost increases to improvements in health outcome. Empirical evidence from these types of studies suggests that medical technology accounts for about 10 to 40 percent of the increase in health care expenditures over time 1. Fuchs 3 concluded that technology contributed 0. Davis 9 found that technology accounted for about 25 percent of the increase in hospital expenses per admission between and Employing a specific illness approach, Scitovsky and McCall 2 found that, from to , cost-increasing changes in treatments generally outweighed cost-saving changes. The main cost-increasing factor was the rise in the use of ancillary services, such as laboratory tests and X-rays. Fineberg 12 and others have also noted the high cost of clinical chemistry tests and other little-ticket technologies. Scitovsky 13 found that from to increases in the cost of ancillary services slowed, but several new and expensive technologies raised costs substantially. Researchers have shown that any individual technology makes a relatively small contribution to health expenditures. One exception is the use of intensive care units, which Russell found to account for about 10 percent of hospital expenditures in One such criterion is based on the proposition that the objective of medical technology is to improve health outcomes. The more the society spends on health care, the more health is improved. Moreover, there are diminishing returns to health care: The more we expand the resources applied to health care, the more health can be improved but the higher the incremental cost per additional unit of health improvement. The principle is that clinical practices having low cost per unit of health benefit should have priority over practices having a higher cost per unit 17, Cost-effectiveness analysis has been used widely to assist policy formation and is gaining acceptance in the medical community as an appropriate criterion for resource allocation 18, Cost-effectiveness analyses of new medical technologies often are useful guides to their potential role in health care; one of the earliest examples was a cost-effectiveness analysis of hemodialysis in end-stage renal disease This study, which projected a relatively low cost per year of life extension, probably influenced the decision by Congress to fund universal coverage under Medicare. A limitation of the study, to which we will return, was that it considered only the most favorable target groupâ€”the relatively young and otherwise healthyâ€”and did not anticipate its expansion to older and sicker patients for whom the cost-effectiveness ratio is much higher. A barrier to applying cost-effectiveness analysis to new technologies generally is that decisions about adoption often are required before satisfactory data on effectiveness or even full cost are available. Pharmaceuticals have probably received the most attention in cost-effectiveness analyses. Analyses of the drug cimetidine for peptic ulcer disease showed it not only to be cost effective but actually to give net savings relative to standard treatment 21, A study of the use of third-generation cephalosporins for hospital-acquired pneumonia also showed savings when compared to standard multiple-drug regimens, largely because of reduced costs of drug preparation and administration, monitoring, and side effects 5. Other drugs, although not cost saving, have been shown to have extremely favorable cost-effectiveness ratios in certain clinical uses. For other drugs, effects on quality of life are crucial, which has led to the use of quality-adjusted life years 1 as a measure of health outcome Cost-effectiveness evaluations of antihypertensive drugs, for example, involve Page 26 Share Cite Suggested Citation: Diagnostic technologies have also been analyzed for their cost effectiveness. Unfortunately, many important imaging technologies, such as magnetic resonance imaging MRI , have not been subjected to formal cost-effectiveness analyses because of the difficulty of attributing health benefits to the use of individual diagnostic modalities. These and other examples illustrate a key lesson for cost-effectiveness research. A technology that is highly cost effective in one clinical situation can be extremely cost ineffective in others. Exercise tolerance testing is a cost-effective screening test for patients with chest pain 25 but not for asymptomatic patients Coronary bypass graft surgery is relatively cost effective for patients with left-main coronary artery disease but not for patients with single-vessel disease Cholesterol-lowering drugs probably are not cost effective for primary prevention of coronary heart disease in patients without other risk factors 28 but may well be cost effective, or even cost saving, in patients with established coronary artery disease or multiple risk factors in addition to high serum cholesterol. The early lessons from the end-stage renal disease story suggest that even a clinically effective and cost-effective life-saving technology will diffuse into domains where it produces little additional health benefit at great additional cost. The Peter Principle says that employees will rise through the ranks until they reach their highest level of incompetence. The analog for diffusion of medical technology is that a technology will expand its use until it has found its way into medical applications that are cost ineffective. This presents a challenge for developers, utilizers, purchasers, and regulators of new technology: Health care financing in the s and early s â€”characterized by cost-based hospital reimbursement, fee-for-service physicians, and generous insurance plansâ€”promoted rapid diffusion of new technologies whether they were cost effective or not. Since providers knew they would be reimbursed for their services, there was relatively little concern over whether technologies were cost effective. As long as technologies were perceived to offer marginal benefits over existing practices, there was pressure in the system to adopt them. As policy makers began to address soaring health care costs in the s, medical technology was singled out as an important source of the problem.

DOWNLOAD PDF TECHNOLOGY AND THE COST OF HEALTH CARE

Chapter 8 : Cost of care savings with telehealth | Philips Government Solutions

Because we passionately believe that science and technology are key enablers in finding new ways to reduce costs and increase the efficiency and quality of care, we spend a lot of time keeping an.

Improving efficiency and quality of care Developing new drugs and treatments With the shift to EHRs and the fact that even one research study can amount to terabytes of data , healthcare facilities need to have expandable, cost-effective, and safe storage solutions. This is where The Cloud comes in. What is Cloud Computing? This is perhaps one of the most innovative products in healthcare technology today. The Cloud uses hardware and software to deliver services via the internet. In this case, healthcare professionals and patients are able to access certain files and data, and use applications from any internet-enabled device. Better and Safer Data Storage Cloud computer technology allows for masses of information to be stored at a low cost, without the limitations or expense of additional hardware or servers. With an increased reliance on EHR systems, Cloud storage protects against the loss of sensitive data with strong backup and recovery services. Improved Access to Big Data The Cloud is an invaluable tool for medical research, as well as for sharing medical information. This new ability to share big data easily has helped lead to the development of life-saving drugs. Information and Communication Technology Approximately million Americans own a mobile phone , and even more are connected online. As with any industry, healthcare has needed to transform its communication processes to connect with people wherever they are. Information and communication technology ICT link healthcare professionals, as well as professionals with patients. Email, smartphones, webcam, telemedicine, and telemonitoring systems are all currently being used to share information. They serve many purposes, such as diagnostics, management, counseling, education, and support. Telemedicine can be used in many fields, such as cardiovascular healthcare. Telemonitoring technology can monitor vital signs and symptoms remotely. There are even plans to develop remote ultrasound technology, which is exciting news for anyone interested in a career as a diagnostic medical sonographer. What Are The Benefits of Telemedicine? Telehealth is improving allied healthcare jobs, including some of the top-paying roles in the field , such as medical assistants. The implementation of these telemedicine options means less crowded waiting rooms and easing the pressure on front desk teams. There are many pros and cons to using mobile technology in the medical field. The Advantages of Using Mobile Equipment Smartphones allow practitioners to complete tasks in remote locations. Improved communication aids the role of medical billers, allowing them to send text message alerts about payment schedules and outstanding bills. Mobile communication can also cut down on snail mail, paper use, and time spent on phone calls. Mobile devices can be easily lost or stolen. Smartphones and tablets are also vulnerable to hacking, malware, and viruses â€” especially if the devices are used on unsecured internet connections. In fact, healthcare apps are one of the fastest-growing markets in mobile application development. There are approximately , health apps currently available, and thousand paid apps are downloaded every day. Mobile health apps give professionals, administrators, and patients greater flexibility. They are an inexpensive way for facilities to provide more high-quality services, and â€" at the same time â€" are cheaper for patients to access. Some generate better health awareness, while others assist communication between patient and care providers.

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

Technology must play a central role for proposed health care reform to contain costs, improve access, and save lives. A smart, ubiquitous electronic medical record system is certainly a big part.

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 the 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.