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Short Communication

Getting the Most Value from Novel Healthcare Technologies

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Jack Welsh, the former General Electric CEO famously said, "When the rate of change outside is greater than the rate of change inside, the end is near".

Healthcare structures have unfortunately not kept pace with healthcare technologies rapid rate of development. The technologies range from remote data collection devices, Artificial Intelligence systems, and the unravelling of the genome to name but a few. These new technologies require changes in the healthcare ecosystem to deliver their full benefit. There has unfortunately been inertia making the needed changes to the current:

1) Setup of healthcare practices
2) Remuneration and billing
3) Training of new doctors and
4) Setup of clinical trials- not discussed in this article, but the recent COVID-19 pandemic has highlighted the need to reform clinical trial and the development of therapeutics and the fact that the trial process needs to become an integral part of the development of therapeutics, and not just act as a final test of efficacy and safety .

This inertia results in the loss of value for all stakeholders in healthcare and the slow uptake of many technologies. By getting the technologies fitted into an optimal system, more patients can be treated with better outcomes for a lower price.

An example of fitting a new technology in a suboptimal healthcare system can be seen with Da Vinci "Robotic" Surgery to do radical prostatectomies -one of the possible treatments for early stage low risk prostate cancer. The surgery is not robotic in that it still needs a skilled surgeon to operate the machine, but it does give the surgeon better access and visualisation of the surgical field, and it makes it possible for the surgeon and patient to be in different locations (which could have large benefits situations like the COVID-19 pandemic). It is a great piece of technology, with possible advantages over open radical prostatectomies regarding lower complication rates and shorter post-operative hospital stays. However, adoption has not been as high as one would expect. Most critics would point to the high cost of the machine and the ongoing cost of maintenance as the reason. However, the reason is that the technology was plugged into a system designed for "intuitive" medicine which was practiced in the last century, and not for the "empiric" going to "precision" medicine of today.

I use the terms "Intuitive", "Empiric" and "Precision" medicine in the way Clayton Christenson does so in his book, "The innovators Prescription" [1]. Intuitive medicine is where medicine was in until the mid-20th century. There was not a lot of data on many diseases, limited technology to make an accurate diagnosis and limited treatment options. Often the doctor relied on their experience or "intuition" to make the diagnosis. It was more art than science. As data and technology evolved, we moved to empiric medicine. This is where we have data, and an understanding of what the optimum treatment is based on collected data, but we are still lacking in our ability to either make the diagnosis with 100% certainty or treat with a treatment that cures the disease with an almost 100% success rate. We enter the realm of precision medicine when we can make the diagnosis and cure with treatments that work with 100% certainty. As we get a better understanding of the human genome, and using this knowledge in diagnosis and treatment, more diseases will start moving into the realm of precision medicine.

In his article I will look at how the changes in the health ecosystem would improve the utilisation of a novel technology like Da Vinci Robot for robotic surgery.

Setup of healthcare practices

Prostate cancer, one of the diseases treated by the Da Vinci Robot, currently fits into the realm of empiric medicine. However, the setup of hospitals and doctors' practices is not geared for empiric medicine as the setup was designed in the time of intuitive medicine. In this system, specialists involved in the treatment of prostate cancer (urologists, radiation oncologists, medical oncologists, pathologists, radiologists etc.) work isolated from each other, usually in one 'solution shop' like a general hospital where patients are referred from one specialist to another. Such a 'solution shop' will accept patients with any medical problem and needs to be equipped to deal with them. As the treatment of prostate cancer moves into empiric/precision medicine, once a diagnosis of prostate cancer is made in a "solution shop", the patient is then best moved out of there and treated in a "value adding centre". The structure of a value adding centre would be in the form of an Integrated Practice Unit (IPU) as proposed by Michel Porter and Thomas Lee in their *Harvard Business Review* article from October 2013 entitled "The Strategy That Will Fix Healthcare" [2]. In the case of the Da Vinci Robot, the Integrated Practice Unit would be a centre dealing only with the treatment of prostate cancer. It would have all the special-

ists and equipment involved in prostate cancer therapy under one roof, using the same record keeping and billing system, so that information flows freely between specialists, and exact costs per diagnosis are known. In this way, accurate outcome and cost data can be accumulated. Such a unit, being dedicated to the management of one disease would achieve more efficiencies of scale and scope than the current system of general hospitals and would produce lower costs and better outcomes for all stakeholders. Patient outcome improvement would result from the dedication of the unit to one disease, resulting in a team that becomes very experienced in the treatment of this disease. The costs are driven down as all the equipment needed to treat the disease would be utilised a lot more in the IPU than in a general hospital setting where the equipment would be often sitting idle while patients with other diseases are being treated. This greater degree of "sweating of assets" would make the large initial capital expenditure on equipment such as the Da Vinci Robot more attractive.

Funding models

There has also been some resistance from funders to fund for the extra cost of a prostatectomy done with the Da Vinci Robot resulting from the large initial investment in the equipment. However, the use of the robot may result in lower downstream costs such as the shorter length of stay post- operatively. An IPU should not use a fee-for-service billing system, but should use a global fee for the treatment of the disease. The IPU would know the average cost of the treatment of the disease from the data collected via their billing and Electronic Medical Records (EMR) system. The cost would include the post-operative stay. Due to the unit achieving efficiencies of scope by treating a lot more patients with the same disease, their patients' recovery times would be much quicker than a patient treated in a general hospital, driving their costs down.

Ideally, when the patient comes into the IPU, the patient's case is discussed by a team of doctors and the best treatment is decided upon. The unit would get the same remuneration regardless of the treatment course embarked upon. In the case of early stage prostate cancer, this is often a choice between radical prostatectomy (robotic or open), prostate brachytherapy and external beam radiotherapy. Since the unit would get the same remuneration regardless of the modality chosen, it would free clinicians to make the best clinical decision for the patient. One proviso is that for this to work efficiently, doctors need to earn a salary - if not it pits them in a zero-sum game with each other, each trying to gain the biggest slice of the global-fee.

Training of doctors

Medical teaching has also not kept pace with the advent of new technologies. In general, new technologies will change the work that doctors do currently. In specialities with a large degree of pattern recognition such as radiology and pathology, much routine work could be automated, leaving expert specialists to consult on the cases unable to be managed by Artificial Intelligence (AI). Algorithmic specialities such as oncology would have up to date treatment recommendations made by AI to assist expert clinicians, and skilled surgical specialities would have new technology (such as better imaging) to reduce the high level of skill required by the operator. In short, the type of medical specialists we are training and the type of training they need will change. Unfortunately, training has not kept pace with technology and another reason for the slow adoption of technology like the Da Vinci Robot is the lack of experience that surgeons had with the technology in their training.

As the example of the introduction of the Da Vinci Robot shows, for the advances in Healthcare technologies to have maximum benefit for the most stakeholders, changes to the structure of hospitals and medical practices, remuneration and teaching need to be made. I've sited just one example here, but with Artificial Intelligence, Genomics and Big Data set to revolutionise diagnostics and therapies, we need to update our healthcare ecosystem to keep pace. The changes are not difficult but the willingness to change current practice may be more challenging. As the famous economist John Maynard Keynes said, "The difficulty lies not in developing new ideas, but in escaping old ones".

Bibliography

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