

# **How Using Online Platforms Affects Diagnostic Decision-Making Process in Healthcare Systems**

**Keivan Sadeghzadeh, Yasaman Asayesh, and Linda Nguyen**

Department of Decision and Information Sciences

Charlton College of Business

University of Massachusetts Dartmouth

Dartmouth, MA 02747, USA

[ksadeghzadeh@umassd.edu](mailto:ksadeghzadeh@umassd.edu), [yasayesh@umassd.edu](mailto:yasayesh@umassd.edu), [lnguyen6@umassd.edu](mailto:lnguyen6@umassd.edu)

## **Abstract**

Online platforms are encompassing different aspects of people's lives including healthcare services. By using advanced technology and online platforms, access to information and reaching out to people across the world has never been easier. Utilizing online communities to gather inputs, ideas and even investments helps users to reach conclusive results faster and cheaper. As well as the vast activities that can be performed with digital technology, many people seek healthcare advice and help through online platforms. In healthcare systems, one of the most important aspects of the decision-making process is the interaction between doctor and patient. The quality of this interaction has a direct and significant impact on medical, clinical or pharmaceutical decisions and treatments. This paper systematically reviews the application of digital and information technology in diagnostic decision-making process in healthcare systems through using online platforms such as social media.

## **Keywords**

Online Platforms, Doctor-Patient Interaction, Healthcare Systems, Diagnostic and Decision-Making.

## **1. Introduction**

In the healthcare industry, there have been many improvements and supports that digital and information technology can be utilized for. Nevertheless, there are still areas that need to be refined since healthcare is a complex system. An area that calls to need more development is the decision-making process.

Many online platforms help patients to communicate with other patients who experience the same or similar hospital procedures to understand their current condition and figure out their actual costs for the treatment (Wicks et al., 2010). Many pieces of online advice are unprofessional but useful to connect with like-minded people across the world. Especially, tips and counseling are becoming commonly sought out through the web for quick medications for specific symptoms. These unsupervised advice and support from family, friends, and strangers, with or without medical knowledge or experience, have changed the dynamic of the interactions between doctors and patients.

Not only patients use online platforms for finding the best treatment plans, surgeons and healthcare service costs but also doctors use these online platforms to diagnose diseases by obtaining multiple opinions from different specialists (McComb and Bond, 2015). In many cases, this method helps (i) to remove the probability of misdiagnosis, and (ii) to improve the diagnostics by collecting information from different patients with similar diseases, symptoms, or treatments. In addition, because of increasing patient demands, state governments, insurance companies, and healthcare providers report prices of healthcare services through online platforms but this information do not provide consumers with the most prominent data such as actual out-of-pocket cost for medical care (Meisel et al., 2015). Hence, investigation in the association between information technologies and healthcare decision-making process have a diverse aspects.

The objective of this paper is to investigate the association between digital and information technologies (i.e. online platforms, social media, etc.) and healthcare diagnostic decision-making process with a focus on patients' perception about quality and accuracy of exchanged medical information to understand where, if plausible, should these platforms be superintended to increase the advantages and circumvent the unprecedented side effects.

## **2. Doctor-Patient Interaction**

Many People visit doctors to consult and find a treatment when they feel unwell. A patient is a person receiving or registered to receive medical treatment while a doctor is a qualified practitioner that delivers medical treatment. The patient is dependent on the doctor for help; however, the doctor depends on the patient to administer the treatment. The quality of the relationship relies on the connection and willingness of both parties to acknowledge some unspoken terms. With the vagueness and complexity of human’s interactions and the process of healthcare, the types of relationships between the doctor and patient are not absolute. Many studies have contributed to the importance of breaking down the elements of the doctor and patient interaction (Johnston, 2019). A commonly used model presents types of healthcare relationships with respect to doctor and patient as (Turabian, 2018; Kaba and Sooriakumaran, 2007):

- Active-Passivity: Participation of patient in the decision-making is little and doctor is in total control of the situation – father and child relationship.
- Guidance Cooperation: Patient cooperates in the decision-making and treatment process – father and teenage son relationship.
- Mutual Participation: Patient and doctor discuss the disease situation and have a balanced and independent relationship.

The outcome of the communication is reliant on the perspective of the patients and their feelings on the experience. Negative experience is defined in relation to disrespect, time constraints, dominance of biomedical culture and helplessness whereas positive experience is described in relation to technical skills, relational skills, and tailored approach to care (Rocque and Leanza, 2015). These receivable actions influence the outcome of communication and the dynamic of the relationship between doctor and patient. The categorized outcomes are listed in Table 1.

Table 1. Outcomes of Satisfactory and Unsatisfactory Communication (Rocque and Leanza, 2015).

Satisfactory Communication	Unsatisfactory Communication
Foster Relationship	Relational Issues and Distrust
Higher Quality of Care	Lower Quality of Care
Patient Autonomy Enhanced and Adherence	Overuse or Underuse of Resources
Satisfaction	Dissatisfaction and Nonadherence

Adherence to treatment, the quality of treatment, patients’ satisfaction and patients’ experience all are dependent on the success of doctor-patient communication. High-quality communication is crucial because it is the step in which first data gathering from patient starts and it has to lead to the creation of a caring relationship, an accurate diagnosis, a helpful therapeutic instructions and more importantly better physical outcomes (Stewart, 1995, Bredart et al., 2005, van Zanten et al., 2007). With the improvements in technology, the interactions between the doctor and patient have been changed drastically. Many doctors are treating patients using the internet or web-based interactions and in many hospitals this is becoming a normal scenario but not many unsure about the effectiveness of these methods compared to the face-to-face interactions (Tates et al., 2017). Understanding the desirable and undesirable outcomes can be essential to constructing a formula that best optimizes the dynamic relationship between doctor and patient especially through an online platform.

## **3. Diagnostic Decision-Making Process in Healthcare Systems**

The most crucial and impactful part of the doctor and patient interaction is the decision-making process. The first stage of this process is diagnosis, and it is the most important decision made about the patient, because it will be the foundation for the following interactions with the patient and determine the treatment plan (Graber, 2012). The decision thereon afterward will be reliant on quality of service and efficient execution.

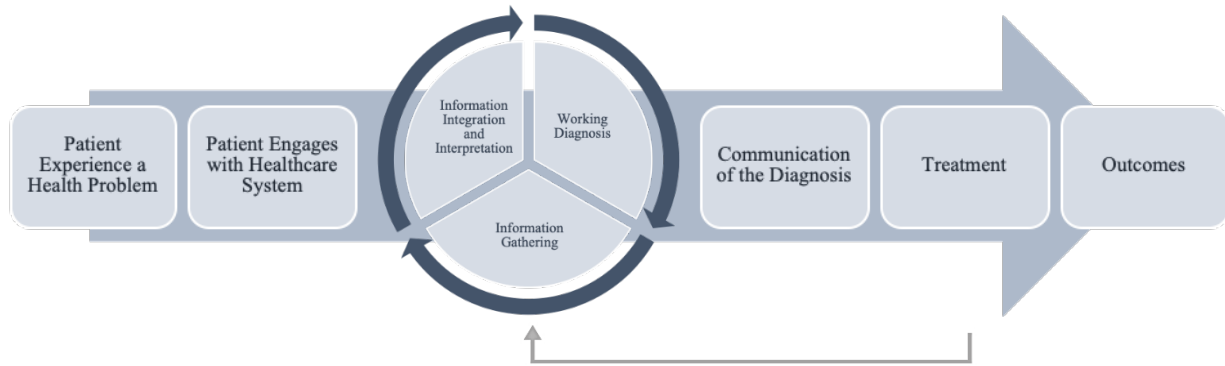


Figure 1. The Conceptual Schema of the Diagnostic Stage (Reprinted From Balogh, 2015).

Many factors come into play within the diagnosis stage. Considering the different methods, tools, and devices that are used to help analyze physical and mental conditions, highly skilled trained clinicians are needed. Other non-tangible components of diagnostic that need to be considered are limited time as well as limited evidence or information on the situation. Therefore, the healthcare career revolving around the decision-making process where its diagnosis stage must undergo multiple years of training and experience (Grote and Berens, 2020). The explanation of the decision-making and diagnosis stage is generalized for the purpose of this paper.

The most complicated part of the diagnosis stage – as the first step in healthcare decision-making process – is that it varies between patient to patient. One situation will never be the same as another due to doctor’s experience, level of injury, patient’s level of communication and etc. Figure 1 depicts a conceptual schema of this stage (Balogh et al., 2015).

The diagnosis stage starts with the patient identifying a health problem. If they choose to engage with a healthcare system, the stage begins with information gathering, integrating and interpreting the information, and figuring out the appropriate diagnosis methods. The diagnosis can further be done through interviews, physical exams, consulting other clinicians, and diagnostic tests to understand the extent of the patient’s health problem(s). Although Figure 1 seems sequential, much of the information gathering and interpreting will happen throughout the process and can be employed at different times and orders. This is a continuous flow of generating a list of potential problems and solutions that can be associated and relevant to the patient (Balogh et al., 2015).

The healthcare providers’ ability to decide the diagnosis method and respond to the situation are affected by external and internal factors that contribute to the decision-making process, such as patient’s ethics, culture, socioeconomic status, family and friends, social engagement, clinical condition and etc. (Guler et al., 2015). Taking these factors into consideration, there are options to how to execute the diagnosis stage and decision-making process through the level of data available.

#### 4. Type and Level of Decision-Making In Healthcare Systems

Table 2 categorizes the type of decision-making that needs to be utilized in straightforward, low complexity, moderate complexity, and high complexity (CMS, 2020).

Table 2. Types of Decision-Making in Healthcare Systems (CMS, 2020).

Type of Decision-Making	Number of Diagnostic and Management Options	Amount or Complexity of Data Reviewed	Risk of Complications, Morbidity, and Mortality
Straightforward	Minimal	Minimal Or None	Minimal
Low Complexity	Limited	Limited	Minimal
Moderate Complexity	Multiple	Moderate	Moderate
High Complexity	Extensive	Extensive	High

There are four main levels of decision-making in the delivery of healthcare (Torrance, 1986; Sutherland and Till, 1993). These four levels require different instruments that are summarized in Table 3 (Guler et al., 2015). This table provides details in measurements associated with the level of decision-making and instruments used.

Even experienced clinicians and doctors can struggle with the decision-making process when data and information are insufficient, therefore understanding the challenge of adjusting to patient preferences can be difficult to measure and complex but useful in the long-run (Guler et al., 2015).

Table 3. Levels of Decision-Making in Healthcare Systems (Guler et al., 2015).

Level of Decision-Making	Measurement
Meta Level	Choices are made between various fields of public expenditure such as healthcare versus defense or education.
Macro Level	Preferences for allocation and utilization of resources. This level uses instruments that allow policy-makers to allocate funds for different healthcare programs without considering the implications for individual patients.
Meso Level	Optimal treatment policy for groups of patients with similar clinical characteristics. This level uses instruments that allow clinicians to select treatments that have been shown to provide the best overall outcome for groups of patients affected by the same disease. At this level, individual's preferences are not integrated in the decision-making process.
Micro Level	Patient's own preferences. This level uses instruments that allow clinicians to select among several potential treatments to match patients' expectations. The micro level aims at capturing individual's preferences for competing therapeutic strategies.

## 5. Online Platforms and Decision-Making

Online platforms are digital services that facilitates interactions between two or more independent individual or institutional users who interact through the service via the internet including marketplaces, search engines, social media, creative content outlets, app stores, communications services, payment systems, gig-economy, etc. (OECD, 2019). In order to facilitate these interactions between users and collect interactions data, all online platforms use information and communication technologies.

For many decades online platforms were used only by companies in order to find suitable markets for their products but recently the public is also using these digital technologies to obtain information for their needs in the form of reviews and forums. By using publicly available online platforms, anyone can find the best of anything in any category ranging from clothes, restaurants, home appliances to automobiles by checking the reviews and forums about that product which are contributed by the public. The usage of online platforms in healthcare started in 2006 but rapidly spread and now it has footprints from patient-caregiver connectivity to contagious surveillance (Hoffmann, 2015).

The success of online platforms and social media in better decision-making or generating a preferable relationship model between the doctor and patient is under debate. Although we are not aware of all the consequences, we were drifting slowly toward using on-line platforms in all aspects of our lives. Despite the seemingly simple and, perhaps, logical appearance of this onlinization trend, unprecedented impacts of online platforms on patients' perception of online information should be investigated.

Most of the interactions between doctors and patients are assumed to be face-to-face. However, information technology has improved the quality of healthcare by using electronic health records and web messaging to communicate with their patients through online platforms. The opportunities that the digital age offers are endless, and so strategies are being conjured to determine the best approach to different situations, because more or less patients are reliant on technology. Therefore, more compliant to communicate digitally especially for certain health conditions that could make transportation undesirable. Correctly implementing technology tailored to the patient's preferences will be beneficial without triggering concerns on privacy and reduction of face-to-face clinical time (Liao et al., 2016).

Although there are many upsides to information technology, digitalization has brought many concerns and issues that cannot be overlooked. The online platforms can strain the doctor and patient communication if not utilized correctly. There may be an increase in dissatisfaction and there may be perceptions of invasion of privacy in the mass data-sharing hub. Frustrations can come from unmet expectations and inefficiently managing and misinterpreting the information communicated. Technology could be a distraction if not taken seriously.

Addressing the situation is the most profound way to implement information technology in healthcare by using online platforms because the degrees of the need for digital technology depends on the specific patients and clinical scenarios. Some scenarios will be deemed inappropriate to the doctor or patient in the decision-making process. One of these appropriate scenarios that allow doctors and patients to utilize the help from the internet is social media.

## **5.1 Crowdsourcing**

As technology advances, the methods of using online platforms have improved dramatically. Crowdsourcing, defined as obtaining required services, ideas or information from a large group of people through internet, is found to be useful in eight areas of healthcare including diagnosis, surveillance, nutrition, public health and environment, education, genetics, psychology, and general medicine (Wazny, 2018). Do so, the most pertinent and prevalent searched topics are specific disease or medical problem, certain medical treatment or procedure, doctors or other, health professionals, hospitals or other medical facilities, health insurance, food safety, drug safety, environmental health hazards, pregnancy and childbirth, memory loss, dementia or Alzheimer's, medical test results, chronic pain, long-term care, end-of-life decisions. Creating an interface where information can be easily accessible and recorded within the patient's permission and the comfortability to track the previous interactions is addressed briefly. Many online crowdsourcing platforms like PatientsLikeMe.com helps patients to communicate with other patients who experience the same or similar hospital procedures to understand their current condition and figure out their actual costs for the treatment (Wicks et al, 2010). In websites like Medibid.com patients can post their requests along with which they can find optimum and doctors can post their bids matching customers' requirements. Websites like Inspire.com helps patients to decide on treatment plans based on the information from other patients who suffered from more than 10 types of cancer. This website will help people to connect to people from different communities to communicate with each other and share information that will help patients to decide their course of action for their treatment plans. Although crowdsourcing is not very well tested, majority of people use crowdsourcing for their healthcare needs (Wu et al., 2016). Though crowdsourcing is relatively a new term, it will not only go for a giant leap in healthcare and help patients in many ways ranging from deciding the right hospital, obtaining treatment plans, choosing the most affordable hospitals and finding the out of pocket costs but also it helps physicians to find the right diagnosis, improving the treatment plans, surveillance among other things. Crowdsourcing could be a powerful influence in choosing the correct physicians and hospitals along with finding the insurance costs and even bidding for the right doctor.

## **5.2 Social Media**

Social media plays a major role in crowdsourcing as it is easily reaching public without any marketing and they are reliable than most of the other ways of obtaining public opinion. In this domain, social media is a great tool for sharing patients' knowledge and experiences in order to help other patients to make the right decisions (Pathak and Sit, 2018). Because of the tenfold increase in social media usage than the last decade, it is one of the easiest ways to attract crowdsourcing and obtain the required information (Perrin, 2015). According to studies, the major factor for people to decide on physicians, surgeons, hospitals, insurance companies, and treatment plans depend on the testimonials from other patients followed by reputation, number of years in practice, and prices (Harris, 2018, Wu and Hultman, 2016).

More than 70% of all internet users are active in social media platforms. Patients' decisions are directly influenced by information on social media. 81% of Americans search for health-related information at least once a year and more than half of the people search on a weekly (18%) or monthly (34%) basis. In 2012, 59% of US adults looked online for health information where this number increased to 73% in 2018 based on a survey of 1700 American adults (Weber Shandwick, 2018). Figure 2 depicts the types of health-related information that Americans looked in 2018.

According to *PWC HRI Social Media Consumer Survey* in 2012, more than 70% of consumers expect that a healthcare company should respond within a day or less when they request information, an appointment, or follow up through social media. 45% of consumers believe their decisions to seek a second opinion would be affected by social media information where more than 40% reported this information found through social media has impact on the way they

coped with a chronic condition or their approach to diet and exercise. This number for choosing a specific hospital or medical facility is 41%, choosing a specific doctor is 41%, and taking certain medications is 34%. Undergoing a specific procedure or test is recorded for 33% of consumers, and choosing a health insurance plan is the reason for 32% of consumers. Therefore, social media could be a powerful influence in choosing the healthcare service. Figure 3 presents the healthcare consumer viewing health information through social media (PWC, 2012).

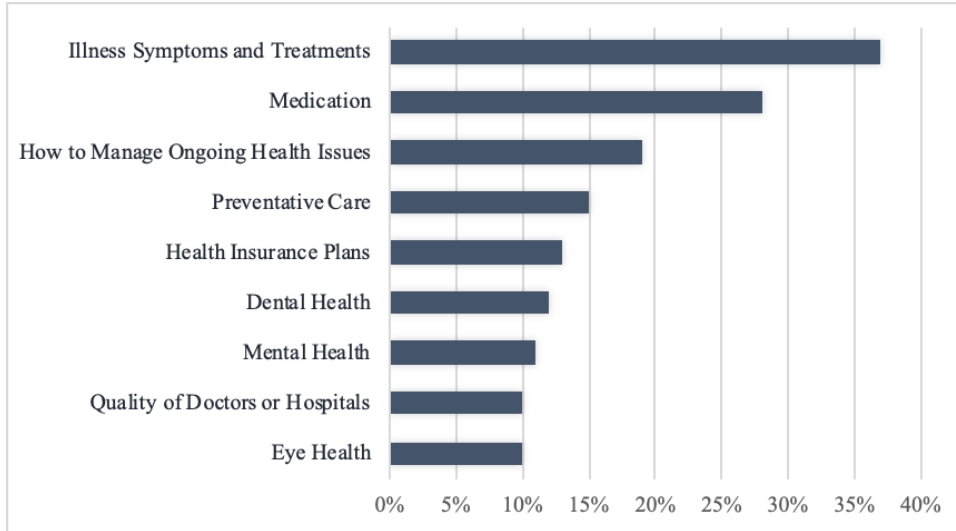


Figure 2. Types of Health-Related Information Americans Searched (Adopted from Weber Shandwick, 2018).

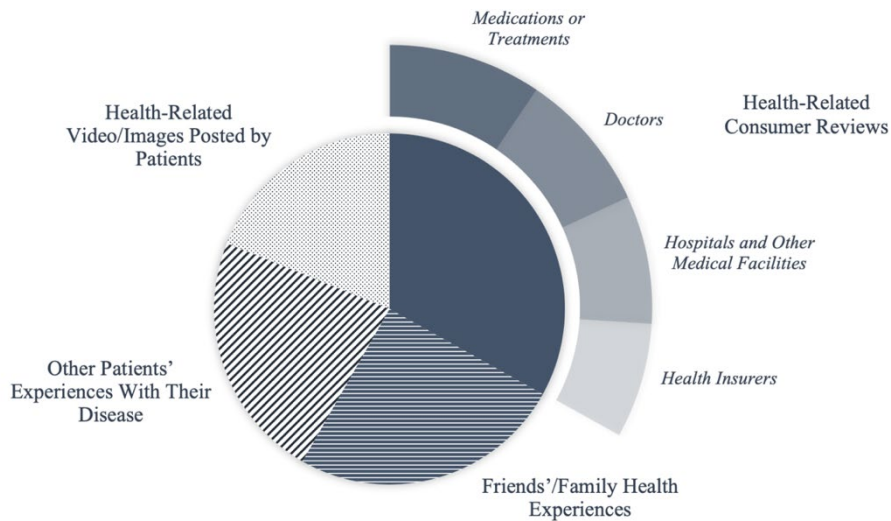


Figure 3. Healthcare Consumer Viewing Health Information Through Social Media (Adopted from PWC Health Research Institute Report, 2012).

On the other hand, as it is shown in Figure 4, a survey of 1060 people regarding the likelihood of trust and sharing of available online information shows that people tend to trust and share healthcare providers' (doctors and hospitals) information more than business-based corporations (insurances, drug companies). Among all, trusting doctors' information has the highest percentage due to the human-based relationship between doctors and patients. This result is an optimistic indicator of doctor-patient relationship role in using online platforms. This means there is not a one-way impact in using online platforms. Hence, we can be sanguine about the prevalence of gaining more supervised and scientific contents rather than misguidance through random inaccurate information.

Online communication is important and essential to cultivate a relationship that will boost the ability for a smoother transition of the healthcare processes. A patient-centered care model helps patients understand the healthcare process by involving them into the steps in order to reach improved communication and health outcomes ultimately. In this model, the patient, clinicians, and healthcare system dynamically interact through (i) accessible, well-organized, responsive healthcare system, (ii) informed, activated, participatory patient and family, and (iii) patient-centered clinicians with good communication skills (Epstein and Street, 2007). Getting more engagement with the patients can boost decision-making and improve health outcomes through the experience of trust and safety. The value of the patient-centered shared decision-making strategy has been addressed in many studies.

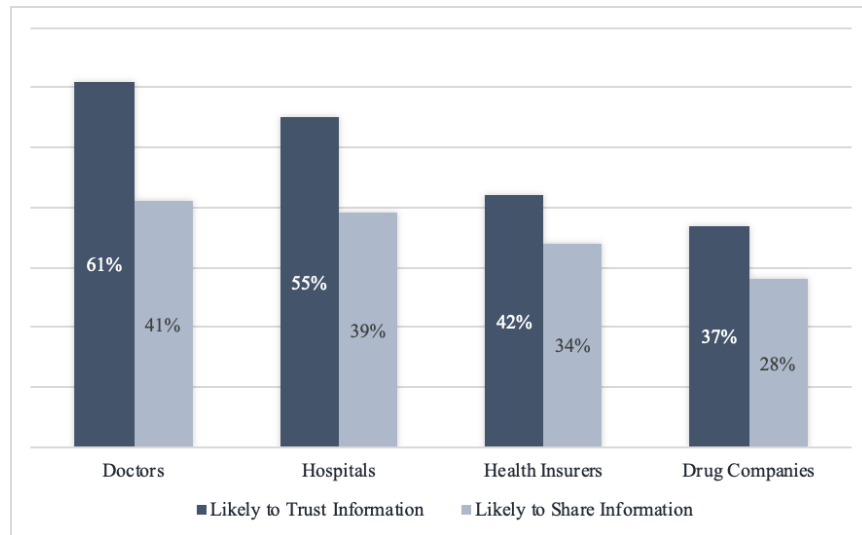


Figure 4. Likelihood to Trust or Share Information via Social Media (Adopted from *PWC Health Research Institute Report*, 2012).

## 6. Conclusion

Information technology tools such as online platforms, specifically social media, has become an effective factor on doctor-patient interactions and a powerful tool in healthcare diagnostic decision-making processes. In this study the application of social media to the patient's experience within doctor decision-making is analyzed. Although there is an enormous concern about the quality of medical information with which people are inundated every day, it seems that people tend to trust more in scientific-based sources such as information provided by doctors and healthcare providers. Moreover, implementation of online platforms such as social media can thoroughly connect patients and doctors in a more informal way that would cultivate trust and understanding, built a more efficient doctor-patient relationship and finally improve the process of decision-making. However, the negative effects of misuse of online platforms is not venial and further studies are needed on how to optimize online platforms effects by creating, supervising and monitoring the framework that trustworthy and accurate medical information is disseminated.

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## **Biographies**

**Keivan Sadeghzadeh** is an Assistant Professor of Operations Management in the Charlton College of Business at the University of Massachusetts Dartmouth. Prior to this position, he was a Postdoctoral Researcher at Massachusetts Institute of Technology (MIT) Sloan School of Management. He received his PhD in Industrial Engineering from Northeastern University. He holds an MS in Systems and Operations Management and earned a BS in Mechanical Engineering. His primary research is focused on developing interpretable machine learning models and applying advanced decision analytics for performing operational risk and reliability analysis with applications to challenging and complex healthcare problems. He is interested in the application of statistics and knowledge discovery systems, as they pertain to operations, particularly in healthcare systems. Dr. Sadeghzadeh has several years of extensive experience in supervising and leading successful research teams and industry projects as an accomplished and professional scientist with insights into research, science, and business. He is the recipient of the *American Statistical Association Natrella Scholarship Award*. Dr. Sadeghzadeh is an active reviewer for international conferences and journals such as Decision Sciences, Production and Operations Management, Academy of Management, International Journal of Production Research, and IEEE Transactions on Reliability. He is a member of ASA, ASQ, DSI, IISE, INFORMS, and POMS.

**Yasaman Asayesh** is a graduate student in Healthcare Management program at the University of Massachusetts Dartmouth, Charlton College of business. She earned a BS in Biomedical Engineering from Amirkabir University of Technology (Tehran Polytechnic) and an MBA from The University of Tehran. She gained seven years of job experience mostly as an application and product specialist in healthcare industry, creating business plans and market development strategies for endoscopy wards and minimally invasive procedures. With a multidisciplinary background in both engineering and management, her research interests include operation management, decision making, data analytics, and artificial intelligence in healthcare systems. She is a member of ASCM/APICS , IEOM and INFORMS.

**Linda S. Nguyen** graduated from the University of Massachusetts Dartmouth with a BS in Operations Management and Management of Information Systems while maintaining her outstanding academic standing within the Honors College. She has an interest in data analysis and attending competitions from hackathons to datathons, won Best Visualization at ASA Datafest, and rewarded being an unexpected anticipated runner up for the Brown University Datathon. She is currently an assistant business manager at a lawyer's firm and is a member of Beta Gamma Sigma, NEHES, ASA and Golden Key International Honour Society.