

# **IS HEALTH INSURANCE A BARRIER TO RECEIVING MEDICAL TREATMENT?**

A Research Paper submitted to the Department of Engineering and Society  
In Partial Fulfillment of the Requirements for the Degree  
Bachelor of Science in Biomedical Engineering

By

Madisan Yates

March 27, 2020

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

Catherine D. Baritaud, Department of Engineering and Society

Accessibility, as defined by Oxford's dictionary, is "the quality of being easy to obtain or use (*Accessibility*, para.2, n.d.)". Insurance is something that should be easy to obtain for all people but in the current state of the United States, that is not the case. Many Americans and their families are without healthcare due to the lack of affordable options. The accessibility of health insurance provides the link between healthcare and medical devices for patients. Devices are made for patients with varying levels of disabilities such as cerebral palsy, muscular dystrophy and hemiplegia. The current ones on the market for children are bulky, rigid orthoses, made in an effort to help strengthen their wrist extensor muscles (Burtner et al., 2008). These children chose not to continue the use of those devices because of the discomfort, look and usability of the device. Changing the design constraints to add ones such as low profile and dynamic movement will improve the usability of the wrist orthosis for children affected by motor impairments like cerebral palsy and muscular dystrophy. Low profile and dynamic mean that the material cannot be bulky and must allow for the movability of the wrist in many directions including flexion, extension, adduction and abduction.

The technical project focuses on the physical product development of the orthosis. Looking past the development of the orthosis will shift focus to the question of accessibility to the device for patients. The Science, Technology, and Society (STS) portion of the paper will look into the impact of insurance companies on the accessibility of products. Tightly coupled with the technical project, the STS portion will analyze the barriers created by insurance companies that patients using devices, such as orthotics and prosthetics, face, using the Actor Network Theory (Callon & Law, 1992). The STS research question being addressed is, Is Health Insurance a Barrier to Receiving Medical Treatment?

## **COST OF INSURANCE POLICIES**

The lack of access to insurance is a leading problem in the discussion of insurance being a barrier to treatment. Overall, there is a lack of affordable and comprehensive health insurance in the United States. There are three main sections of insurance: private insurance, government funded insurance, and no insurance.

### **Private Insurance**

Private health insurance encompasses all insurance companies that consumers can purchase or that employers provide for their employees. Users in the private system with higher income pay more for health insurance but have lower out-of-pocket medical costs (Pardo, 2019). These consumers have the ability to pay the upfront cost for the insurance which allows them the access to the better long-term insurance plans. Wealthier individuals are more likely to select private insurance due to their comprehensive plans (Pardo, 2019). With the lower out-of-pocket cost promised by the companies, consumers are often able to pay more upfront knowing that they will not be spending money on healthcare during the year.

### **Government-Funded Insurance**

Government-funded insurance programs cover the elderly population and those who fall in the low income populations. Two of the major examples in the United States are Medicare and Medicaid. Medicare is intended for the elderly population while Medicaid is intended for people who fall below a specific income bracket and children. The benefits vary depending on the state of residence but long-term care is not covered across the board ("*Not covered*", n.d.). Because Medicare and Medicaid patients are at a greater risk of having more health problems throughout the year and some are more likely to be long-term, individuals are stuck paying more out-of-pocket costs than they would if they had private insurance.

In terms of individuals, Medicaid covers about half of the United States low-income population. The accessibility to Medicaid programs allows further eligibility for federal public assistance for the individuals and their respective families. The accessibility to these programs allow patients the extra care they need. Medicare covers 95% of the United States population over the age of 65 (Angrisani et al., 2018). For the elderly population, there is a reduction in out-of-pocket medical expenses due to Medicare (Angrisani et al., 2018). With low out-of-pocket expenses, patients are more likely to go to the doctor when they are ill, leading to longer life expectancies.

### **Uninsured**

The uninsured category covers the remaining individuals who do not have health insurance. Patients without health insurance are those who either do not qualify for Medicare or Medicaid or cannot afford or choose not to pay for private insurance companies.

Access to health care services increases after the age of 65 meaning that the health of individuals changes from poor to good. The change is primarily due to people delaying their medical care until after they have reached the age of 65 because of this accessibility of Medicare (Angrisani et al., 2018). If people continue to push their medical care off until they are eligible for Medicare, the costs of Medicare are going to increase, causing the accessibility to decrease. The problem would then be multiplied for many more individuals.

Medical debt arises when people are without health insurance or are underinsured. Oftentimes this inadequate access to care can lead to rapidly declining health which can play a role in changing the socioeconomic status of a person or family (Hoffman & Paradise, 2008).

## **Socioeconomic Status**

Socioeconomic status plays a large role in determining the kind of insurance someone has access to. In a study done by Heck and Parker (para.16, 2002), it was found that children of single mothers were more likely to have Medicaid than private insurance. Single mothers typically fall in the low-income bracket that Medicaid covers, therefore private insurance companies have upfront costs that are too steep for them to pay. Discussing socioeconomic status brings in the perspective of patients without insurance. The single mother example is just one of many examples that show how socioeconomic status can impact a person's insurance choice.

## **INSURANCE AS REGULATORY AGENCY**

For-profit insurance companies grew in the market starting in 1950, increasing the amount of shareholders with a say in the insurance company profits (Hoffer, 2019). With the rise of for-profit insurance companies, health care costs and insurance premiums began their increase to today's amounts. Higher rates led to more patients without insurance (St. Lawrence, 2011). The change from non-profit to for-profit companies was a change for Blue Cross Blue Shield that, unlike the shift seen in the St. Lawrence article, led to positive changes in the insurance realm. The shift appeared to increase coverage for individuals in not only the private sector but also those without insurance. Risk selection also increased meaning that even though companies were taking on more patients, their selection of who received insurance was more specific. If individuals had disabilities or were not in good health, they were not accepted by the insurance companies (Lieber, 2018).

## **Food and Drug Administration (FDA) approval**

Food and Drug Administration (FDA) approval is necessary for devices to make it to market. In the past three years, an average of 43 new devices have made it through the FDA

approval process (Health, 2020). Typically, 80% of FDA approved devices are covered by Medicare but with specific restrictions. Even though devices are approved by the FDA, they do not have to be covered by insurance companies (Chambers et al., para.1, 2013). With the approval of the FDA, insurance companies may be more motivated to cover devices but they are not required. The lack of requirements for insurance companies leads to an insufficiency in the coverage of all devices.

### System in Context

The system in context, represented in Figure 1, holds true for medical devices throughout the approval process. The yellow face represents the Food and Drug Administration within the black circle who approve devices. The black circle encompassing the yellow face depicts a boundary which prevents communication between groups within the circle and groups outside of the circle. The blue face represents all insurance companies who then decide if devices should be covered for patients, represented by the orange face. The insurance companies act as a boundary object or gatekeeper, determining what gets to leave the black circle separating the FDA and the patients. The arrow around the system represents the social context: the medical field.

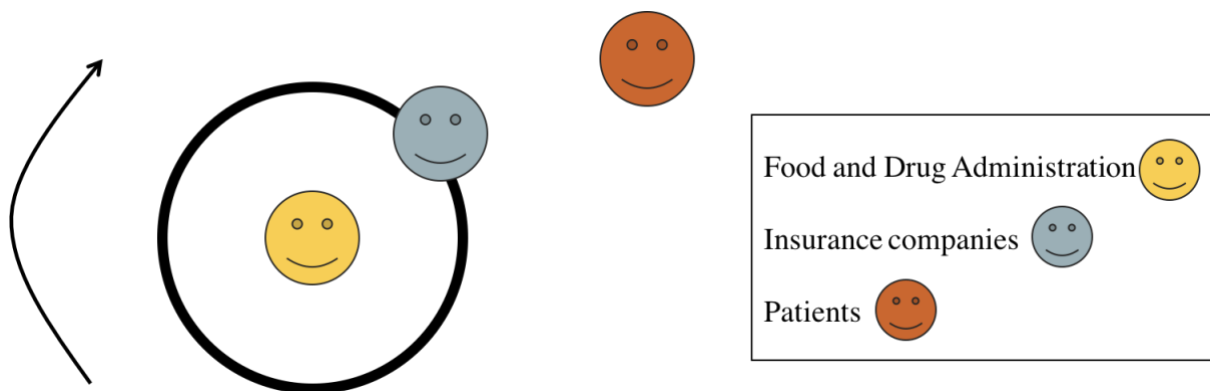


Figure 1: System in Context for Medical Devices: Medical devices travel through the system, starting at the Food and Drug Administration, receiving approval from the insurance companies and only then ending in the hands of the patients (Adapted by Madisan Yates (2020) from B. Carlson, 2009).

## **COVERAGE PROBLEMS**

Coverage problems feed into the barriers that insurance causes for receiving treatment. The orthotics and prosthetics field is small in comparison to others such as the pharmaceutical industry. Insurance companies look at the small field with little research and choose not to provide coverage due to a lack of proof within the field (Mitka, 2008). Coverage benefits change depending on the insurance company. Each company views the orthotics and prosthetics field in a different light, therefore their willingness to cover devices differs (Fish, 2006). In the orthotics and prosthetics field, diagnostics and treatment are typically high which may lead to insurance companies not covering treatment for their patients.

### **Quality of the Healthcare**

The quality of healthcare an individual receives is often correlated with which type of insurance they have and if they have preexisting conditions. A study done by Bethell et al. assessed the gap in healthcare for children with differing types of health insurance. Children who had private insurance were shown to receive the necessary care and coverage more often than those with government-funded insurance (Bethell et al., 2011). Privately insured children had more consistent coverage, leading to higher quality healthcare and more adequate coverage. The imbalance in quality left the government-funded insurance users at a disadvantage. 43% of children in the US have at least one chronic health condition. 29.1% of children are insured with government-funded insurance, and this typically leads to an increase in the prevalence, complexity and severity of those health conditions.

### **Orthotics and Prosthetics Example**

When patients come into an Orthotics and Prosthetics (O&P) office to be assessed for a device, normally a mold or cast is taken for the orthotist or prosthetist to make the device at a

later date. In between the initial appointment and the appointment set for delivering the device, it may take a few days or up to a month for insurance to approve the device, depending on the patient's insurance company (M. Bryant, personal communication, October 28, 2019). Skaggs et al., (2007) found that children with preferred provider organizations (PPO) always had their devices approved faster than children with government-sponsored or health maintenance organizations such as Medicare or Medicaid. The government-sponsored insurance, even though they were found to approve all devices at a slower rate, approved ankle-foot orthoses (AFOs) much quicker than thoracic lumbar sacral orthoses (TLSOs). The TLSOs cost 4 times as much as the AFOs causing insurance companies, such as Medicare and Medicaid, to push off approving the devices. The actual procurement of the braces was faster for PPO children as well, most likely due to other factors such as socioeconomic status, time off of work and transportation barriers. In order to assess why specific insurance companies respond faster to their patients than others, research needs to be done into what the companies look for when approving devices for patients.

### **Problem Modeled through an Actor Network Theory**

The Actor Network Theory (Callon & Law, 1992), represented in Figure 2, demonstrates the problem within the healthcare system caused by insurance companies. The specific example modeled here shows the orthotics and prosthetics field to demonstrate a small scale problem but the overall network can be applied to many fields within the healthcare system. The model shows the actants that play a role in the decisions and actions the actors take within the orthotics and prosthetics field. There are three actors in this network: patients, orthotists/prosthetists, and insurance companies. Each actor is impacted by different actants in the network: time, money, orthotic and prosthetic (O&P) devices and legislation. Legislation is an actant which impacts the



insurance companies through the policies they have in place. Time is an actant which impacts the insurance companies through how long it takes them to approve the devices, orthotists and prosthetists through how long it takes them to make the devices, and patients through how long it takes them to receive the devices. Money is an actant which impacts the insurance companies through how much of the device the insurances will cover, orthotists and prosthetists through how much they charge the insurances for the devices, and patients through how much they spend on the devices after insurances have covered a portion. O&P devices are actants which impact the insurance companies through, depending on what the device is, them not approving the device, orthotists and prosthetists through them physically being in charge of making the devices, and patients through receiving the actual devices.

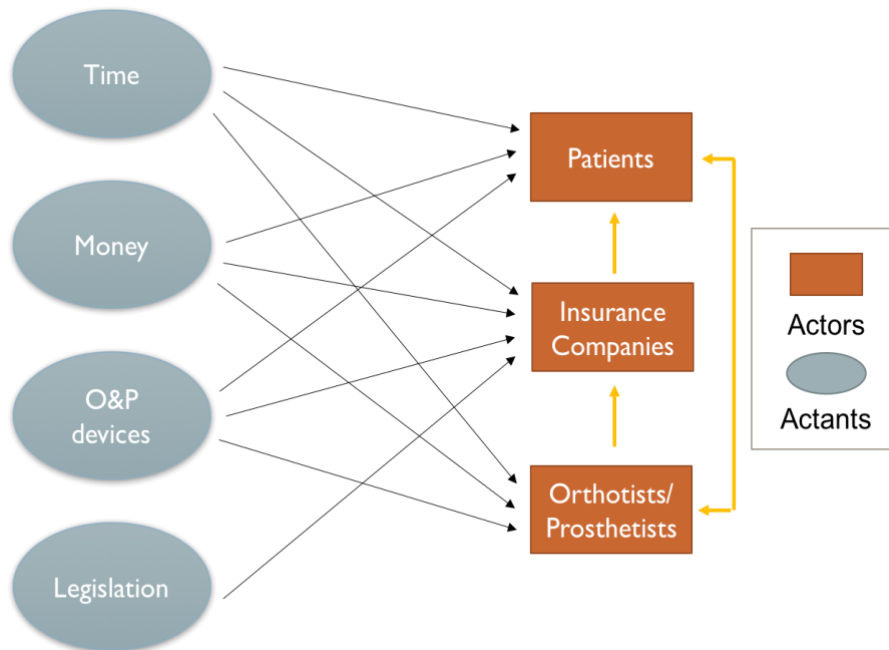


Figure 2: Problem Actor Network Theory in the Context of O&P: The blue ovals represent actants within the network which impact the actions that the actors, represented by the orange rectangles, take in the orthotics and prosthetics field. (Adapted by Madisan Yates from Law and Callon, 2019)

The problem in Figure 2 lies between the actors, among the yellow arrows. The orthotists and prosthetists, which in the O & P field are the manufacturers of the devices, first must see the patients and evaluate what devices need to be made. Then they send off the required paperwork to the insurance companies and wait for the required approval before they can begin making the

devices for the patients. If the insurance companies do not approve the devices, then the arrow stops at the insurance companies and the devices never make it to the patients, meaning they do not receive the treatment that they need. The insurance companies have now become the barrier, preventing the patients from receiving the necessary treatment.

## **SOLUTION TO THE HEALTHCARE SYSTEM**

With the state of the United States healthcare system now, medical care ranges from none for those who do not have any health insurance to optimal for those with great private insurance. In order to make a change for individuals in the United States at the bottom of the healthcare brackets, a systematic step forward needs to be made. One way to make the systematic change is enacting Medicare for all which places the government as the intermediary between patients and the healthcare providers.

### **Solution Modeled through an Actor Network Theory**

The Actor Network Theory (Callon & Law, 1992), represented in Figure 3, maintains the same actants as the problem model depicted in Figure 2. The arrows in the model are now double arrows between all of the actors ensuring open communication between the orthotists and prosthetists, insurance companies which in the new model is Medicare for All, and the patients. The biggest change can be seen where the insurance company actor used to be, Medicare for All is now in its place. To solve the barrier created beforehand by insurance companies preventing patients from receiving their devices, Medicare for All should be put in place of all insurance companies. In Figure 2, Medicare for All is represented by a green box to show the change in actor but it is outlined by black outline to show it is still an insurance company, rather just a specialized one. The specialization will allow for more people in the United States to have access to insurance, decreasing the number of uninsured individuals (Dalen et al., 2019).

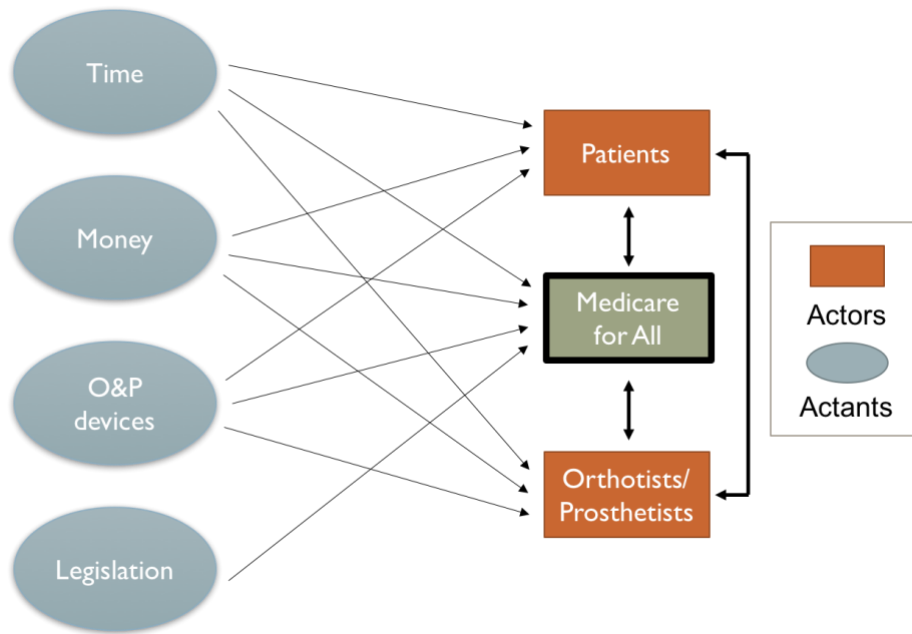


Figure 3: Solution Actor Network Theory in the Context of O&P: The blue ovals represent actants within the network which impact the actions that the actors, represented by the orange and green rectangles, take in the orthotics and prosthetics field. (Adapted by Madisan Yates from Law and Callon, 2019)

## MOVING FORWARD

Insurance needs to be equally obtainable for all people rather than a privilege for those who can afford it. In the current state of the healthcare system, there is a barrier to receiving the necessary treatment. When individuals are on the receiving end of good health insurance, they tend to not think twice about how insurance may affect others. With the state of the world during the global pandemic, many individuals without health insurance are being exposed, showing how critical it is for insurance to be a right rather than a privilege. To solve the health insurance barrier, Medicare for All must be enacted in the United States. Healthcare fields such as Orthotics and Prosthetics may then be viewed as vital for basic daily tasks. Devices such as the ones created by the technical project will improve the overall quality of life if they are allowed past the insurance barrier. The technical and STS research combined will allow the barriers created by insurance companies, faced by patients, to be addressed through Medicare for All.

## WORKS CITED

- Accessibility* | *Definition of Accessibility by Lexico*. (n.d.). Lexico Dictionaries | English. Retrieved February 24, 2020, from <https://www.lexico.com/en/definition/accessibility>
- Angrisani, M., Atella, V., & Brunetti, M. (2018). Public health insurance and household portfolio Choices: Unravelling financial “Side Effects” of Medicare. *Journal of Banking & Finance*, *93*, 198–212. <https://doi.org/10.1016/j.jbankfin.2018.05.001>
- Bethell, C. D., Kogan, M. D., Strickland, B. B., Schor, E. L., Robertson, J., & Newacheck, P. W. (2011). A national and state profile of leading health problems and health care quality for US children: Key insurance disparities and across-state variations. *Academic Pediatrics*, *11*(3, Supplement), S22–S33. <https://doi.org/10.1016/j.acap.2010.08.011>
- Burtner, P. A., Poole, J. L., Torres, T., Medora, A. M., Abeyta, R., Keene, J., & Qualls, C. (2008). Effect of wrist hand splints on grip, pinch, manual dexterity, and muscle activation in children with spastic hemiplegia: A preliminary study. *Journal of Hand Therapy*, *21*(1), 36–43. <https://doi.org/10.1197/j.jht.2007.08.018>
- Callon, & Law. (1992). Mobilization of local and global networks. ResearchGate. [https://www.researchgate.net/figure/Mobilisation-of-local-and-global-networks-Law-Callon-1992\\_fig1\\_220393175](https://www.researchgate.net/figure/Mobilisation-of-local-and-global-networks-Law-Callon-1992_fig1_220393175)
- Chambers, J. D., May, K. E., & Neumann, P. J. (2013). Medicare covers the majority of FDA-approved devices and part b drugs, but restrictions and discrepancies remain. *Health Affairs*, *32*(6), 1109–1115. <https://doi.org/10.1377/hlthaff.2012.1073>
- Dalen, J. E., Plitt, J. L., Jaswal, N., & Alpert, J. S. (2019). An Alternative to Medicare for All. *The American Journal of Medicine*, *132*(6), 665–667. <https://doi.org/10.1016/j.amjmed.2019.01.007>
- Fish, D. (2006). The development of coverage policy for lower extremity prosthetics: The influence of the payer on prosthetic prescription. *JPO: Journal of Prosthetics and Orthotics*, *18*(6), P125.
- Health, C. for D. and R. (2020). 2019 device approvals. *FDA*. <http://www.fda.gov/medical-devices/recently-approved-devices/2019-device-approvals>
- Heck, K. E., & Parker, J. D. (2002). Family structure, socioeconomic status, and access to health care for children. *Health Services Research*, *37*(1), 171–184. <https://doi.org/10.1111/1475-6773.99190>
- Hoffer, E. P. (2019). America’s health care system is broken: What went wrong and how we can fix it. Part 2: health insurance. *The American Journal of Medicine*, *132*(7), 791–794. <https://doi.org/10.1016/j.amjmed.2019.02.039>

- Hoffman, C., & Paradise, J. (2008). Health insurance and access to health care in the United States. *Annals of the New York Academy of Sciences*, 1136(1), 149–160. <https://doi.org/10.1196/annals.1425.007>
- Lieber, E. M. J. (2018). Does health insurance coverage fall when nonprofit insurers become for-profits? *Journal of Health Economics*, 57, 75–88. <https://doi.org/10.1016/j.jhealeco.2017.09.001>
- Mitka, M. (2008). Advocates seek better insurance coverage for amputees needing limb prostheses. *JAMA*, 299(18), 2138–2140. <https://doi.org/10.1001/jama.299.18.2138>
- Pardo, C. (2019). Health care reform, adverse selection and health insurance choice. *Journal of Health Economics*, 67, 102221. <https://doi.org/10.1016/j.jhealeco.2019.07.001>
- St. Lawrence, G. (2011, August). For-profit health care used to be illegal. *Health Over Profit*. <http://healthoverprofit.org/2017/03/19/for-profit-health-care-used-to-be-illegal/>
- What's not covered by part a & part b? | Medicare*. (n.d.). Retrieved March 23, 2020, from <https://www.medicare.gov/what-medicare-covers/whats-not-covered-by-part-a-part-b>
- Yates, M. (2020). System in Context for Medical Devices. [Figure 1]. Adapted from “Conceptual Frameworks” B. Carlson, on February 24
- Yates, M. (2019). Actor Network Theory in the Context of O&P. [Figure 2]. *STS Research Paper: Is Insurance a Barrier to Receiving Treatment?* (Unpublished undergraduate thesis). School of Engineering and Applied Science, University of Virginia. Charlottesville, VA.

## BIBLIOGRAPHY

- Adrienne, C., & Manigandan, C. (2011). Inpatient occupational therapists hand-splinting practice for clients with stroke: A cross-sectional survey from Ireland. *Journal of Neurosciences in Rural Practice, 2*(2), 141–149. <https://doi.org/10.4103/0976-3147.83579>
- Berk, M. L., & Schur, C. L. (1998). Access to care: How much difference does Medicaid make? *Health Affairs, 17*(3), 169–180. <https://doi.org/10.1377/hlthaff.17.3.169>
- Biddiss, E., McKeever, P., Lindsay, S., & Chau, T. (2011). Implications of prosthesis funding structures on the use of prostheses: Experiences of individuals with upper limb absence. *Prosthetics and Orthotics International, 35*(2), 215–224. <https://doi.org/10.1177/0309364611401776>
- Burtner, P. A., Poole, J. L., Torres, T., Medora, A. M., Abeyta, R., Keene, J., & Qualls, C. (2008). Effect of wrist hand splints on grip, pinch, manual dexterity, and muscle activation in children with spastic hemiplegia: A preliminary study. *Journal of Hand Therapy, 21*(1), 36–43. <https://doi.org/10.1197/j.jht.2007.08.018>
- CDC. (2018, March 9). *Data and statistics for cerebral palsy* | CDC. Centers for disease control and prevention. <https://www.cdc.gov/ncbddd/cp/data.html>
- CDC. (2019, June 25). *MD STARnet data and statistics* | CDC. Centers for disease control and prevention. <https://www.cdc.gov/ncbddd/muscular dystrophy/data.html>
- Chaillo, M. D., Frank, K. F., & Newman, R. M. (2019). *Low-profile dynamic wrist splint for pediatric patients with motor impairment* (Unpublished undergraduate thesis). University of Virginia, Charlottesville, VA.
- Huycke, L., & All, A. C. (2000). Quality in health care and ethical principles. *Journal of Advanced Nursing, 32*(3), 562–571. <https://doi.org/10.1046/j.1365-2648.2000.01540.x>
- Lannin, N. A., & Ada, L. (2011). Neurorehabilitation splinting: Theory and principles of clinical use. *NeuroRehabilitation, 28*(1), 21–28. doi: 10.3233/NRE-2011-0628
- Metz, S., & Maloney, C. (2012, January 9). Problem with health care is for-profit insurance. *PNHP*. <https://pnhp.org/news/problem-with-health-care-is-for-profit-insurance/>
- Ochalla, B. (n.d.). *Health insurance and orthotics coverage*. QuoteWizard. Retrieved October 22, 2019, from <https://quotewizard.com/health-insurance/orthotics>
- Philadelphia, T. C. H. of. (2014, June 30). *Pediatric stroke*. <https://www.chop.edu/conditions-diseases/pediatric-stroke>
- Simoens, S., De Coster, S., Moldenaers, I., Guillaume, P., Depoorter, A., Van den Steen, D., Van de Sande, S., Debruyne, H., Ramaekers, D., & Lona, M. (2008). Reforming the Belgian

market for orthotic braces: What can we learn from the international experience? *Health Policy*, 86(2), 195–203. <https://doi.org/10.1016/j.healthpol.2007.11.012>

Skaggs, D. L., Oda, J. E., Lerman, L., McGoldrick, E., Rice, C., Weiss, J., & Kay, R. M. (2007). Insurance status and delay in orthotic treatment in children. *Journal of Pediatric Orthopaedics*, 27(1), 94. <https://doi.org/10.1097/01.bpo.0000242437.04059.41>

Span, P. (2020, January 17). Medicare's part d doughnut hole has closed! Mostly. Sorta. *New York Times*. <https://www.nytimes.com/2020/01/17/health/medicare-drug-costs.html?searchResultPosition=1>

United Healthcare of California. (2019). *Shoes and foot orthotics*. 5.

Yates, M. (2019). Gantt Chart for Capstone Team. [Figure 1]. *Prospectus* (Unpublished undergraduate thesis). School of Engineering and Applied Science, University of Virginia. Charlottesville, VA.