Investigation of Medical Device Pricing and its impact on Accessible and Equal Care in different countries

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Kathleen Nguyen

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

Advisor

Travis Elliott, Department of Engineering and Society

Introduction:

The purpose of this paper is to analyze the differences in healthcare systems and medical device pricing between two countries, United States and Japan, and how different social groups approach the usage of certain medical technologies. Both countries consider themselves as health care leaders in their respective areas of strength and describe themselves as exceptional (Rodwin, 1993). Their differences result from the structure of their health system, policy makers, and the actions of their care providers. It is of interest to look into these differences in policies or health practices to determine if it affects the accessibility or quality of care in the patients of these two countries and thus what kind of technologies are used more frequently than others. The Social Construction of Technology (SCOT) will discuss the role of medical technologies in society and how they are used differently in the two countries by various stakeholders. This paper will consider the various impacts that these technologies have on healthcare and its stakeholders, including doctors, patients, and manufacturers.

Background:

U.S. healthcare spending grew 2.7 percent in 2021, reaching $4.3 trillion or $12,914 per person (CMS, 2019). This total includes the cost of healthcare services, medications, and premature death. The United States' healthcare consists mainly of secondary and tertiary treatment, which often leads to increased expenditure. Secondary treatment involves seeing a specialist like a cardiologist, while tertiary treatment involves specialized care like surgeries. However, these may be costly for people, for instance cardiac catheterization scans can cost around $5000 without insurance (Oseran et al., 2022). One solution to decrease costs of healthcare spending would be to invest in point of care devices that would promote early diagnosis (St. John & Price, 2014). Japan, although having a similar capitalistic society (Ikegami,

1991), has opted for a system that focuses on primary health and preventative medicine thus leading to decreased healthcare costs. As Japan opts to increase primary medicine, this aligns with the goals to prevent the worsening of diseases in terms of health and cost. It would be beneficial for the United States, who struggles with increasing health expenditures to learn from other countries such as Japan in order to decrease hospital costs for their society.

The United States has three main properties representing their healthcare system: low level of public expenditure compared to total health expenditures, high level of total health expenditures as GDP, and a lack of universal healthcare (Rodwin, 1993). However, there are few elements of national health insurance (NHI) like Medicare and Medicaid, but overall the US has one of the lowest share of public expenditures compared to other developed countries (Rodwin, 1993). Doctors are paid exceptionally well and can perform procedures at high profit margins, which encourages competition leading to high quality of care options for patients (Baker, 2017). However, compared to peer nations, the U.S. has among the highest number of hospitalizations from preventable causes and the highest rate of avoidable deaths (Tikkanen & Abrams, 2020).

People in Japan have one of the longest health expectancies in the world (Kondo, 2014). There are some factors that contribute to this like the hygienic culture, their diet, but arguably one of the biggest factors is their healthcare system. Japan implemented a nationally uniform fee schedule-- "uniform" meaning the same fee is paid by all insurers to providers no matter the location or doctor (Block & Joffe-Walt, 2009). Due to the goal of keeping healthcare affordable for all, there are bi-yearly negotiations between the government and physicians to discuss the cost of procedures. This led to some services like getting magnetic resonance imaging (MRI) scans being extremely cheap– as low as $160 on average (Watari et al., 2021)– which could have resulted in people getting these services more often simply to check up on their health

(Matsumoto et al., 2015). These services became so popular and people in Japan get MRI scans twice as much as Americans (Norris, 2008).

STS Framework:

When looking through the lens of Social Construction of Technology (SCOT), there are various social groups that can drive the development and design of technology to fulfill their needs. An engineer is not the only group that determines the final design of a device and what place it has once it has been introduced, as other groups might behave differently than what is expected. The development of the technology can be variable because of the fact that it is given meaning by different social groups, as defined by interpretative flexibility. Once a social need has been met, the role of the technology and its design will start to stabilize, or reach a conclusive and final design, and thus give it meaning based on its place in society (Bijker & Pinch, 1984). Once a design has stabilized, its meaning will likely no longer be changed or interpreted differently in society.

To thoroughly understand this problem in depth, it is important to highlight the various stakeholders present: patients, healthcare workers (including doctors, nurses, technicians, etc.), government, and medical device manufacturers. Patients might opt to have the cheaper diagnostic tools in order to reduce costs while doctors and hospitals might want to perform more expensive procedures in order to produce a profit. The roles might also be reversed by doctors who might prefer to prescribe cheaper procedures to practice defensive medicine. These stakeholders shape how medical technology will be used and will determine what device manufacturers will create in order to enter the market in response to user needs. SCOT will be used to analyze these complex relationships between social groups and their implications on screening technology. More specifically, the SCOT framework can be used to analyze the

differences in MRI device usage between the United States and Japan. According to SCOT, technologies are not neutral but are shaped by social and cultural factors. In the case of MRI devices, there are several social and cultural factors that may help to explain the differences in usage between the two countries.

STS Analysis - Attitudes towards routine health checks and primary care:

The United States and Japan have largely different cultures that may shape how each group approaches medicine (Ohtaki et al., 2003). The Japanese government has shown many instances where they implemented different programs to promote health and risk awareness, which in turn shaped the country's perception of health and medicine. In Japan, the Ministry of Health, Labour, and Welfare (MHLW) outlined a framework called the "Health Japan 21" in 2013 to promote risk prevention at the national level (OECD, 2019). The aim of this framework was to reduce health inequalities, prevent non-communicable diseases, and increase life expectancy. This program relies heavily on the assistance of local level groups such as employers and schools to execute their plans. One element of this program are routine yearly check ups which are required for infants, school children, employees and any "health specific need" (OECD, 2019). At schools, these routine check ups are often provided at no charge and can be done at schools for ease of access. Students or their parents are notified of health check-up results and if the results suggest that students have any diseases or abnormalities, they are recommended to seek follow-up diagnosis and/or health care. The uptake of health check-ups among school children has been nearly 100% across educational institutions (OECD, 2019). The high uptake has been achieved by its well-established and organized delivery, high public awareness and most importantly, free access. Similarly for employers, they are required to provide health check ups to their employers at the time of hire and annually, also with no

additional costs. In addition to the basic health check up which consists of measurements of weight, vision, hearing, and blood pressure, employers can also provide a secondary check up to cardiovascular diseases for employees at high-risk (i.e. high blood pressure, high body mass index, blood sugar, etc).

In the United States, there is no national law requiring health screenings for adults or children. In fact, as of 2019, the United States has removed the requirement of having health insurance, much less enforcing health screenings. This has brought some inequalities in healthcare as many who are uninsured avoid going to the doctors in fear of high costs. In a study identifying health barriers to learning, it highlighted that only 49% of states required a comprehensive health exam for children to attend school. Although most children in the United States will have their routine check up, 20% of children did not have a physical examination in the year of 2018 (Gracy et al., 2018). According to the study, those who are more likely to miss check ups are poor families (19%), Hispanic children (21%), and/or children without health insurance (44%) (Gracy et al., 2018). The authors of this study identified that missed opportunities to identify children will lead kids at risk of untreated health conditions that may affect their success in school and later in life. In a different survey from Health Testing Centers focused on American adults, it reported that of the 80% of Americans with health insurance, 25% of them did not get a routine check up. For those without health insurance, only half of them go for their yearly health evaluations (Ettinger, 2020). To add on to this, even when Americans become sick, 44% of them still do not go to a doctor, with many of them citing costs as their main barrier from accessing healthcare (Young, 2018).

According to the Organisation for Economic Co-operation and Development (OECD), the number of doctor visits per capita in Japan and the United States were 13.0 and 4.0

respectively in 2011, making Japan having more than 3x the amount of doctor visits than America (OECD, 2021). The reason why Japanese people utilize hospital visits and check ups is largely due to their culture and support from the community and government. When comparing Japan and the United States, it is clear that Japan focused many of their resources on preventative health. This created a very comfortable relationship the Japanese citizens have with healthcare workers as it allows them to build a relationship with them. It also brings upon an expectation that citizens should monitor their health frequently. The Japanese government has made it incredibly easy to have a primary health check because not only as it is free, but also provided by schools and employers for convenience, thanks to the support of the MHLW (OECD, 2019). On the other hand, many Americans, especially those who are uninsured, do not even go to their primary care doctors for a routine checkup. If they are less likely to get a routine checkup to detect any potential problems, they are even less likely to get secondary treatments such as screenings for cancers, heart disease, and more. The largest barrier of their desire to get evaluated ultimately is due to money and support from their government not only on the national level, but on the state and local level as well since there are no mandatory regulation for health insurance or wellness check ups, which is the first step of preventing and detecting any possible diseases or others. This will continue to affect how Americans receive care in comparison to the Japanese people.

STS Analysis - Secondary Care with MRI scans:

The distinguishing characteristic of medical care both in Japan and in the United States is the use of high-technology diagnostic equipment such as MR imaging. However, not only do the Japanese go to the doctors 3x compared to the average American, they also get MRI scans nearly twice as much (Norris, 2008). According to a 2019 report by the OECD, the United States had

40.44 MRI machines per million inhabitants, while Japan had 55.21 MRI machines per million inhabitants (OECD, 2023). Out of all the OECD countries, Japan has the most MRI machines per million people and this is largely due to their tight government regulations on medical device pricings. The tight regulations on the cost of MRI scans lead to Japan having one of the lowest prices across the globe. In Japan, a MRI around the neck region can cost around $98 which is incredibly cheap when considering in America it would cost $1,200 (Norris, 2008). The cost is also standardized across the whole country, which makes it even more accessible and reduces health disparities. In 2002, the Japanese government, specifically the Health Ministry, thought that they were paying too much for MRI scans, so they cut the reimbursement for them by over 30% (Kenney, 2009). This was initially done because of concerns over costs relating to over-utilization, but this had an unintended effect. As costs became so low, physicians in Japan seeked to make up costs by providing a larger volume of MRI scans to consumers. MRI centers have started to directly market to the consumer and even reduce the amount of gatekeeping by no longer requiring a physician recommendation if the patients pay by cash (Kenney, 2009). However, hospitals cannot make a profit on these scans no matter what, as the Japanese Ministry of Health will reevaluate the pricing of devices every two years, therefore the best physicians can do is break even through a high volume of MR scans (Hisashige, 1994). Overall, the demand for MRI devices and scans have increased due to ease of access and low cost, which explains why Japan has the highest number of MRI devices compared to other OECD countries.

Despite MRI prices in Japan being incredibly cheap, this does not limit innovation and a desire for device manufacturers to enter the Japanese market. Since the demand for MRI devices is high, manufacturers would not want to miss entering this market. Toshiba has found ways to make smaller and more affordable MRI devices that they can sell to doctors, and with these

innovations they are being exported around the world (Reid & Palfreman, 2014). As Japanese MRI units have increased, the average purchase price of MRI units declined by approximately 38% over a span of 8 years (Hisashige, 1994). Additionally, some manufacturers would even lower their prices to enter the Japanese market, as much as half the price compared to it being sold in America (Block & Joffe-Walt, 2009). Furthermore, as Japan's culture focuses primarily on preventative medicine, there is a clear preference towards technology that promotes non-invasive procedures. As a result, Japanese device manufacturers such as Toshiba will focus on making products that fit the needs of society and what doctors will pay for, or other companies such as Siemans for GE will lower their prices to fit the needs of Japanese doctors. For instance, equipment requiring invasive operations such as pacemakers and artificial heart valves are almost all imported, whereas diagnostic equipment, e.g. CT scanners and MRI machines, are produced and exported in large numbers (Rodwin, 1993).

America has the second highest number of MRI machines per million people, lagging only behind Japan. In the United States, there has been significant investment in medical technology research and development, and there is a cultural expectation that the latest and most advanced medical technologies should be available to patients (Rodwin, 1993). This has resulted in the widespread adoption of MRI devices in many medical settings, even when they may not be strictly necessary. One explanation for the high imaging rates is that the techniques have improved so much over time that physicians may be using them for concerns that might not have prompted imaging in the past (Smith-Bindman et al., 2008). Another reason is that many physicians benefit from recommending these scans due to their profitability. Out of all medical services provided, the greatest profit margins are considered from the MRI. The average cost of an MRI unit was estimated to be $1,338,309 in 1993, which costs roughly $500,000 more than

Japan, but they still made a net profit around $535,000 for that unit, whereas in Japan a profit is not possible (Hisashige, 1994). This created incentives for physicians and hospitals to recommend and refer patients to take MRI scans. However, concerns over physician referrals lead to Stark Laws being implemented where it generally prohibits a physician from making referrals to an entity for certain healthcare services, if the physician has a financial relationship with the entity (CMS, 2020). However, this did not stop the increasing price ceiling of medical services provided, especially as imaging services are still a contributing factor to why healthcare spending is still increasing without any notable government intervention (Mazaheri et al., 2021).

The high profits made on MRI devices are largely due to how the payment is set up in America. To start, MRI scans can change wildly in costs depending on the location, they can also change depending on the patient (Anderson, 2007). Uninsured patients and those who pay with their own funds are charged 2.5 times more for hospital care than those covered by health insurance and more than 3 times the allowable amount paid by Medicare. This is because hospitals often markup their services for insurance companies to pay in order to make a profit, but they apply the same rates to everyone without knowing whether or not they are insured. The charge-to-cost ratio was greatest at for-profit hospitals (Anderson, 2007). Not only physicians and hospitals are benefitting from this payment system, but manufacturers who want to keep making state of the art devices that will allow physicians to provide “higher quality” care to patients with also a higher price point (Block & Joffe-Walt, 2009). The downside of this approach is that it has led to reduced economic motivation for developing lower cost, efficient MRI exam protocols, which also enhance patient throughput. Additionally, for those who are uninsured this will put a huge financial burden on them as many cannot afford these treatments

or diagnosis. As mentioned earlier, if people cannot afford going to yearly appointments, it would be reasonable to assume they cannot afford these expensive diagnostic tests either.

Discussion:

For Japan, the support of the government, local physicians, and community helped create a culture in which patients go to the doctors often for check ups, routine diagnostic tests, and more all to ensure there are no problems with their health. They have an affordable and accessible healthcare system that makes all services equally available to all patients, which leads to lower health complications for patients if they are able to access these services regularly. This is due to the government's tight regulations on medical services that prevent many hospitals from making too much of a profit in order to keep costs low for the government, employers, and also Japanese citizens. As doctors want to keep their costs low since they cannot make too much of a profit, this leads to a demand for lower priced MRI machines. Manufacturers have adjusted to their preference by either creating smaller and more affordable devices or lowering the costs of their devices to enter the market. This greatly benefits the patients as the demand for MRI scans are also high due to the cultural norm of regularly checking for their health through routine visits, tests, and scans. However, this may limit the quality of care patients receive as doctors may not be able to afford the fanciest MRI devices, or manufacturers will choose to reduce features and costs in their designs instead of aiming to increase quality and speed. A potential solution for this might be for the Ministry of Health to allow hospitals and physicians to make a reasonable margin of profit on their services so they would not have to compromise quality for costs. This will also allow physicians to spend more time with fewer patients to give more quality care instead of aiming to see as many patients in as little time as possible to make up for low costs of services.

In America, there is largely less support on the national level for controlling medical service prices and enforcing insurance for all citizens. Many cannot afford going to yearly check ups for basic examinations, much less afford more sophisticated services for treatments or diagnosis. The payment system through mainly private insurers in the US has allowed hospitals to have unprecedented profits at the cost of some of their patients, but at the same time also increased quality of care by aiming to sell modern and cutting edge services for high costs due to competition. This prompted manufacturers to continue to create even more expensive MRI machines that they will sell to hospitals at a high price. This may bring access inequality for those who are poor or uninsured, so even if technology has been evolving and improving, they cannot experience these advances if they cannot afford it. It is also possible that some of these new features in MRI devices are unnecessary to treating patients, as some devices have spa-like treatments. Providing health insurance for the uninsured could reduce the hospital markup for self-pay patients. Another potential solution to address the issue include charging a single, flat rate to all hospital patients or increasing cost transparency for healthcare as a whole, which contributed to large variations and increases in cost. This will reduce any healthcare disparities for citizens who cannot afford such care.

Conclusion:

The Japanese and American healthcare systems have both made significant contributions to the development and use of MRI technology in medical diagnosis and treatment. While the American healthcare system has been at the forefront of MRI technology development and innovation, the Japanese healthcare system has demonstrated a unique approach to integrating MRI technology into their healthcare system by emphasizing preventive care and health screening programs. Both systems have their strengths and weaknesses in terms of access to

healthcare, affordability, and quality of care. However, the use of MRI technology has undoubtedly played a crucial role in improving patient outcomes and advancing medical knowledge in both countries. As technology continues to evolve, it will be important for healthcare systems around the world to consider the social and cultural factors that shape the development and use of such technologies, in order to maximize their potential benefits for patients and society as a whole.

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