Improving Patient Flow for the Suite 2100 Clinics in the UVA Health System
(Technical Paper)

How Sociotechnical Factors Impact the Relationship Between Doctors and Patients in China
(STS Paper)

A Thesis Prospectus
In STS 4500
Presented to
The Faculty of the
School of Engineering and Applied Science
University of Virginia
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Systems Engineering

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November 1, 2021

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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.

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Introduction

Suite 2100, an essential part of the University of Virginia (UVA) Hospital system, is composed of three clinics: Endocrinology, Primary Care, and Rheumatology. With all three clinics sharing the same check-in desk, resources, and patient waiting area, they are facing similar patient throughput inefficiencies. Factors leading to such problems vary, including lack of communication, defect understandings of systems to maximize efficiency, as well as long-term challenges and impacts due to COVID-19. The hospital system must work to increase Suite 2100's patient throughput by providing recommendations on doctor scheduling and patient-clinic communication, and patient flow system design. However, accomplishing this goal demands a few subtasks. Even though these tasks are fluid, we plan to break them into three facets: Understanding the current system state and conditions, conducting an analysis of doctor scheduling and utilization, and applying observational clinic data from the electronic medical record (EMR) system to develop data-driven quantitative recommendations. The final technical deliverable, including a doctor schedule visualization, a patient arrival time recommendation, and patient flow improvement recommendations, will make efficient use of given constraints and conditions faced by the UVA Hospital System while holding to its existing core values.

The second proposed project examines a different perspective on the health care system, the relationship between the doctor and patient is very crucial ranging from the UVA health system to anywhere in the world. In comparison to many other relationships, the doctor-patient relationship is one of the most meaningful and moving experiences shared by human beings, which involves trust and vulnerability. The unique relationship is encompassed by four key elements: loyalty, mutual knowledge, regard, and trust (Chipidza, Wallwork and Stern, 2015). However, this relationship and both parties (doctors and patients) that flow through it are not always flawless.

With research and analysis on the factors that form the current phenomenon of such relationship in certain demography such as a country or a state, the project presents an opportunity to release some of the seemingly impenetrable and esoteric reasons that lead to the outcome and thus would make the initial understanding and future improvement on such outcome more possible. This proposed STS Research paper will study the sociotechnical factors that build such relationships in China, where the doctor-patient relationships have been deteriorating for a decade.

Improving Patient Flow for the Suite 2100 Clinics in the UVA Health System

Due to the COVID-19 pandemic, health systems have been disrupted significantly all over the world. There has been an increasing need for improving the patient flow throughout healthcare systems under the new requirements and guidelines that are meant to alleviate the spread of the disease. Suite 2100 within the UVA Hospital system contains three clinics: Primary Care, Rheumatology, and Endocrinology. These clinics all share the same check in desk, and the admittance process for the clinic starts when the patient enters the building, and check in at central registration, illustrated in the Figure 1 below (K. Dowdell, personal communication, September 10, 2020). As seen in the Figure 2, the patient then travels to the clinic floor, checks in at the front desk in the clinic's suite, and waits for a nurse to bring them to an exam room. (K. Dowdell, personal communication, September 10, 2020). Even though it is sufficient to handle such patient arrival pre-pandemic, the process is now lacking to support patient admittance in current pandemic situation.

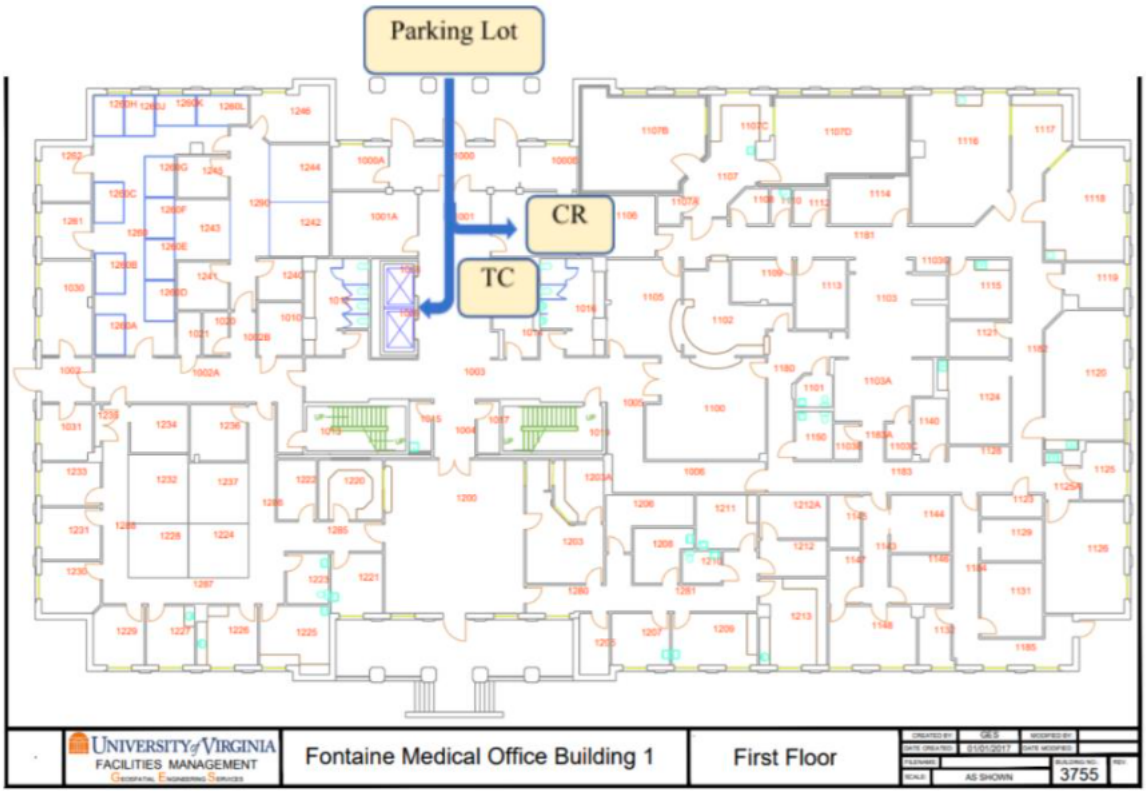

Figure 1. Diagram denoting patient flow process for patients going into Primary Care Clinic & locations of the parking lot, entrance of the building, central registration (CR), and temperature check (TC) (Geospatial Engineering Services, 2017).

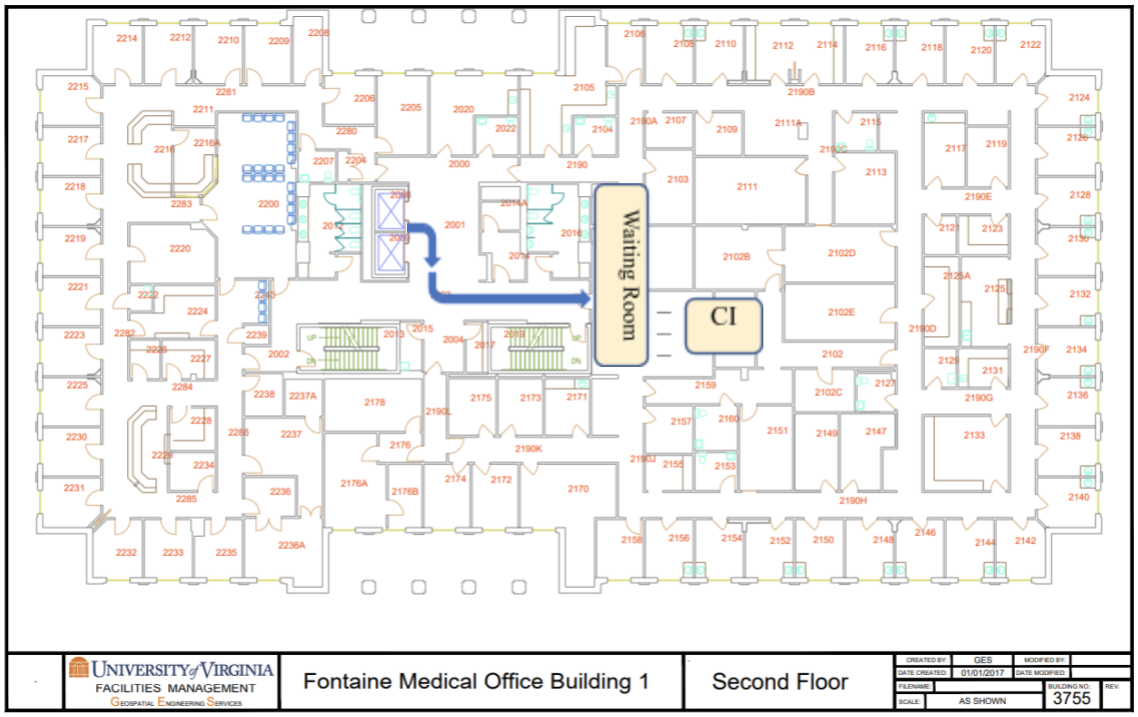

Figure 2. Diagram denoting patient flow process for patients going into the Primary Care Clinic & locations of the waiting room for the Primary Care Clinic and check-in to the clinic (CI) (Geospatial Engineering Services, 2017).

Many of these issues are the result of outdated communication systems and long-term challenges due to the COVID-19 pandemic. During 2020-2021 academic year, a capstone team assisted the Primary Care clinic in mitigating patient safety challenges due to the COVID-19 pandemic. In 2021-2022 academic year, under the advisement of Professor Robert Riggs, seven undergraduate engineering students intend to work to increase patient throughput by providing recommendations on doctor scheduling, patient-clinic communication, and patient flow system design.

The overarching goal of the project is to increase patient throughput in the clinics; however, accomplishing this goal requires numerous subtasks. Although these tasks are fluid, they are initially broken into three facets: understanding the current system state and conditions, conducting

an analysis of doctor scheduling and utilization, and applying observational and clinic data from the electronic medical record (EMR) system to develop data-driven quantitative recommendations. The first subtask will be accomplished through clinic observation. The team will focus on understanding the initial registration process that occurs downstairs before entering the clinics, the check-in processes, waiting times, and clinic signage and overall flow. The second subtask focuses on understanding the requirements of the clinic, the doctor's schedules and preferences, and the current time utilization and associated efficiencies. Finally, the descriptive scenario and understandings of the clinic will be used by the researchers to create data-driven recommendations to present to the client. It is important to note that all of these tasks are intended to be completed at some level, but the scope of work may change based on client requests and time restrictions.

Throughout the duration of this research, the researchers intend to develop multiple deliverables to present to the client. There is a sample of desired deliverables tabulated below; this list is preliminary in nature and may change in size, scope, and focus after further consultation with the client. The team will create visualizations of doctor schedules to identify areas where scheduling can accommodate more patients and timeframes where there is a limited variety of bookable appointment types. First, the team intends to convert the current schedules from several tabs in a spreadsheet workbook to a simplistic, easy-to-use, potentially interactive tool. The tool will inform preliminary recommendations about scheduling and allow doctors to assess scheduling problems going forward as requirements and constraints change throughout time. Second, the team will also develop a recommendation for how early patients should arrive at the clinic before their appointment. The researcher's goal is to determine a time where, on average, patients arrive not too close to their appointment time or late such that they induce delays but also not so early that they induce system congestion. The team will also identify the best methods and practices to

communicate this information to patients; the process will take into consideration current communication capabilities and restrictions within the health system. Finally, the researchers will develop recommendations for ways in which to improve patients' flow through the clinics with a prioritization of efficiency. This deliverable will focus on rectifying the fluctuating levels of congestion that are experienced due to unclear check-in and check-out instructions, confusing or excessive signage, and a unique edge case created by the inclusion of an unrestricted patient laboratory service (Cusack, Dozier, Schmid, Huffman, Sass, Drissi & Wu, 2021).

How Sociotechnical Factors Impact the Relationship Between Doctors and Patients in China

The relationship between doctors and patients in China is a severe social problem impacting billions of people. The Doctor-Patient Relationship, also known as DPR, is a complicated notion that emerges when patients go to doctors for consulting, and subsequently tend to follow the guidance given by doctors (Qiao, Fan, Geater, Chongsuvivatwong, & McNeil, 2019). A healthy DPR increases the effectiveness of this sociotechnical relationship. On the contrary, a poor relationship between doctors and patients has negative impacts on many outcomes including patient anxiety, inferior health care quality, poor compliances, and many more. In China, the DPR is currently in crisis, and the tension of this relationship is a major threat to the healthcare system. The quality of DPR in China has continuously deteriorated in recent years that doctors have been facing an augmented number of threats to their safety in the forms of both physical and verbal abuse at work, injuries, and even being murdered, by patients or their family members that are not satisfied. Such attacking behaviors have already become a daily routine (Qiao, Fan, Geater, Chongsuvivatwong, & McNeil, 2019). In a 2019 survey conducted by The Economist, 85% of the doctors have encountered violence at work in China (The Economist, Violence against doctors in China is commonplace, 2021). Medical-related jobs such as doctors are identified as high-risk

occupations in China. The severity of the problem draws a huge amount of pressure on young doctors as well as steering away from the population of students that are willing to study medicine. In addition, the general level of trust in doctors is very low among patients (Qiao, Fan, Geater, Chongsuvivatwong, & McNeil, 2019).

Various studies are attempting to explain the factors behind a poor DPR from both patients' and doctors' points of view. For instance, some scholars describe the difference between doctors and patients on ways of viewing ill-health, even for those with the same social and cultural background. Moreover, due to the skilled and technological superiority nature of doctors' occupation, they commonly assume an authoritative role, and conflicts may occur when patients do not accept what is being told by the doctor. There is a lack of consensus between patients' expectations and doctors' objectives, thus a gap in DPR emerges which damages the trust between doctor and patient as well. On the doctor's part, the lack of communication skills, for instance, using medical terms at most times instead of listening to the patient's complaints thoroughly would lead to a poor doctor-patient relationship. Nevertheless, some other researchers found that the proportion of doctors who consider the issue to be intense is more than those of patients, and doctors are the more influenced party instead of patients. On several studies about factors affecting the doctors and patients' relationship from the doctor's perspective, the most influential aspects so far are doctors' social status, work pressure, communication barriers, hospital environment, and occupational risk consciousness (Qiao, Fan, Geater, Chongsuvivatwong, & McNeil, 2019).

It is inevitable to admit that such growing tension of Doctors Patients Relationship and the high frequency of medical dispute impacts Chinese society significantly. Factors behind such quality of DPR are varied. The unique historical background, socioeconomic, cultural traditions, habits of lifestyle make China different from other countries in the world. Moreover, the unique

background of China and such a high level of tension, as well as lack of trust between doctors and patients, shows difficulties in utilizing DPR's conventional models. The optimal approach is to treat such relationships as mutual participation that is coped with beneficial mutually. Thus, the goal of this research paper is to understand how the sociotechnical factors are influencing DPR from the perspective of both the doctor and the patient. For example, there are many stakeholders in the doctor-patient relationship that reach far beyond doctors and patients themselves. First, the government can step in with legislative policies if they are willing to do so, and decision-makers such as the president can respond to advise and acts that would set the tone for the Chinese people. Second, health care facility companies, system providers, insurance companies can influence the event. In addition, the press and social media also have a big influence on DPR. These may be worth to investigate as well.

The conceptual framework for this analysis is The Social Construction of Technology, also known as SCOT. The agency-centered approach, initially presented by Trevor Pinch and Wiebe Bijker articulates four associated components (Klein & Kleinman, 2002). The first one is interpretive flexibility, which suggests that the design of technology creates different outcomes based on the social circumstances of development, and it is an open process. For instance, some sociologists of science argue that particles studies in particle physics are the products of intergroup negotiations over the observations' interpretation. However, SCOT scholars utilize the interpretive flexibility concept to technological artifacts to illustrate how the artifacts are similar to the intergroup negotiations' product. The second component of SCOT is the concept of the relevant social group, which are the avatars of particular interpretations: "all members of a certain social group share the same set of meanings, attached to a specific artifact." (Klein & Kleinman, 2002). Those relevant social groups are the agents in this agency-centered approach, and their actions

demonstrate the meanings they give to artifacts. The development of technology in multiple groups embodies specific interpretations of an artifact differently among each other while negotiating over its design. For instance, groups have diverse definitions of a certain educational technology, thus development continues until all groups come into an agreement that such common technology works. The third component of SCOT is closure and stabilization. When different understandings between multi-groups occur on an artifact's images during the design process, conflicts would take place. The design process would keep going until the artifact does not appear problematic to any associated social group. The process reaches its closure when no additional design modification emerges and the artifact stabilizes in its final version. At this point, a final decision occurs. For instance, in rhetorical closure, a declaration of no further problems exists and no need for extra design is being made. The fourth and final component is wider context, which is the wider political and socio-cultural milieu where artifact development happens (Klein & Kleinman, 2002). The role it plays is relatively minor, it is here that many of the structural notions we discuss belong.

While SCOT will help analyze the DPR problem in China, there are some critiques about this framework. Some scholars such as Pinch and Bijker criticize that its original formulation is insufficient. Even the original authors themselves are acknowledged and are a part of this critique as Pinch and Bijker keep refining this framework. The main criticism of SCOT is targeting its view on society as composed of groups. SCOT assumes all groups are equal and all related social groups are present in the process of design. With some groups are effectively kept away from participating in the design process, and some groups with only a diverse collection of subgroups may not be groups at all, this notion fails to sufficiently attend to authority asymmetry in-between groups (Klein & Kleinman, 2002). Therefore looking into other frameworks such as ANTs may be necessary of problems emerge during further research.

The structure of relevant social groups in SCOT approach is helpful to this project because it treats all groups as unproblematic, and by studying on different groups of people in Chinese society on the issue equally is very efficient, even though it risks overlooking some significant absences. While exploring the factors causing the dilemma of DPR in China and how to improve it, concepts such as “rules of access,” “power to exclude,” and “design forum” would direct my attention in relatively different directions. It is worth thinking that why did one design takes place rather than the other ones, and how can an eventual working artifact, which is the exposure of the identification on factors with possible change to them on DRL in this project, harm the interest of both doctors and patients? Thus, the structural feature in SCOT would help as an organizational tool and is relevant for explaining the result of the project when other benefits that are not intended to be discovered in this project emerges.

Research Question and Method:

The research question that is: How do sociotechnical factors impact the relationship between doctors and patients in China? The social construction of technology framework will demonstrate how human activity influences technology. In this case, the outcome of how the current state of DPR is formed in China is being examined. To conduct such a study, methods including discourse analysis and documentary research will be used. While performing documentary research, keywords include “Doctor-Patient Relationships in China”,, “Stakeholders of DPR,” “Chinese Health Care System Background,” “Factors behind DPR in China,” “Impact of DPR on society,” etc. The project will also help address the result of how DPR are behaviors derived from a scientific and psychological point of view. In addition, discourse analysis will be incorporated while utilizing the documentary, “Opinion: The Chinese doctor-patient relationship in the digital era” (Bouteiller, 2020), as it talks about some insight on the COVID-19 impact on

the doctor-patient relationship in China. The discourse analysis will support building the sociotechnical relationships that are used to analyze the publications found from the documentary research process. By using the two different research analysis methods, further examination on how the current Chinese DPR is formed by sociotechnical factors will be conducted. In addition, the research analysis methods can also reveal some outcomes and limitations on both positive and negative sides that are seen in social technologies. Finally, the information will be presented in a contemporary time manner; how the sociotechnical factors behind the formation of the current Chinese DPR are influenced by large medical care companies and their psychological impact on Chinese society will also be discussed.

Conclusion

Notably, the Suite 2100 Clinics in the UVA Health System demonstrates many challenges that lead to improvements for many areas. While the researchers do not have sufficient time for all possible areas of interest, we work with the client to focus on the issues of the highest priority of importance. The outcome of the Capstone by the team intends to provide descriptive recommendations for future improvements and research for other individuals to build upon the work that will be completed by our effort. The STS research paper will look at the current state of the Doctors and Patients Relationship throughout the People's Republic of China, a relationship that is not well understood and does not usually get too much attention from the public. The outcome will be dissecting the sociotechnical factors behind the state of this relationship and some potential areas of improvement.

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