

Actors of Telemedicine Virginia: A Response to Regional Health Disparity

A Research Paper submitted to the Department of Engineering and Society

Presented to the Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

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Spring, 2020

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Regional Healthcare Disparity in Virginia

Access to healthcare is alarmingly differentiated based on regions in Virginia, requiring some citizens to travel up to 3 hours from southern Virginia for an appointment in northern VA. The regional healthcare disparity in VA is a result of differing socioeconomic conglomerates and allocation of resources (*Hospital & Healthcare Preparedness – Emergency Preparedness*, n.d.). Government bodies have acknowledged the issue of healthcare access at the state level, and there are initiatives in place to combat the disparity (*State Office of Rural Health – Health Equity*, n.d.). One such initiative put in place by the state of Virginia is telemedicine. Telemedicine is a technology that employs the use of medical information and communication technology to provide and support healthcare when there is a distance between the patient and health care professional (Telemedicine & Field, 1996b). As a possible method of combating the regional access to healthcare in VA, telemedicine utilizes audio and visual technology that connects patients and healthcare providers separated by geographic distance. Inherent to the implementation of technology are the actors behind integration and utilization of that technology. As such, this paper employs Actor Network Theory (ANT) in order to reveal different actors and relationships within telemedicine. The goal of this research is to implement actor network analysis as a framework for assessing possible inequalities or barriers that would inhibit effective utilization of telemedicine as a sustaining technology that combats healthcare access in VA.

Research Question and Methods

Given the complex nature of the system of telemedicine, investigating the question of key entities within Virginia's telemedicine network requires extensive network analysis. There is an interaction of society and technology with the enactment of a technology as encompassing as

telemedicine in Virginia's healthcare infrastructure. In order to answer the question of which actors, both human and non-human, are contributing to enforced marginalization and barriers of entry in telemedicine, actor network analysis is used to assess relationships and social factors.

As a method for mapping the actors involved in Virginia's telemedicine network, actor network analysis is utilized. The goal of mapping the network is geared towards a comprehensive network map that has potential to reveal social factors inherent to telemedicine (Rees et al., n.d.).

Additional methods include historical case study analysis. Historical studies are investigated as a means of providing precedent for implementation of telemedicine in other states. The goal of historical case studies in varying states is to provide more evidence for different social factors that persist in telemedicine, and a means of shedding light on potential future factors that may exist in the future in Virginia's healthcare system. Building on the actants identified in background analysis of telemedicine, research keywords are centered around discovering roles of these actants in telemedicine. Evidence from studies is interpreted in the framework of Actor Network Theory (ANT), assessing influence and relationships between actors present in the evidence.

Telemedicine Landscape In Virginia

Aforementioned, the Virginia Department of Health has expressed a call for policy changes that address the regional health care disparity apparent in Virginia. Not only do people in Virginia's Appalachian region face geographic barriers to getting adequate healthcare needed, statistics show a decrease in life expectancy as a result of these socioeconomic and regional differences (Countries et al., 2011). For context, Southern Appalachian regions when compared

to Northern Virginia represents are largely disparate with regards to healthcare facilities (McGarvey et al., 2011). Although a seemingly astute solution to Virginia's regional healthcare calamity, there are aspect of telemedicine that require further consideration.

As previously defined, telemedicine employs communication technology, both audio and visual. In order to establish a sufficient stream of communication and an visual environment that allows confident diagnosis, image quality is of high importance. Expenses for telemedicine equipment come at a high cost, and some regions cannot support telemedicine components (Minh et al., 2012).

When researching on mapping the network of actors involved in telemedicine to identify social factors, it is crucial to consider the stakeholder of telemedicine. At a glance, directly involved stakeholders include the patients receiving treatment and the health care provider engaging in communication and providing diagnosis and treatment. Less apparent at surface level are the various regulatory and supportive bodies—such as insurance companies, system administrators, healthcare staff, and pharmacists (Troshani, 2013). All of these entities, both human and nonhuman, are affected by and affecting the infrastructure of telemedicine. Topics for discovery in this network include questions of patient confidentiality balanced on the trust of cybersecurity. Further, there are potential marginalized groups that may lose jobs as a result of telemedicine. Balestra describes the result telemedicine has on nurse practitioners, as they traditionally served the primary physician when a more qualified M.D. was not available. With the introduction of telemedicine, an intermediary position in the nature of nurse practitioner is not required, as patients can access a doctor via telemedicine (Balestra, 2018).

Actor Network Theory and Telemedicine

Cresswell writes that ANT focuses on effects of technologies and humans on social processes. Through tracing associations between the various actors, account for such social effects such as power and marginalization are revealed (Cresswell et al., 2010). With ANT theory framework in mind, the complex infrastructure and networks of telemedicine begin to materialize. From a constructionist perspective, ANT fails to assert the social construction of social phenomena. Rather, ANT assumes social phenomena are the result of network interactions. For the case of assessing social factors in telemedicine as a large healthcare network, consideration of social factors as a result of network interactions is a more succinct approach than considering larger scale societal and institutional forces. For the purposes of addressing network interactions in telemedicine, Virginia's telemedicine infrastructure is considered an isolated entity interacting constitutively. Other critiques of telemedicine include the dismissal of fundamental social factors such as race, class, and gender (Pages, 2011). I plan to keep this perspective in mind when investigating the actor networks involved in telemedicine, as a means of addressing the various critiques and pitfalls of ANT.

ANT employs a "black box" system, in which actants are only considered as their outputs, regardless of qualities of that individual's personal qualities or bias. As a framework, ANT is critiqued for its failure to address social institutions that are also in place. It is important for the sake of this research to continue considering the individuals and mechanisms within telemedicine's black box actants (Bencherki, 2017). Critiques of ANT go on further to discuss how ANT uses spokesman, which are actants that represent a longer chain of black boxes. In the case of spokesmen, social factors inherent to individuals or parties is disregarded in the grouping of telemedicine's actants (Bencherki, 2017). The research of this paper exists in the sphere ANT

to assess telemedicine, but aims to address underlying social factors that are identified as shortcomings in ANT.

Results and Discussion

Application of ANT to telemedicine in VA provides insight to the different actants involved. The network mapped is displayed in Figure 1, and the actants relevant to results are represented.

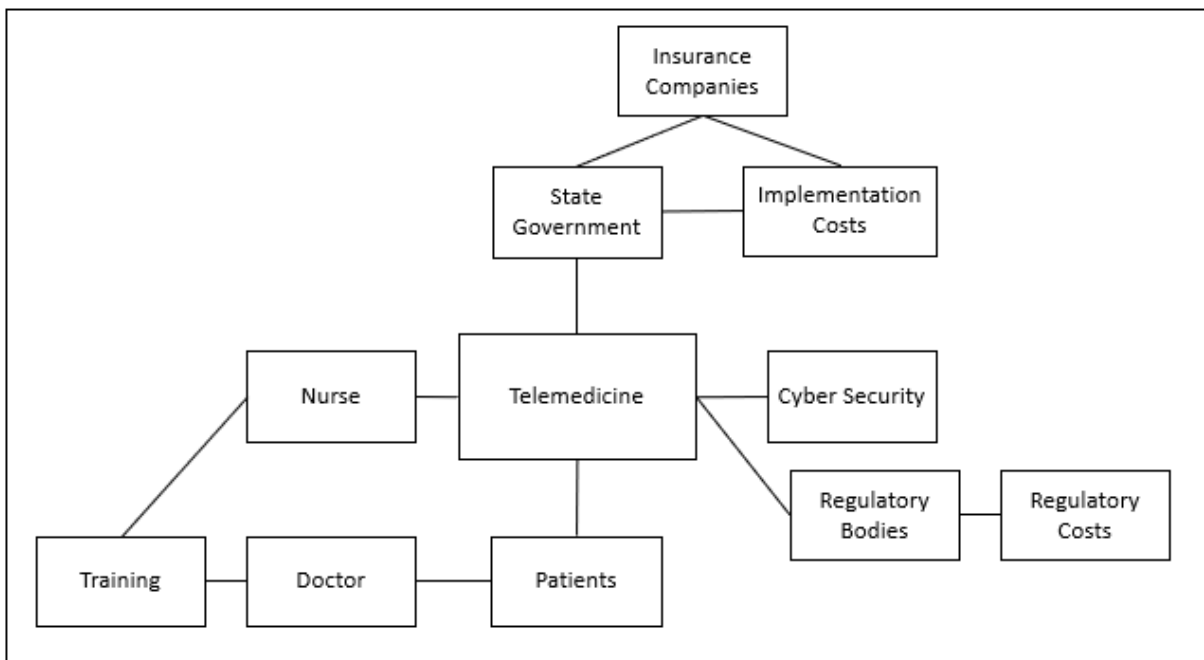


Figure 1 shows the actor network mapper for telemedicine in Virginia, with boxes referring to actants, both human and nonhuman. Lines connecting boxes represent interaction between actants (Murphy, 2020).

Some actants are black boxed for sake of simplified relationships in the research proposed. As demonstrated by identifying key actants and assessing roles of those key actants through historical case analysis, evidence points towards marginalization of nurse practitioners as a result of telemedicine in VA. Additionally, utilization of historical case studies demonstrated actor networks of telemedicine in similar systems revealed that upfront costs for technology and

insurance coverage ambiguity introduce barriers for some regions to enter a telemedicine network.

In a study investigating cases of respiratory infection, with regard to the patient's actant, the cost of a telehealth visit was \$79 compared to \$146 visit to the physician's office, not even to mention travel costs for patients far away from the clinic. Tele medicine introduces higher upfront costs for insurance companies, but because of earlier detection and the availability for 24/7 patient access, the expense result is better for insurance companies as preventative care ("Telehealth & Telemedicine Cost Benefits," 2017). Evidence supports cost savings as a result of telemedicine, from the perspective of patients as an actor. Cost savings for patients represent an opposition to the barrier of implementation costs delegated as too high.

A key beneficiary of telehealth services in VA is veterans, and in 2016 about 12% of veterans received elements of care via telehealth (*Telehealth VA* /, n.d.). Virginia's veteran population may serve as a model for a specific patient population that largely benefitted from telemedicine based on synergistic effects of actants influencing telemedicine. Telemedicine is available for over 50 specialty areas of care, and circumvents any social factors induced by the actants insurance companies or cost that would deter patients from electing for a telemedicine service. Adopting Medicaid and Medicare policies that mimic the coverages provided for veterans is a possible method of state-to-state communication that improves telemedicine utilization.

Investigating further into the role of insurance companies and government regulation in the network of telemedicine, barriers are enforced that impede full utilization of telemedicine. Referencing the interplay in Figure 1 between Implementation Costs and State Government, evidence in a study by Uscher-Pines et al provides information on how these actants interact. As

a reflection on actions of the State Government, a black box also influenced by federal government, the study showed that there is ambiguity in which services are covered by Medicaid (Uscher-Pines et al., 2019). From a social perspective, cost of healthcare services is a significant consideration, especially for lower income populations typically associated with rural areas where utilization of telemedicine is mainly targeted. As a result, in the telemedicine network government actants and insurance companies enforce a social and economic barrier that prevents patients from utilizing telemedicine. Although barriers are not intentional for the sole purpose of restricting telemedicine, there is still a resounding effect on the utilization of technology. Regulatory bodies and cybersecurity costs also have an effect on the total cost of implementing telemedicine. Training courses for medical professionals and support staff also represent a significant cost in telemedicine (Telemedicine & Field, 1996a). Although training propels telemedicine, training is included in the black box of implementation costs and can also act recursively by preventing implementation of telemedicine. While costs and government bodies impeded telemedicine, democratic pressures inherent to the black box of state government are catalysts of change.

There are also strides towards improving the coverage of telemedicine. A 2010 bill passed by Virginia legislature required private health insurers and health care subscription programs to cover the cost of health care services via telemedicine. Later in 2015, the same bill was expanded to cover care costs for minor illnesses (*Telemedicine Regulations in Virginia*, n.d.). In addition to enforcing barriers, the actant State Government is also acknowledging underutilization of telemedicine technology and making strides towards a more accessible system. The interplay between insurance companies and state government in telemedicine's network in efforts to progress telemedicine and increase availability is an example of

constructive influence apparent in the network. Actor network analysis not only provides a framework to identify barriers for telemedicine, but also examples of cooperative influences that enable sustainable utilization of technology. These examples serve as a model for other states to follow and learn from in order to adjust their own systems of telemedicine.

Upfront implementation costs are a considerable actant in the network of Virginia telemedicine. In a study investigating telemedicine costs in an ICU, it is reported that operational costs for a single bed for 1 year is in the range of \$50,000 to \$100,000 (Kumar et al., 2013). Implementation costs are especially an issue in rural regions with smaller hospitals and underfunding. As a nonhuman actant, implementation costs introduce a significant barrier for hospitals entering the telemedicine network. Implementation cost is a black box system for the purposes of this research which includes operational costs, private and public sponsorship, and technology costs. Interacting with government actants and insurance companies, cost also influences decisions for funding telemedicine. Addressing implementation costs in a study, the American Hospital Association introduces evidence that telemedicine lowers healthcare costs (*Telehealth: Helping Hospitals Deliver Costs*, 2016). Coupled with strict government spending, rural hospitals most in need of telemedicine technology are not receiving adequate implementation of telemedicine based on influence of cost actants. Research demonstrated by the American Hospital Association suggests that in long-term not only does telemedicine lower health care costs, but also improves access and quality of care (*Telehealth: Helping Hospitals Deliver Cost-Effective Care*, n.d.). Barriers of entry influenced by operational costs provide a challenge that results in underutilization of telemedicine, but current research shows that upfront costs are less of an issue when long term savings are considered.

A more recent and poignant application of telemedicine is demonstrated in the outbreak of COVID-19. Early on in the outbreak of COVID-19 in the United States, President Trump extended telemedicine coverage to include Medicare beneficiaries (*President Trump Expands Telehealth Benefits for Medicare Beneficiaries During COVID-19 Outbreak* | CMS, 2020). As one of the first acts upon declaration of a national state of emergency, it is important to consider implications of removing the actor that serves a barrier in telemedicine, insurance coverage. The COVID-19 era serves as an example for how barriers to effective implementation are negated in the presence of systemic and organizational change at the level of federal policy. In addition to providing evidence of viability of telemedicine, the case of telemedicine in the COVID-19 era demonstrates applications of telemedicine as an enabling technology outside the bounds of connecting rural regions to established healthcare professionals. In the case of COVID-19, telemedicine provides a means of communicating with possibly infected patients in a time when PPE is not widely available, and patients cannot leave quarantine. Telemedicine provides a means of making diagnosis and informing patients on treatment instructions when hospitals are overrun and there is a lack of ventilators, hospital staff, and resources. Although not an ideal policy shift or governmental cohesive movement to initiate widespread and effective implementation of telemedicine, COVID-19 may act as a catalyst in the paradigm shift towards not only telemedicine as a standard of organization in healthcare, but also widespread adoption of tele networking in more general applications including remote work and education.

Limitations

Framing of telemedicine in VA with ANT and looking into different cases reveals evidence for different actants that enforce barriers and influence social factors that result in an underutilization of telemedicine. However, by black boxing actants for the sake of simplified

consideration, many actants are integrated into a single and cohesive actant (Stalph, 2019). Information about individual actants included in a black box are part of a conglomerate, and specific details potentially relevant to interactions are overlooked. Additionally, the evidence proposed in this paper is based on secondary sources or research studies and is influenced by bias of research bodies involved. For example, agency that relies on revenue from successful and widespread implementation of telemedicine programs has motive for shedding a negative light on other actors that inhibit telemedicine like government and insurance.

Future Research

Keeping in mind limitations of the results of VA telemedicine framed with ANT and looking towards future research, a large focus is structured around addressing ambiguity of black boxes. Insurance policies and government funding are identified as key actants that introduce barriers to effective utilization of telemedicine. In future research more insight on the mechanisms and interactions present inside the black boxes. Moreover, further investigations also address another limitation--inherent bias of different research body perspectives. By investigating deeper into a black box and considering closer interaction, different actant agendas that may enforce barriers in telemedicine become more apparent. Different policy researchers are part of a field that provide useful insight to further understanding social implications and barriers for telemedicine. Providing evidence that enables state-to-state communication on methods of implementing telemedicine is a promising route for policy makers to contribute to this research in the future.

Insights in Telemedicine Implementation Looking Forward

The question of which actors, both human and non-human, contribute to enforced marginalization and barriers of entry in telemedicine, actor network analysis is used to assess

relationships and social factors, investigating the actor network mapped for telemedicine in VA. As demonstrated by case study evidence, upfront costs represent a barrier for hospitals to implement telemedicine. Smaller hospitals in rural regions that have the greatest need for telemedicine require government support for implementing large upfront costs (telehealth16). Additionally, state government and insurance companies provide barriers that introduce cost restrictions for patients to utilize telemedicine. However, state government and insurance programs also act cooperatively to address barriers to telemedicine through policy change. VA's telemedicine system and research proposed in this paper serve as an example for challenges other states and international regions may face in efforts for implementing telemedicine, and demonstrates evidence for advisory routes for policy shifts.

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