BARRIERS AND FACILITATORS TO AUTOMATED PATIENT SELF-SCHEDULING FOR HEALTH CARE ORGANIZATIONS: SCOPING REVIEW, CONSENSUS FROM A DELPHI PANEL OF KEY STAKEHOLDERS, AND EXPLORATORY CASE STUDY

by

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ABSTRACT

Appointment management in the outpatient setting is important for provider organizations as waits and delays lead to poor outcomes and inefficiencies. Automated patient self-scheduling of outpatient appointments has demonstrable advantages for organizations in the form of patients' arrival rates, labor savings, patient satisfaction, and more. Despite evidence of the potential benefits of self-scheduling, organizational uptake of self-scheduling in health care has been limited. The goal of this dissertation is to identify the barriers and facilitators to self-scheduling for provider organizations through a scoping review of the literature, a consensus from a Delphi panel of stakeholders from US academic health systems, and an exploratory case study of a large medical practice in the US that implemented automated self-scheduling. Results demonstrated that self-scheduling initiatives have increased over time, indicating the broadening appeal of self-scheduling. Offering convenience for patients is the leading enabler for organizations to implement the technology, signaling that provider organizations may now recognize the need for innovation. For provider organizations, the relative advantage of self-scheduling over the traditional method of scheduling is a facilitator; barriers include complexity and providers' resistance. There is evidence of digital inequities based on identifying users, with relatively less use by Medicaid beneficiaries. Provider organizations may benefit from thoughtful, intentional strategies to identify, diagnose, and address barriers and facilitators. Additional research is warranted to understand actionable steps to address the impediments and promoters of the technology.

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TABLE OF CONTENTS

TABLES

FIGURES

INTRODUCTION

Appointment management in the outpatient setting is vital for health care organizations as waits and delays lead to poor outcomes and inefficiencies. For example, according to the Patient Access Collaborative (Patient Access Collaborative, 2021), the median new patient lag time for an outpatient encounter in the United States is 16.35 days, while the median utilization rate of appointment slots is only 73.6%. Lengthy waits adversely impact patients who are queued for appointments during which problems may worsen and satisfaction may decline. If a health care organization does not effectively distribute appointment slots, the result is poor resource utilization that may limits access for patients.

In *Crossing the Quality Chasm: A New Health System for the 21st Century*, the Institute of Medicine (IOM) established six aims for advancing health care quality, including improving visit timeliness (Institute of Medicine (US) Committee on Quality of Health Care in America, 2001). Despite this goal of timely access to care, the topic of visit timeliness is one of the least evaluated and understood aspects of care delivery. There is little assessment of what drives care timeliness and potential approaches for improving this dimension of care (Institute of Medicine, 2015). Appointment wait times and scheduling difficulties may negatively affect patient satisfaction (Habibi et al., 2018; Kerwin & Madison, 2002; Leddy et al., 2003), patient expectations (Glogovac et al., 2020; Marco et al., 2021), access to care (Waller et al., 2012), patient safety (Murray & Berwick, 2003), and health care utilization and organizational reputation (Institute of Medicine, 2015). Timely access has a broader impact on the delivery of cost-effective health care (Rust et al., 2008) and individuals' well-being (Bhandari & Snowdon, 2012). Schneider et al. demonstrated the association between patient experience and perceptions of the quality of care (Schneider et al., 2001).

Timely access to care is crucial for patients. Myriad studies about the techniques for effectively designing outpatient schedules for optimal use have been published, dating back to the mid-20th century (Bailey, 1952). Reviews of the literature on outpatient scheduling methodologies can be found in Cayirli and Veral (Cayirli & Veral, 2003), Gupta and Denton (Gupta & Denton, 2008), and Ahmadi-Javid et al. (Ahmadi-Javid et al., 2017). This research contributes to the design of appointment management systems by identifying factors that impact performance and modeling, however, the body of literature about scheduling design focused on elements of internal construction, not methods of offering them to patients for booking. The body of literature about appointment design may be applied to self-scheduling, thereby increasing its value.

Outside of health care, other industries with perishable resources have addressed timeliness to service by engaging customers through self-service. Transportation and hospitality, as examples, have experienced improvements in operations (Jansson, 1966; Mak et al., 2014), profitability (Shugan & Xie, 2000), customer loyalty (Chiu, 2009), and customer wait times (Robinson & Chen, 2011) via the execution of consumer-based reservation systems. Today, consumers make reservations for services from a multitude of non-healthcare businesses. The adoption of technologies aimed to address administrative issues, such as self-scheduling of appointments in healthcare, however, has trailed other industries.

Literature addressing patient self-scheduling spans several decades; the evolution of the technology is evident in the body of published research. Articles expressing the benefits of the new offering of self-scheduling were coupled with stories of adoption early in the technology's life cycle (Craig, 2007; J. P. Friedman, 2004). Researchers reported on the technology's potential impact on patient quality (Kerwin & Madison, 2002) and satisfaction (Versel, 2004), as well as its capability to improve scheduling methods (Pruhs et al., 2004). A multinational survey in Europe

in 2005 and again in 2007 concluded that self-scheduling had the highest utility for the components offered by automated communications in health care (Santana et al., 2010).

BENEFITS

Automated self-scheduling may benefit health care organizations and patients; there is evidence to support these advantages. There may be a different impact on lower and middle-income countries (LMICs) based on historical methods of obtaining appointments. The COVID-19 pandemic may have affected the uptake of the intervention as health care organizations respond to patients' expectations.

Health Care Organizations. There is evidence that automated self-scheduling provides value to health care organizations; more specifically, the intervention advantages provider organizations such as hospitals, medical practices, and other health care delivery systems. Researchers have identified the advantages of automated patient self-scheduling for provider organizations in the form of labor savings (J. P. Friedman, 2004; Idowu et al., 2014; R. Jones et al., 2010; Lee et al., 2020; Zhao et al., 2017); information transparency (S.-C. Chen et al., 2013; M. Zhang et al., 2014); cost reduction (Kamo et al., 2017); cycle time (Mendoza et al., 2020); patient satisfaction (Gupta & Denton, 2008; Volk et al., 2020); patient accountability (Xie et al., 2020); patient information (Sherly et al., 2016); patient time-savings (Judson et al., 2020); physician punctuality (Habibi et al., 2019); patient loyalty (S.-C. Chen et al., 2013); and patient attendance (Craig, 2007; Paré et al., 2014; Parmar et al., 2009; Siddiqui & Rashid, 2013; Yanovsky & Das, 2020). Reducing missed appointments increases health care organizations' efficiency and effective allocation of resources (Gao et al., 2019). Automated self-scheduling eliminates the barriers inherent in the fixed capacity of telephone lines and scheduling staff (Tang et al., 2014).

Patients' Expectations. Health care organizations are faced with the need to increase convenience to accommodate patients' changing expectations (Berry et al., 2014; Tuzovic & Kuppelwieser, 2016). Self-scheduling can offer the convenience patients seek (H. H. Chang & Chang, 2008; Kurtzman et al., 2018). Countries including Nigeria (Idowu et al., 2014); India (Sherly et al., 2016); Taiwan (Lee et al., 2020); Philippines (Mendoza et al., 2020); Iraq and the Kurdistan region (Hussein et al., 2019) have determined that self-scheduling may serve as a better alternative to obtaining an appointment as opposed to the traditional process to access outpatient care by physically standing in line. In Iran (Samadbeik et al., 2018) and China (Cao et al., 2011; Yu et al., 2013; M. Zhang et al., 2014), hospitals are mandated to provide the capability, in part to address the problems associated with the in-person queues for appointments. Estonia built the functionality into its national system (Yeh & Saltman, 2019).

Evidence from LMICs. In low and middle-income countries (LMICs), persons may not realize the benefits of self-scheduling, where patients report negative experiences associated with poor communication, short visits, and lengthy waits. (Kruk et al., 2018). Patients may not have confidence in the health care system. Self-scheduling may be perceived as elusive or ineffective in this context. Patients may prefer to physically wait in line because access through a queue is observable, as compared to the relative invisibility inherent to a computer-based system. This perception, therefore, may not be a malfunction of the technological solution. The barrier may be a result of the LMICs' failure to address socioeconomic disparities that have eroded patients' confidence in the health care system (Malhotra & Do, 2013). Trust in the health care system may be a barrier to automated self-scheduling in LMICs, a barrier that may not similarly exist in countries with stable and reliable health care systems.

Impact of COVID. Health care organizations may have an acute need to consider self-scheduling at present, as patient expectations are rising in concert with the proliferation of technology that focuses on convenience, access, and experience. The COVID-19 pandemic exacerbated challenges related to the management of outpatient visit scheduling in the US. The pandemic altered the delivery of outpatient encounters in 2020; with the implementation of physical distancing requirements, stay-at-home orders, and pervasive fear, patient visits in the outpatient setting in the US dipped to their lowest level at a 58% cumulative visit deficit in March 2020, with a portion of in-person visits quickly replaced by virtual encounters (Mehrotra et al., 2020).

As the delivery of outpatient visits increasingly converted to telemedicine during the pandemic, the means of reserving appointments in the US remained largely in the traditional format of synchronous telephone communication between patients and personnel. Health systems suffered financial losses and staff members were released from employment (American Hospital Association, 2020; Bureau of Labor Statistics (US), 2020). The financial and staffing crisis created challenges in effectively managing the traditional telephone-based scheduling workflow because of an insufficient labor pool. According to the Patient Access Collaborative (Patient Access Collaborative, 2021), the median personnel cost per appointment-related telephone call was $4.29 and 37.2% of patients with scheduled appointments did not arrive in the slot reserved for them. A provider organization in the US that schedules one million appointments in the outpatient enterprise, for example, would therefore spend more than $4 million on the labor to schedule appointments for which 628,000 patients arrive. The labor cost associated with the appointment scheduling for the consumed visits is, in the example, approximately $6.80 per arrived patient. In

a case study, Kamo and colleagues (Kamo et al., 2017), approximated $5 per call being saved at their health care organization every time an appointment was self-scheduled.

ADOPTION

Despite evidence of the potential benefits of self-scheduling, organizational uptake of self-scheduling in health care has been limited. The lack of adoption may result from myriad factors: organizational factors such as absent financial incentives (Ghafur & Schneider, 2019); cost (Bernstein et al., 2007); leadership (Ingebrigtsen et al., 2014); and policy and regulations (Jacob et al., 2020) examined in other studies of technology adoption by health care organizations may be considerations. Further, organizations may react to patient hesitancy. Despite the infusion of technology in daily living, patients have exhibited reluctance in automation in health care, citing concerns about accuracy, security, and the lack of empathy compared to human interactions (Nadarzynski et al., 2019).

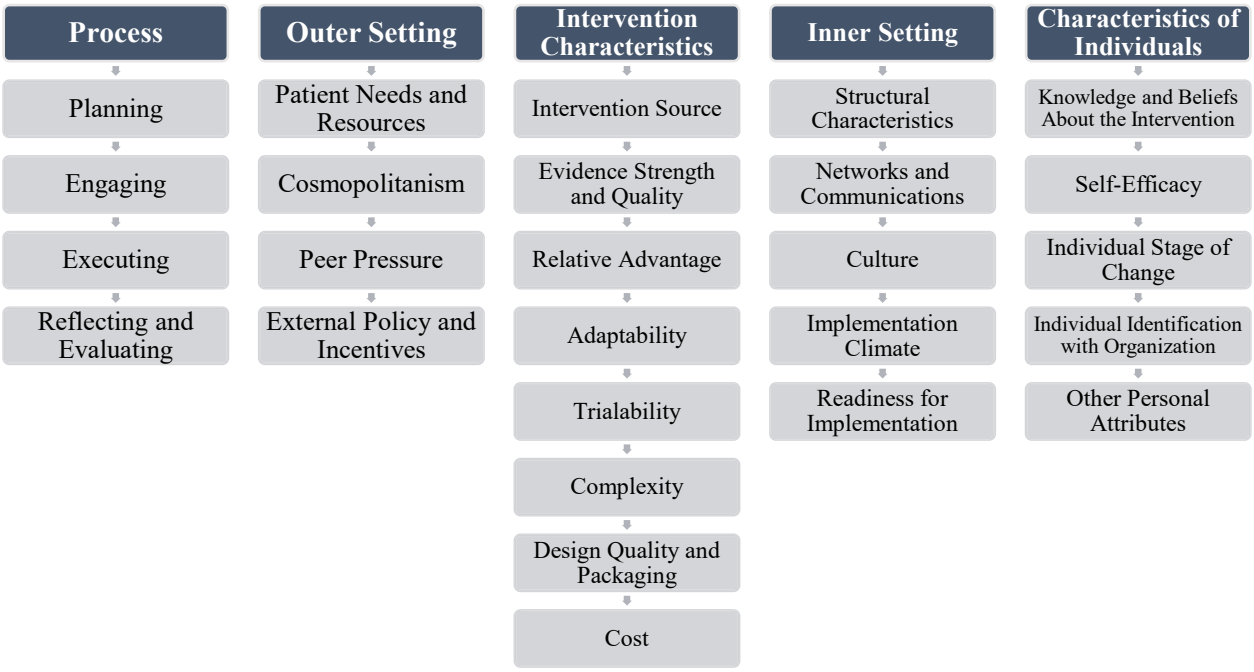
The lack of adoption of self-scheduling may be a result of the unique challenges experienced in health care, information asymmetry between the consumer and provider, consumers' emotional vulnerability, and consumers' desire to achieve good personal health (Dobele & Lindgreen, 2011). Unlike other industries with perishable inventory, health care organizations cannot price discriminate because the offering represents a cultural expectation that authors Wen et al. (Wen et al., 2020) describe as "social fairness."

Organizational barriers to the adoption of automated self-scheduling were evident early in the technology's formulation. A practicing physician, informaticist, and the founder of a software company that offered self-scheduling products, Dr. Jonathan Teich, revealed to the *American Medical News* in 2004: "Before you can successfully implement self-scheduling, you have to implement 'Mabel.' Mabel is the generic scheduling administrator who has been working for Dr.

Smith for 35 years, and knows a thousand nuances and idiosyncrasies and preferences that have been silently established over the years… Unfortunately for the computer world, it's extremely difficult to find out what Mabel really knows, let alone try and put it into an algorithm" (Versel, 2004). Research has demonstrated physician preference is a key factor in scheduling (Wang & Gupta, 2011), with physicians' expressing a fear of losing control (Farr, 2000; Lowes, 2006; Riddell, 2012). In a systematic review of self-scheduling, Zhao and colleagues (Zhao et al., 2017) acknowledged the relative inflexibility of "Mabel" as a factor in discouraging providers from adopting self-scheduling, in addition to providers' concerns about system abuse, patient harm, loss of control, and cost. Consequently, these barriers may limit uptake.

CONCEPTUAL FRAMEWORK

The findings of this dissertation are presented in alignment with the Consolidated Framework for Implementation Research (CFIR). The conceptual framework guided the research by constructing a standard, evidence-based path of identifying, organizing, and communicating the dimensions of barriers and facilitators across organizations to advance the opportunity for industry adoption of the study's findings. The framework is comprehensive, synthesizing essential constructs from 29 organizational and implementation science theories; standard terminology promotes generalizability across disciplines (Damschroder et al., 2009). The Consolidated Framework for Implementation Research is presented in Figure 1.



Source: CFIR (CFIR Guide, 2021)

Figure 1: CFIR Domains and Constructs

SUMMARY OF CHAPTERS

Automated self-scheduling may benefit health care organizations. Opportunities exist to improve patient satisfaction, appointment waits and delays, and the wasteful use of providers' time. There is evidence that key barriers to implementing the technology have existed since the introduction of the technology; the impediments may remain today. Little is understood about the organizational-level barriers and facilitators related to a technology that may solve important challenges faced by provider organizations.

The goal of this dissertation was to acknowledge, identify, and assess the organizational-level barriers and facilitators to the implementation of automated self-scheduling in the outpatient enterprise. An implementation framework (CFIR) was applied to guide, organize, and present the dissertation. The research was accomplished by a literature review of the intervention determinants

in the international setting, a qualitative research study to gather consensus from US stakeholders, and a case study of a US-based provider organization that implemented the intervention. The research presented herein is organized into three chapters: the scoping review, Delphi panel of key stakeholders, and an exploratory case study.

The scoping review in Chapter One aimed to examine the barriers and facilitators for health care organizations throughout the world to implement self-scheduling. The scoping review was selected as the research method to synthesize a broad and heterogeneous range of literature. The intervention was defined: automated self-scheduling is the real-time, synchronous booking, and automated fulfillment of appointments by patients online or via a smartphone application for themselves. The study provided clarity about the field of evidence by cataloging the barriers and facilitators to self-scheduling for health care organizations. The literature offered evidence of the existence and advantages of automated self-scheduling. The uptake of the intervention was evident over time, yet remained low. National policy, competition, and the organizations' response to patients' needs and technology access were determinants of implementation. The focus of the literature, however, was on the characteristics of the intervention. The research identified a gap in the literature regarding broader evidence of internal and external factors that may help health care organizations interested in the intervention.

The aim of the Delphi panel of key stakeholders in Chapter Two was to construct a consensus statement of experts in the US regarding organizational-level barriers and facilitators. Fifty-three expert panelists representing 41 academic health systems participated in three rounds of surveys to reach a consensus on the organizational-level barriers and facilitators to the implementation of self-scheduling. Seven facilitators and three barriers were identified and ranked by the Delphi panel. The most prominent determinant was the organization's prioritization of

patient needs related to convenience. A culture to improve access and the relative advantage of using self-scheduling as compared to the call center (at which agents facilitate the scheduling process over the telephone) followed as the second and third facilitators, respectively. Barriers reflected the challenges related to the complexity of scheduling, providers' resistance based on specialization, and the variability of the current scheduling process. The leading determinants did not include the processes, costs, or available resources associated with the intervention.

The case study in Chapter Three aimed to assess the uptake, users' characteristics, outcomes, and determinants of automated self-scheduling in an organization that deployed the intervention. The case study was performed at a 400-provider, predominantly primary care medical practice affiliated with an academic health system. Uptake increased over time. The analysis demonstrated usage by younger, commercially insured patients. Digital inequity was evident based on lower usage by Medicaid patients. An administrative requirement associated with the technology may have adversely affected this cohort of patients. The advantage of a lower missed appointment rate associated with self-scheduling users was demonstrated. A higher cancellation rate was evident and requires attention. The study demonstrated complexity as an organizational-level barrier to the intervention, which may be associated with providers' fears and concerns about patient care. Intervention traits that may address complexity were compiled. The relative advantage of automated self-scheduling compared to the agent-based scheduling process was named as an important implementation facilitator, yet could not be quantified.

Together, these three papers form a collected work of organizational-level barriers and facilitators to automated self-scheduling. A summary of the research was provided as the final chapter. The research identified the need for additional exploration of implementation factors, including the impactful influence of the external environment, the prominent role of responding to

patients' expectations, and the relative advantage of self-scheduling over the incumbent scheduling process that relies on manual labor. Automated self-scheduling is a technology geared to improve an administrative task, yet the intervention represents a multi-faceted workflow that involves providers and patients. A holistic approach to determinants – and the linkages between them – is therefore crucial. Improvements in the intervention related to complexity are urgently needed. Diffusion of the technology is possible, but attention is required. Thus, engaging providers is recommended.

The research findings may benefit health care organizations considering strategies to deploy patient self-scheduling as a consumer reservation system. By identifying barriers and facilitators to automated self-scheduling, the research may assist provider organizations seeking solutions to the management of the outpatient enterprise, ultimately benefiting patients through improved satisfaction, reduced disruptions and administrative burden for the organization, and enhanced utilization of providers' time.

CHAPTER ONE: SCOPING REVIEW

BACKGROUND

Automated patient self-scheduling of outpatient appointments has demonstrable advantages in the form of patients' arrival rates, labor savings, patient satisfaction, and more. Despite evidence of the potential benefits of self-scheduling, organizational uptake of self-scheduling in health care has been limited. In this scoping review, I conducted a comprehensive assessment of existing evidence regarding the reasons that organizational uptake of automated self-scheduling is low.

The questions posed for the scoping review were: What are the barriers and facilitators to self-scheduling for provider organizations? What are the gaps in the literature regarding barriers and facilitators? The selection of the scoping review technique was made based on having a broad research question, the pursuit of identifying content without judging the quality of the material, and the intention to perform a qualitative synthesis (Armstrong et al., 2011). The proliferation of articles published since a systematic review examining self-scheduling was conducted in 2017 (Zhao et al., 2017) may reflect the evolution of technological solutions, the adoption of technology, and patients' changing expectations regarding convenience. This scoping review aimed to examine the barriers and facilitators for health care organizations throughout the world to implement self-scheduling.

METHODS

Arksey and O'Malley (Arksey & O'Malley, 2005) issued a methodical framework for rigor and transparency in scoping reviews. Arksey and O'Malley's five-step process for scoping reviews was deployed for this study: 1) identification of the research question, 2) identification of relevant

studies, 3) study selection, 4) charting the data, and 5) collating, summarizing, and reporting the results.

Step 1: Identification of the Research Question

The following research questions guided the review: What are the barriers and facilitators to provider organizations' uptake of automated patient self-scheduling? What are the gaps in the literature regarding barriers and facilitators?

Step 2: Identification of Relevant Studies

The scoping review was performed by searching electronic databases according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses Searches (PRISMA-S) guidelines (Rethlefsen et al., 2021). The databases used were PubMed, CINAHL, Business Source Ultimate, and Scopus. The search strategy was developed with the assistance of an informationist specializing in reviews. The search terms for self-scheduling were developed by researching titles, keywords, and commonly used phrases in the relevant literature. The search strategy was initiated on PubMed using combinations and word variations of key terms for the scoping review: self-scheduling, automated scheduling, Web-based scheduling, e-appointments, online scheduling, Internet scheduling, and self-serve scheduling. Additional terms were integrated using keywords from articles of interest retrieved from a preliminary search on PubMed. The implementation-related search string was adapted from a study of barriers and facilitators (Stone et al., 2018). The initial search strategy was referenced against the published systematic review by Zhao et al (Zhao et al., 2017) to identify supplementary terms. The search strategies used in the databases are reported in Appendix 1.

Step 3: Study Selection

Records were selected if they involved automated patient self-scheduling. Articles were determined eligible for inclusion if they discussed the use of self-scheduling by health care organizations. Peer-reviewed, primary research, reviews, and original studies described in editorials in peer-reviewed journals that focused on patient self-scheduling were included. Only articles published in English were included. No geographical boundaries were imposed, thereby incorporating literature about the topic from health care organizations across the globe.

For the review, the definition of self-scheduling involves the real-time, synchronous booking, and automated fulfillment of appointments by patients online or via a smartphone application for themselves. Self-scheduling does not include an appointment by a physician on behalf of a patient, as in the case of a primary care physician scheduling an appointment with a specialist for the patient. Further, the definition excludes asynchronous scheduling transactions that feature the patient initiating a request for an appointment but not booking it automatically, or the slot being appointed automatically through a waitlist feature (Chung et al., 2020), or a reschedule option (X. Zhang et al., 2015). Patients scheduled as research subjects are not included. Finally, the definition excludes the self-scheduling of providers and staff for work shifts.

Step 4: Charting the Data

A data extraction Excel spreadsheet was developed to systematically record details of the articles. Charted data (Appendix 2) included article characteristics (author, year, and country), intervention characteristics (standalone or component, source, introduction, description of design, and identified need), research design, setting, intervention measure (s) assessing the impact of self-scheduling, and main result (s). Relevant results were extracted from the result section of each article.

Step 5: Collating, Summarizing, and Reporting the Results

The scoping review was undertaken to determine the information that is available from existing literature regarding the barriers and facilitators to health care organizations' uptake of self-scheduling and to identify gaps in the current body of knowledge regarding self-scheduling. This scoping review was organized and presented in alignment with the Consolidated Framework for Implementation Research (CFIR). The conceptual framework guided the research by constructing a standard, evidence-based path of identifying, organizing, and communicating the dimensions of barriers and facilitators across organizations to advance the opportunity for the adoption of the study's findings. The framework is comprehensive, synthesizing essential constructs from 29 organizational, and implementation science theories. Standard terminology promotes generalizability across disciplines (Damschroder et al., 2009). Thematic analysis was performed to convey the main findings of the material.

RESULTS

Articles were identified, screened, and selected for further review in two stages by the author: titles and abstracts, followed by full text. Titles and abstracts were reviewed for 1,726 records; 1,604 records were excluded. The full text was retrieved and reviewed for 122 articles. Ninety-two were excluded because they failed to meet the inclusion criteria. A total of 30 studies were included in this scoping review. Figure 2 outlines the selection methodology via a PRISMA diagram.

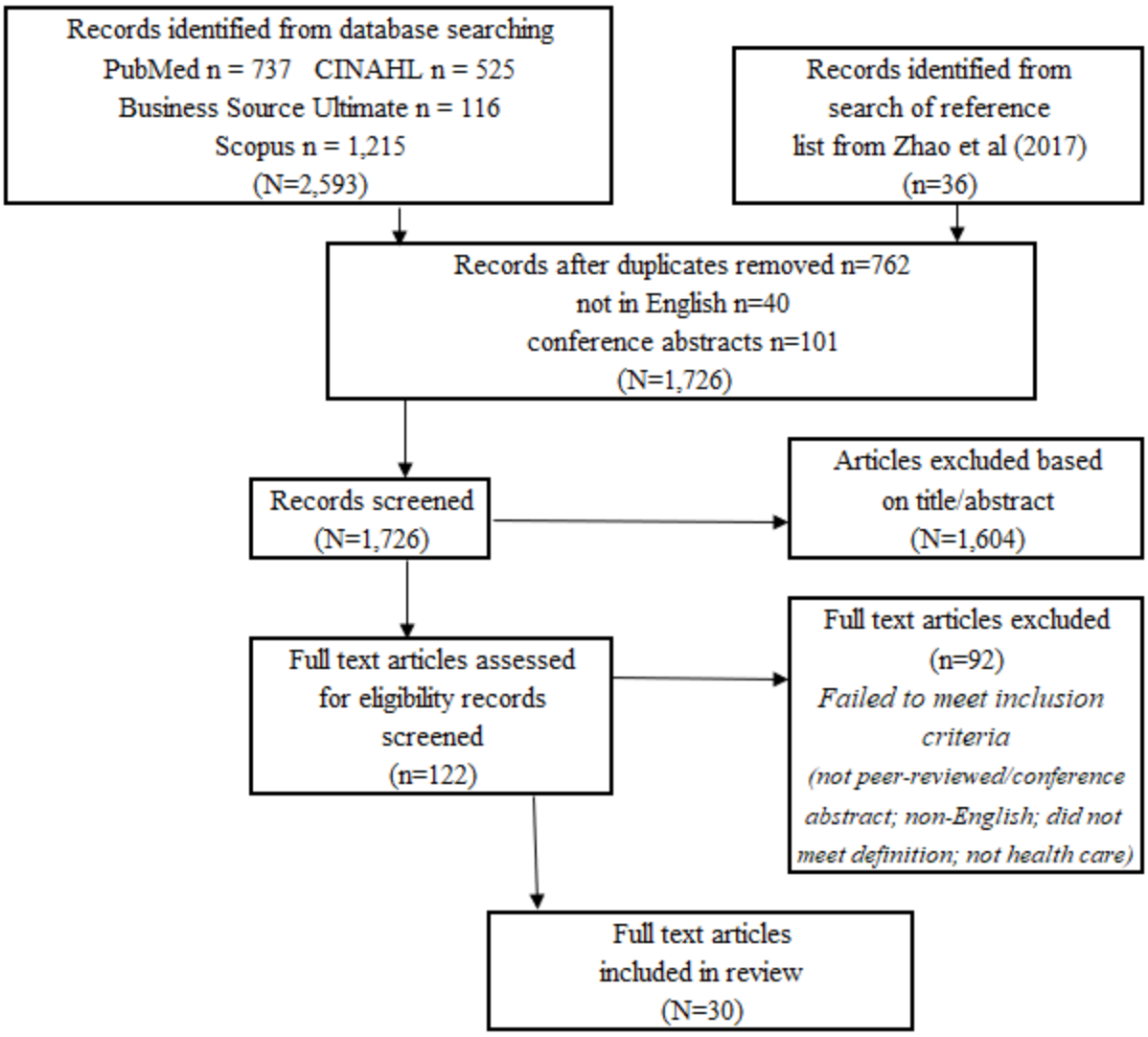


Figure 2. PRISMA Diagram

The countries that were covered in the review include United States (Craig, 2007; Denizard-Thompson et al., 2011; J. P. Friedman, 2004; Ganguli et al., 2020; Judson et al., 2020; Kurtzman et al., 2018; Siddiqui & Rashid, 2013; Volk et al., 2020; Xie et al., 2020; Yanovsky & Das, 2020), Taiwan (H. H. Chang & Chang, 2008; S.-C. Chen et al., 2013; Lee et al., 2020), Great Britain (R. Jones et al., 2010; Parmar et al., 2009; Ryan et al., 2019, 2020), China (Cao et al., 2011; P. Chen et al., 2017; M. Zhang et al., 2014), Australia (X. Zhang et al., 2012, 2015, 2014), Canada (Paré et al., 2014), Iran (Habibi et al., 2018, 2019; Samadbeik et al., 2018), and the Philippines

(Mendoza et al., 2020). Another article included seven countries in Europe (Santana et al., 2010). (Table 1 presents the countries and count of articles from each.)

Table 1. Articles by Country

Setting	
Country	Count
United States	10
Taiwan	3
Great Britain	4
China	3
Australia	3
Canada	1
Iran	3
Philippines	1
Europe	1
Other (review)	1
TOTAL	**30**

The first article retrieved for the scoping study was published in 2004 (J. P. Friedman, 2004), with three or fewer articles each year through 2019. In 2020, eight articles (Ganguli et al., 2020; Judson et al., 2020; Lee et al., 2020; Mendoza et al., 2020; Ryan et al., 2020; Volk et al., 2020; Xie et al., 2020; Yanovsky & Das, 2020) featuring barriers and facilitators to automated self-scheduling were published. Figure 3 displays the count of articles by year of publication.

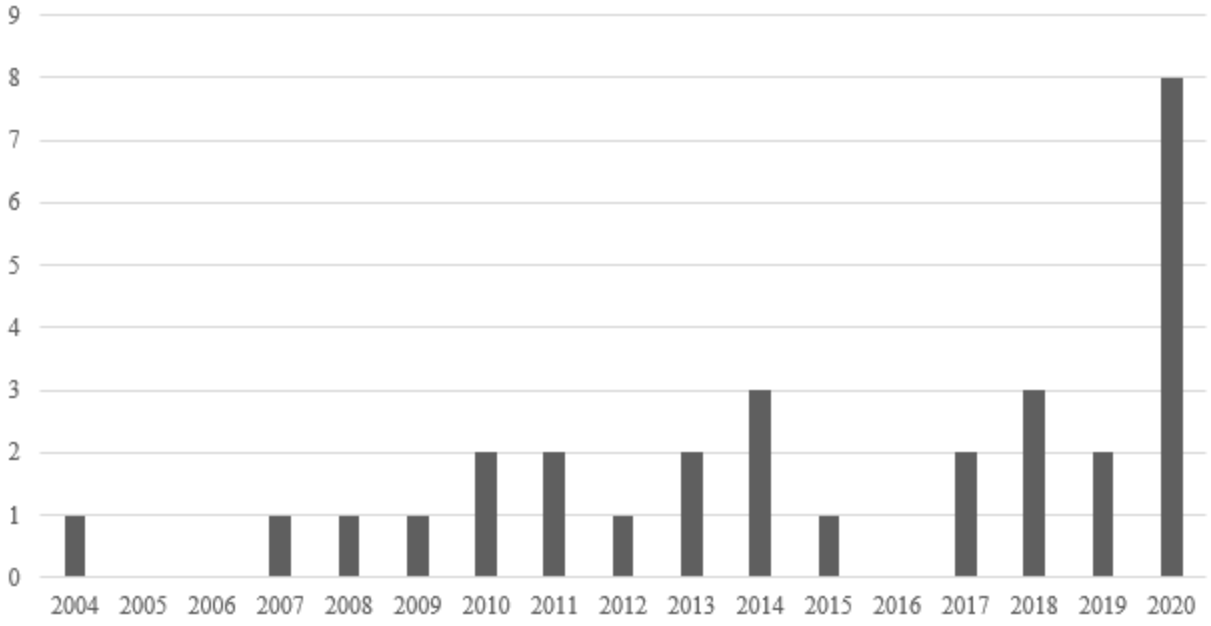


Figure 3. Articles by Year of Publication

Guided by the implementation framework, I analyzed the five domains of automated self-scheduling among the included studies: intervention characteristics, outer setting, inner setting, characteristics of individuals, and process.

Intervention Characteristics

Intervention Source. Four articles reported internal solutions for self-scheduling (Ganguli et al., 2020; Judson et al., 2020; Volk et al., 2020; Yanovsky & Das, 2020). These studies were joined by another two that were launched with a combination of internal and external resources (J. P. Friedman, 2004; R. Jones et al., 2010). Six articles featured externally created interventions, four of which were created by a third party (Kurtzman et al., 2018; Paré et al., 2014; Ryan et al., 2020; Siddiqui & Rashid, 2013), one by the first author (X. Zhang et al., 2012), and one by unknown (Parmar et al., 2009). The remaining articles did not elucidate the source of the intervention (Cao et al., 2011; H. H. Chang & Chang, 2008; S.-C. Chen et al., 2013; Habibi et al.,

2018, 2019; Lee et al., 2020; Mendoza et al., 2020; Samadbeik et al., 2018; Santana et al., 2010; M. Zhang et al., 2014; X. Zhang et al., 2015, 2014), did not feature a specific intervention (P. Chen et al., 2017; Craig, 2007; Denizard-Thompson et al., 2011; Ryan et al., 2019; Xie et al., 2020), or represented the systematic review (Zhao et al., 2017).

Nine articles (Cao et al., 2011; J. P. Friedman, 2004; Habibi et al., 2019; R. Jones et al., 2010; Lee et al., 2020; Mendoza et al., 2020; Parmar et al., 2009; Ryan et al., 2020; X. Zhang et al., 2015), provided some level of description of the intervention, with four providing only limited characteristics (Lee et al., 2020; Mendoza et al., 2020; Parmar et al., 2009; Ryan et al., 2020). Most articles (Cao et al., 2011; S.-C. Chen et al., 2013; Craig, 2007; J. P. Friedman, 2004; Ganguli et al., 2020; Habibi et al., 2018, 2019; Kurtzman et al., 2018; Mendoza et al., 2020; Paré et al., 2014; Parmar et al., 2009; Samadbeik et al., 2018; Siddiqui & Rashid, 2013; Yanovsky & Das, 2020; M. Zhang et al., 2014; X. Zhang et al., 2012, 2015, 2014) featured the self-scheduling intervention as a standalone service, with a minority (H. H. Chang & Chang, 2008; P. Chen et al., 2017; Damschroder et al., 2009; Denizard-Thompson et al., 2011; R. Jones et al., 2010; Judson et al., 2020; Lee et al., 2020; Ryan et al., 2020; Santana et al., 2010; Volk et al., 2020; Xie et al., 2020) including self-scheduling as a component of a larger technology offering. The systematic review by Zhao et al. (Zhao et al., 2017) discussed the intervention in both contexts. The literature included limited information about the source of the intervention. Sources were not cited as a barrier or facilitator to implementation. This is evidenced by the volume of unknown and undescribed sources. The internally developed solutions, all reported in 2020, may imply that access for health care organizations to implement self-scheduling solutions has become easier.

Evidence Strength and Quality. The measurement of outcomes was a prominent element of the articles; however, the strength and quality of evidence was not presented as a determinant

in the implementation of self-scheduling by the organization. The systematic review concluded that researchers had demonstrated reduced no-shows, decreased staff labor, decreased waiting times, and improved patient satisfaction (Zhao et al., 2017). The evidence was not measured consistently. For example, a case study documented a specific reduction of costs: a decrease of 25% of staff dedicated to scheduling, with an annual savings of $170,000 to the organization (J. P. Friedman, 2004). The specifics about the roles of personnel, their compensation, or other factors was not reported. Another study (Ryan et al., 2020) reported the intervention's "anticipated" results. The literature did not provide a robust body of evidence that may have influenced the implementation of self-scheduling by health care organizations.

Relative Advantage. The advantages of the intervention compared to the alternative solution of telephone-based scheduling were discussed in the literature. The comparison was made to the option of using the telephone to schedule an appointment (P. Chen et al., 2017; Craig, 2007; Denizard-Thompson et al., 2011; J. P. Friedman, 2004; Ganguli et al., 2020; R. Jones et al., 2010; Judson et al., 2020; Ryan et al., 2019, 2020; Volk et al., 2020; Yanovsky & Das, 2020; X. Zhang et al., 2015, 2014). The literature revealed the relative advantage of self-scheduling being the use of the solution at any hour to overcome patient barriers to scheduling (Ryan et al., 2019, 2020). Findings reported that 34 (X. Zhang et al., 2015), 46 (Yanovsky & Das, 2020), and 51 (R. Jones et al., 2010) percent of appointments were self-scheduled outside of office hours. After-hours access to the health care organization allowed early morning appointments to be filled, thus benefiting the organization (Craig, 2007). In their findings, studies detailed an improved use of staff resources (P. Chen et al., 2017; J. P. Friedman, 2004; Ganguli et al., 2020; Volk et al., 2020; Yanovsky & Das, 2020; X. Zhang et al., 2015, 2014) and time savings for the patient (Denizard-Thompson et al., 2011; R. Jones et al., 2010; Judson et al., 2020). Volk and colleagues (Volk et

al., 2020) hypothesized that self-scheduling offered patients an enhanced sense of anonymity and a diminished sense of responsibility, as compared to the traditional telephone-based scheduling process.

Adaptability and *Trialability*. Faced with a surge of patient demand due to the COVID-19 pandemic, an academic health system introduced the intervention "immediately", integrating revisions in real-time based on feedback from nurses and physicians (Judson et al., 2020). Although not explicitly stated, this implementation provided evidence of adaptability and trialability as determinants that promoted the implementation of self-scheduling. The importance of allowing each practice the latitude to adapt a strategy for marketing the intervention was observed; by the second year of adoption in one health care organization, 20% of all slots were booked via self-scheduling (Paré et al., 2014). Without any promotion, researchers in Great Britain observed an increase from 3.5% to 10% of appointments self-scheduled within just 10 months; patients cited the Google search engine as their mechanism of the technology discovery (R. Jones et al., 2010). The rapidity of implementation, customization of the solution, and patient usage without promotion provided evidence of the determinants of adaptability and trialability to facilitate implementation.

Complexity. Although most of the studies did not describe the intervention, several studies made note of elements that revealed the complexity of the intervention. Slot unavailability was cited as the reason that one-third of patients who attempted to self-schedule could not (Paré et al., 2014).[1] Similar conclusions were drawn by another study, which reported inflexible and insufficient time slots as the two main deterrents for patients attempting to self-schedule (X. Zhang

[1] *As gleaned from the author's professional experience, scheduling systems are designed to allow health care organizations to allocate slot availability by method; for self-scheduling systems, the organization can determine the quantity of available slots for self-scheduling, in addition to the other methods of distribution.*

et al., 2015). Ease of use was confirmed to be a key attribute of self-scheduling from the perspective of the patient (S.-C. Chen et al., 2013; Xie et al., 2020). These findings contrast to Lee and colleagues (Lee et al., 2020), who concluded that ease of use was not a factor; instead, the researchers ascertained that performance expectancy was the determinant. Craig (Craig, 2007) recognized the challenges of replicating "the intuition of…experienced scheduling staff," however, concluded that the flexibility of self-scheduling could be leveraged. Solutions that were bundled with triage featured an algorithm that diverted patients with acute symptoms from the self-scheduling option (R. Jones et al., 2010; Judson et al., 2020). One health care organization reviewed appointments manually for safety and appropriateness (Ganguli et al., 2020). The complexity of the intervention was reported to be important to manage, suggesting that it was a determinant of implementation success for health care organizations.

Design Quality and Packaging. The literature did not elaborate on the design quality and packaging of the intervention, except for sample screenshots of the patient interface presented by Friedman (J. P. Friedman, 2004), X. Zhang et al. (X. Zhang et al., 2015), and Habibi et al. (Habibi et al., 2019). Studies raised the importance of integration with other information technology systems (Craig, 2007; Paré et al., 2014). One of the studies pointed out a pre-determined lack of publicity: a health care organization during the pandemic avoided promotion to prevent artificially inducing additional patient demand (Judson et al., 2020). A key factor in adoption was the organization making patients aware of the intervention (Paré et al., 2014; X. Zhang et al., 2015, 2014). Brochures made available to patients were reported to be ineffective in raising awareness (Paré et al., 2014; X. Zhang et al., 2012, 2014). Health care organizations documented the importance of presenting the intervention to patients using communication methods planned

locally, as varying methods of approach may affect outcomes (Denizard-Thompson et al., 2011; Ganguli et al., 2020; Ryan et al., 2020).

Cost. Information about the cost of the intervention to the health care organization was not addressed in the literature, although Zhao and colleagues (Zhao et al., 2017) revealed the concern about cost as a barrier for physicians' interest in offering self-scheduling. One author, a practicing physician, funded the intervention personally after his organization declined to dedicate capital to fund the project (J. P. Friedman, 2004). No detail was provided on the amount spent on the intervention. For self-scheduling cervical cancer screening, Ryan et al. (Ryan et al., 2020) referenced a free app available to download through Great Britain's National Health Service (NHS) apps library, and also documented that the practices participating in the study focused on cervical screening appointments were compensated. The amount of the payment was not revealed.

Outer Setting

Patient Needs and Resources. Change management is more effective in organizations that are patient-centered (Shortell et al., 2004). The extent to which the needs are understood and prioritized is an important factor in implementation. Concerns about automated self-scheduling were raised in the literature regarding possible inequities in care access for Medicaid recipients in the US due to lower provider count and longer distance to appointments based on the offerings via the third-party self-scheduling platforms (Kurtzman et al., 2018). Further, there was evidence of reduced usage rates of self-scheduling by Medicaid patients as compared to non-Medicaid patients (Ganguli et al., 2020; Judson et al., 2020). Research provided evidence of diminished access to self-scheduling for rural patients, as compared to urban (Siddiqui & Rashid, 2013). Low socioeconomic status was a driver of low adoption rates (Ryan et al., 2020; X. Zhang et al., 2015), with younger (Ganguli et al., 2020; R. Jones et al., 2010; Ryan et al., 2020; Yanovsky & Das,

2020; X. Zhang et al., 2015), female (R. Jones et al., 2010; Yanovsky & Das, 2020), employed (X. Zhang et al., 2015), and patients with higher education (M. Zhang et al., 2014; X. Zhang et al., 2015) using the self-scheduling platform. Younger patients expressed the value of self-scheduling, as compared to older users (Cao et al., 2011; Habibi et al., 2019; Santana et al., 2010). One study (Parmar et al., 2009) concluded that older patients were higher users and the study focused on the self-scheduling of specialty visits following a primary care physician's referral. Patients with comorbidities were demonstrated to be higher users than other patients (Ganguli et al., 2020). Although most studies measured patient awareness, characteristics, use, and intention to use, there was a growing interest over time in accounting for patients' needs and resources.

Multiple studies identified patients' access to the Internet and computers as a potential barrier to self-scheduling use (Denizard-Thompson et al., 2011; Siddiqui & Rashid, 2013; X. Zhang et al., 2012, 2015, 2014). In a post-intervention focus group, Mendoza et al. (Mendoza et al., 2020) confirmed stakeholders' concerns about access to the Internet, noting that a barrier may be speed in that the desired slot may be taken by another patient if the bandwidth is inadequate. In the systematic review, Zhao et al. (Zhao et al., 2017) concluded patients' reluctance to adopt self-scheduling results from prior experience with the Internet and computers, as well as preferences for communication methods. Addressing people's trust to enhance utilization is essential (Xie et al., 2020). Researchers identified gaps between people's interest in the technology and its use (Santana et al., 2010; Xie et al., 2020) and awareness of the technology and its use (X. Zhang et al., 2012).

Cosmopolitanism – the extent to which an organization is networked with others external to itself and peer pressure - was not discussed in the literature.

External Policy and Incentives. The research was influenced by government policies in several studies. A federally funded initiative was established to fast-track the advancement of health information technologies across Canada (Paré et al., 2014). The British government recommended the "novel use of information technology" to meet government-mandated targets for appointment offerings (R. Jones et al., 2010). The "Choose and Book System" studied by Parmar et al. (Parmar et al., 2009) was the national electronic referral and booking service introduced in Great Britain in 2004 (and subsequently replaced). The studies by researchers from China described the Web-based appointment system (WAS), the use of which was supported by the Ministry of Health for deployment by all hospitals, as of 2009 (Cao et al., 2011; M. Zhang et al., 2014). In Australia, the National E-Health Strategy incorporated electronic communication between patients and providers (X. Zhang et al., 2015). Iran mandated that hospitals offer self-scheduling of outpatients, although compliance was limited (Samadbeik et al., 2018).

In their multi-national research in Europe, Santana et al. (Santana et al., 2010) acknowledged the importance of the prevailing legal and regulatory environment of each nation, as well as a country's health care policies and technological advances, in the adoption of self-scheduling. The influence of external policy and incentives at the national level on all aspects of eHealth has been scrutinized by researchers all over the globe (D. J. Friedman, 2006).

In addition to the impact of government, other external factors may play a role in the uptake of self-scheduling including the COVID-19 pandemic (Judson et al., 2020).

Inner Setting

Key elements of the structural characteristics of the research settings are included in Appendix 2. Among the 28 studies defining the research setting, 14 were based on outpatient

practices (Denizard-Thompson et al., 2011; J. P. Friedman, 2004; Habibi et al., 2018, 2019; R. Jones et al., 2010; Kurtzman et al., 2018; Paré et al., 2014; Parmar et al., 2009; Ryan et al., 2020; Siddiqui & Rashid, 2013; Yanovsky & Das, 2020; X. Zhang et al., 2012, 2015, 2014), 10 in medical centers (Cao et al., 2011; H. H. Chang & Chang, 2008; P. Chen et al., 2017; Ganguli et al., 2020; Judson et al., 2020; Lee et al., 2020; Mendoza et al., 2020; Samadbeik et al., 2018; Volk et al., 2020; M. Zhang et al., 2014), and four surveyed community members (S.-C. Chen et al., 2013; Ryan et al., 2019; Santana et al., 2010; Xie et al., 2020). Four of the outpatient practice studies featured settings of single specialties: two dermatology (Siddiqui & Rashid, 2013; Yanovsky & Das, 2020), one audiology (Parmar et al., 2009), and one genitourinary (R. Jones et al., 2010).

Data were not included in the studies for networks and communication, or culture. Limited information was provided about the implementation climate: Friedman (J. P. Friedman, 2004) conveyed that his physician colleagues "turned white as ghosts" at the suggestion of implementing self-scheduling, citing concerns over the intervention's potential for transparency, however, Friedman concluded that 90% of the physicians adopted the platform by the conclusion of the study. Acknowledging the reluctance to implement, Craig (Craig, 2007) advised readers that "like anything new, [the intervention] will take some getting used to." In contrast, Habibi et al. (Habibi et al., 2019) attributed the success of the self-scheduling intervention to the "interest and eagerness of the physicians…and the collaboration in setting up the system."

Habibi et al. (Habibi et al., 2018) determined the importance of rendering favorable services due to "increased competition" among health care organizations. This study was joined by nine others who also expressed the priority for change (H. H. Chang & Chang, 2008; J. P. Friedman, 2004; Judson et al., 2020; Lee et al., 2020; Mendoza et al., 2020; Samadbeik et al.,

2018; Volk et al., 2020; M. Zhang et al., 2014; X. Zhang et al., 2015). The sense of urgency increased over time. M. Zhang et al. (M. Zhang et al., 2014) reported lines forming late at night and “incidents of knife attacks at hospitals” resulting from patients’ frustrations.

The importance of problem-solving in the outpatient environment, as the face of the hospital, was emphasized (Mendoza et al., 2020). Lee et al. (Lee et al., 2020) concluded that the impression of service quality put forth by the self-scheduling technology was a key success factor for a hospital to “gain an…advantage…in an increasingly competitive healthcare market.” Volk and colleagues (Volk et al., 2020) described the current environment that led to the introduction of the intervention as "threatening the organization's reputation and financial well-being."

Readiness for implementation was not addressed in detail. One study (Habibi et al., 2019) offered mention of providing the secretaries with a tablet and training, however, no other study described the engagement of leadership, available resources, or access to knowledge and information.

Characteristics of Individuals

Limited information was provided about the individuals engaged in the self-scheduling research. A practicing physician, Friedman (J. P. Friedman, 2004), provided personal funds to develop and launch the intervention after being rejected by the organization. One study described the hesitancy of physicians, although a revision to the intervention (pop-up menus) was developed during the project to address it (Paré et al., 2014). Habibi et al. (Habibi et al., 2019) reflected on the “interest and eagerness of the physicians,” which contributed to the success of the self-scheduling intervention. The other articles in the scoping study offered little insight into the

characteristics of the individuals taking part in the intervention and whether individuals served as barriers or facilitators to adoption.

Process

Limited information was provided about the process associated with the intervention: planning, engaging, executing, reflecting, and evaluating. One study (Paré et al., 2014) detailed the importance of managing physicians' expectations about slot availability, as patients may lose interest and discontinue use of the system based on insufficient slots. Two studies postulated the importance of integrating the self-scheduling platform with the electronic medical record system (Craig, 2007; Paré et al., 2014). Volk and colleagues (Volk et al., 2020) documented a "leadership task force." The literature offered limited insight into the implementation process.

DISCUSSION

The scoping review located 30 published articles that described synchronous, automated self-scheduling tools for patient appointments.

The number of studies related to self-scheduling has increased over time. The growing volume of research reflects the popularity of this technology, signaling the broadening appeal of this scheduling mechanism. Research studies performed in the same community-based multispecialty clinic concluded a low intention to use (X. Zhang et al., 2012, 2014, 2015). However, low intention to use was not demonstrated in a study since 2015, perhaps reflecting the now-pervasive use of computers throughout the world. Researchers have studied patients' trust in the intervention as a possible barrier to the intervention (Xie et al., 2020). Further, studies have continued to identify gaps between the interest and awareness of the technology and its use (P.

Chen et al., 2017; Xie et al., 2020). Researchers have concluded that concerns about access to the Internet persist (Mendoza et al., 2020).

Lee et al. (Lee et al., 2020) determined that ease of use was no longer a factor in patients' continuous usage, concluding that the system is now "stable, reliable, and well designed." This study reflected patients' increasing comfort with technology supported by literature about other consumer-oriented offerings such as telemedicine (Andino et al., 2017; Rimmer et al., 2018). Articles aimed at optimization methods for scheduling, such as recommendations for demand matching (Wen et al., 2020), formulated on a platform of automated scheduling, a reflection of the literature that has evolved from the foundational elements of implementation to a more sophisticated approach.

Efforts to determine the effect of self-scheduling may be hindered by the incorporation of the intervention as an element in a suite of technology offered to patients. Thirty-seven percent of the literature in this scoping review (H. H. Chang & Chang, 2008; P. Chen et al., 2017; Denizard-Thompson et al., 2011; R. Jones et al., 2010; Judson et al., 2020; Lee et al., 2020; Ryan et al., 2019, 2020; Santana et al., 2010; Volk et al., 2020; Xie et al., 2020) included self-scheduling as a component of a larger technology initiative. Another intervention may be the source of organizational benefit.

The scoping study incorporated the systematic review that concluded in 2017. The systematic review (Zhao et al., 2017) reported the advantages of self-scheduling for organizations. In the literature before the systematic review, the gains were reported to benefit the organization from an internal perspective. Beginning in 2017, the advantages of self-scheduling increasingly focused on the outer setting. Organizations reacted to consumers' access to technology and the competitive environment. Furthermore, the benefits of self-scheduling from the patients'

perspective – satisfaction, time, convenience, and engagement – were increasingly named as potential advantages. Table 2 highlights the change in the focus of the literature related to the identified need for the intervention over time. This may reflect an alteration in determinants of adoption.

Table 2. The Focus of Literature Pre- and Post-2017

Identified Need		Pre-2017	2017-2020
Inner Setting	Organization's cost/staff burden	4 (S.-C. Chen et al., 2013; J. P. Friedman, 2004; X. Zhang et al., 2015, 2014)	5 (P. Chen et al., 2017; Ganguli et al., 2020; Volk et al., 2020; Xie et al., 2020; Yanovsky & Das, 2020)
	Organization's resource utilization (no-shows)	6 (H. H. Chang & Chang, 2008; Craig, 2007; Paré et al., 2014; Parmar et al., 2009; Siddiqui & Rashid, 2013; X. Zhang et al., 2015)	3 (Ganguli et al., 2020; Xie et al., 2020; Yanovsky & Das, 2020)
	Communication/information transparency	2 (S.-C. Chen et al., 2013; Santana et al., 2010)	1 (Lee et al., 2020)
	Alternative to existing scheduling method	2 (Denizard-Thompson et al., 2011; R. Jones et al., 2010)	0
	Subtotal	14	9
Outer Setting	Consumer access to technology	1 (X. Zhang et al., 2012)	1 (Habibi et al., 2019)
	Organization's need to compete	1 (H. H. Chang & Chang, 2008)	1 (Habibi et al., 2018)
	Government policy	1 (R. Jones et al., 2010)	1 (Samadbeik et al., 2018)
	Patient satisfaction	1 (H. H. Chang & Chang, 2008)	4 (Mendoza et al., 2020; Samadbeik et al., 2018; Xie et al., 2020; Yanovsky & Das, 2020)
	Patient convenience	2 (Denizard-Thompson et al., 2011; X. Zhang et al., 2014)	5 (Ganguli et al., 2020; Judson et al., 2020; Kurtzman et al., 2018; Ryan et al., 2019, 2020)
	Patient wait time	3 (Cao et al., 2011; S.-C. Chen et al., 2013; M. Zhang et al., 2014)	3 (Habibi et al., 2019; Xie et al., 2020; Yanovsky & Das, 2020)
	Patient engagement	0	1 (Xie et al., 2020)
	Subtotal	9	16
	TOTAL	**23**	**25**

Note: Count based on mentions.

Literature about the uptake of self-scheduling has focused on the end-user: patients' awareness, characteristics, use, and intention to use. Although there are references to the providers' perspective in the literature incorporated in the scoping study (Craig, 2007; J. P. Friedman, 2004; Habibi et al., 2019; Paré et al., 2014), neither the viewpoints of nor the effects on providers are examined in detail. Research on providers as resisters of other automated health care administrative tools such as telemedicine has proliferated (Choi et al., 2019). For the only study that reported measuring it, physician punctuality improved after the intervention was introduced; the researchers surmised that the enhancement resulted from the physicians' enthusiasm about the solution, as well as the reminder of the first appointment of the day transmitted via text from the self-scheduling tool (Habibi et al., 2019). While one study (Mendoza et al., 2020) concluded that they could eliminate some elements of patient dissatisfaction, the researchers determined that 40% of the dissatisfaction was a function of physicians being late and canceling clinics, albeit the intervention they launched enabled the staff to inform patients of the delays. The understanding of how the intervention interacts with providers and effectively uses the providers' time was unexplored.

In the systematic review, Zhao et al. (Zhao et al., 2017) concluded that cost, flexibility, safety, and integrity were barriers to adoption. However, the research upon which the conclusions about barriers were based drew upon the popular literature except for a 2004 case study (J. P. Friedman, 2004) and 2007 commentary (Craig, 2007), both of which noted providers' hesitancy. The organizational barriers have not been replicated in the literature since 2017 except for concerns about safety (Ganguli et al., 2020; Mendoza et al., 2020). The lack of evidence-based organizational barriers over time may mean that the obstacles have historically been organizations' perceptions of patient behavior. The reluctance of patients to adopt based on their experience with

computers reported in the systematic review (Zhao et al., 2017) was not reproduced other than the potential impact of broadband speed (Mendoza et al., 2020). Despite the lack of evidence-based organizational barriers, however, utilization of self-scheduling has continued to be reported at low rates from 2017 to 2020 (P. Chen et al., 2017; Ryan et al., 2020; Samadbeik et al., 2018).

Within the CFIR domains, much of the research to date has focused on the intervention characteristics of self-scheduling, including the intervention source, relative advantage, adaptability, trialability, complexity, design quality, and packaging. The characteristics are largely presented as effects of the intervention, not determinants of implementation. Evidence strength and quality may be enhanced through improved research methods. The discussion of the cost of the intervention and its ongoing maintenance is limited. There is no consistent approach to the study of the intervention's characteristics to inform adoption. After presenting the results of a pilot study, researchers in 2020 (Yanovsky & Das, 2020) concluded: "We hope to encourage other colleagues to explore and share their experiences…and to stimulate conversation regarding implementation of technology to improve access to care." There is evidence of a gap in the literature about barriers and facilitators for the implementation of self-scheduling.

Researchers have explored the challenges of implementing other information and communication technologies that have exhibited evidence for improving systems, processes, and outcomes in health care. Documented inner-setting obstacles to technology implementation include a culture that lacked receptivity (Police et al., 2010), an absence of trust (Schreiweis et al., 2019), a resistance to change (Kruse et al., 2016), workflow changes that were required for uptake (Castillo et al., 2010; Dutta & Hwang, 2020), and the upfront and ongoing costs of the solution (O'Donnell et al., 2018). The Systems Engineering Initiative for Patient Safety (SEIPS) 2.0 model was introduced to account for human factors systems, extending into the concepts of adaptation,

engagement, and configuration (Holden et al., 2013). The determinants identified by researchers evaluating the implementation of other technologies by health care organizations may offer insight to explore the limited uptake of self-scheduling.

OPPORTUNITIES FOR RESEARCH

Self-scheduling may offer value to health care organizations. Additional research about barriers and facilitators to implementation is warranted in key areas. Consistency of nomenclature and additional insights about determinants offer opportunities for further research.

Nomenclature. The terminology used to describe self-scheduling offered a challenge for the scoping study. The function – "scheduling" – was documented using a variety of labels, leading to a diversity of terms for the intervention under study. The definition presented for the scoping study may be considered for broad industry adoption. Standard terminology was not present in the variables identified and assessed in the research. For example, the US-based research incorporated insurance coverage, lacking direct comparison with the non-US-based research that contained findings about "social grade" (Ryan et al., 2020; X. Zhang et al., 2012) and "socio-economic status" (X. Zhang et al., 2015). Other characteristics such as age ranges varied in reporting.

Within the outer setting, researchers explored patient needs and resources in the form of gender, race, socio-economic status, education level, employment, geography, computer access, experience, and literacy. However, there was no consistent inclusion of characteristics. The non-standard approach makes it difficult to determine the barriers and facilitators for health care organizations to meet the needs of all patients. Rural populations, as an example, faced more problems with accessing care (Laditka et al., 2009; Probst et al., 2004). Consideration may be given to customized interventions for vulnerable patient populations, a topic unexplored in the literature. Otherwise, existing inequities related to the broadening gap of rural-urban disparities in

life expectancy in the US may be perpetuated (Singh & Siahpush, 2014). The lack of a standard vocabulary for the intervention and its users, uptake, evidence, and so forth, has implications for research, as well as acceptance and adoption by health care organizations. Further research is merited to address this gap.

Evaluation. Additional research about organizational factors that impact implementation is warranted. Concepts warranting further research include the inner setting and individual characteristics as contained in the Consolidated Framework for Implementation Research. Qualitative research is needed to provide context and understanding of the reasons that health care organizations face implementation barriers. For example, an obstacle may be technology support resources. A qualitative survey could explore the reasons that the automated, self-scheduling initiative was not resourced with technology support: Was there another priority for technology resources? Could technology resources with the appropriate skill set be sourced or hired? Did the resourcing lack the support of the senior technology leader? Was the technical pathway for implementation too difficult to understand? Was the project plan ineffectively constructed for implementation? These may be present in the inner setting of organizations and individuals' characteristics, constructs that are largely unexplored by research in self-scheduling.

External policy and incentives play a role in influencing self-scheduling, primarily at the country level. While researchers mention the national initiatives, no detail is provided about the initiative serving as a barrier or facilitator – or the manner by which that influence could be successful. Recognizing the importance of policies and regulations in health care technology (Lang, 2014), researchers may explore the characteristics and impact of the external policies and incentives for nations that require self-scheduling be offered by health care organizations.

The existing literature did not elucidate the factors that promote or impede the uptake of self-scheduling by health care organizations. The absence of the aggregation and examination of barriers and facilitators may reflect the complexity of self-scheduling as an intervention. As demonstrated by the literature, the intervention's characteristics, the outer and inner settings of the health care organization, individual stakeholders, and the process related to the intervention influenced the solution. Self-scheduling cannot be implemented and scaled without a comprehensive understanding of these factors. In contrast to the focus on dissecting individual components defined by CFIR, the success of implementation by a complex, adaptive health care organization is informed by the interdependence of the determinants (Sarkies et al., 2020). The exploration of enablers and obstacles through examining the contingent and reciprocal relationships within health care organizations may better illuminate implementation determinants for self-scheduling. Additional research is warranted.

LIMITATIONS

Only one author conducted the screening process, which may have introduced selection bias. The lack of a standard naming convention may have resulted in missing relevant articles for the scoping review. Given many findings from countries with a primary language other than English, including English-only articles may have missed publications that were not accessible from the databases deployed in the search strategy.

Scoping studies, by definition, do not incorporate a quality assessment of individual studies, in contrast to systematic reviews therefore it is challenging to assess whether studies produce robust findings (Arksey & O'Malley, 2005). As such, data synthesis and interpretation are limited (Armstrong et al., 2011).

Agreement on common measures to identify and monitor the impact of self-scheduling is needed. Even research that tracked the most cited advantage of reducing the no-show rate failed to accompany the discourse with a definition of said rate.

The research included in the scoping study determined evidence of an influence on patient access to appointments in the outpatient setting. The issue of patient access is multi-factorial. Multiple administrative barriers contribute to access issues in the US. The current and future shortages of physicians have been well-documented (Association of American Medical Colleges in association with HIS Markit Ltd, 2019), as well as challenges related to the insurance reimbursement system (Tice et al., 2011). Other administrative barriers determined by researchers include long appointment lead times, hours of operation, transportation issues, language barriers, and geography (Butkus et al., 2020; Kamimura et al., 2018; Stein et al., 2014; Taber et al., 2015; Woodcock et al., 2020). A causal relationship between self-scheduling solutions and performance improvement in access cannot be inferred.

CONCLUSION

The scoping review cataloged existing knowledge and identified gaps in knowledge regarding the uptake of self-scheduling by health care organizations. The intervention was defined: self-scheduling is the real-time, synchronous booking, and automated fulfillment of appointments by patients online or via a smartphone application for themselves. There was evidence of the broadening appeal and demonstrable benefits of automated self-scheduling. Uptake, however, remained low. The literature review sought to examine the barriers and facilitators to self-scheduling for health care organizations. Outer setting determinants to include national policy, competition, the response to patients' needs, and technology access played an increasing role in

influencing implementation over time. The focus of the literature was on the characteristics of the intervention.

Scholarly pursuit lacked recommendations related to the framework's inner setting, characteristics of individuals, and process as implementation factors. To inform evidence-based practice, further studies exploring various aspects of the implementation framework for self-scheduling should be conducted. Automated self-scheduling may offer a solution to health care organizations striving to positively impact access. Additional research regarding determinants of the uptake of self-scheduling by health care organizations is warranted.

CHAPTER TWO: CONSENSUS FROM A DELPHI PANEL OF KEY STAKEHOLDERS

BACKGROUND

Despite the acknowledged benefits of administrative technology in health care, adoption has been slow with implementation barriers cited as drivers of limited diffusion (Wachter, 2016). There is limited evidence regarding organizational-level barriers or facilitators. Stakeholders involved in the implementation of the intervention may have insight into determinants. The goal of the study is to develop an agreement regarding the organizational-level barriers and facilitators to the implementation of automated patient self-scheduling by health care organizations in the United States. The primary research question posed is: What is the consensus regarding the barriers and facilitators as identified by professionals employed by academic health systems engaged in the implementation of patient self-scheduling? I conducted a Delphi study of 53 expert panelists representing 41 academic health systems. The research strives to inform health care organizations considering the implementation of self-scheduling. More broadly, the study may enlighten suppliers in the creation and maintenance of the technology for provider organizations.

METHODS

Design. The consensus process was conducted using a three-stage modified Delphi technique to solicit, identify, and synthesize determinants of implementing self-scheduling technology by provider organizations. The modified Delphi technique is a structured, participatory qualitative research method (Dalkey & Helmer, 1963). Named for the Oracle at Delphi in Ancient Greece, the Delphi technique, which was originally developed by the RAND Corporation in 1948 (Dalkey & Helmer, 1963; Helmer & Rescher, 1959), involves an iterative process until consensus

is obtained. Because of the anonymity of the process, the risk of domination by one individual or coalition is avoided (Jairath & Weinstein, 1994). The Delphi method has become a popular approach to studies in health sciences research (Villiers et al., 2005) and technology foresight (Birko et al., 2015). The research method was selected as the literature lacks evidence of the determinants of implementation of the technology under study (J. Jones & Hunter, 1995). As self-scheduling represents an emerging technology for health care organizations, the opinions of stakeholders engaged as practitioners of the intervention are important (Meshkat et al., 2014; Trevelyan & Robinson, 2015).

The Delphi method can account for key informants who are geographically and professionally diverse (Jairath & Weinstein, 1994; Linstone & Turoff, 1975). Given the workload of the panelists during the COVID-19 pandemic, the Delphi technique was selected as it does not require a specific meeting time, thereby allowing a thoughtful response at a convenient time for participants (Schmidt, 1997). This research was conducted electronically, considered to yield the same results as a traditional paper-based survey (Boulkedid et al., 2011; Gill et al., 2013). Three survey rounds were employed to reach a consensus (Iqbal, 2009).

Participants. A purposeful sample was gathered from attendees to an educational event held in September 2020 that featured the implementation of automated self-scheduling solutions by academic health systems. All participants were employed by academic health systems and engaged in an automated self-scheduling initiative at their respective organizations. Snowball sampling was subsequently applied to identify additional key informants employed by their organizations with knowledge of the research subject. All participants were confirmed to be employed by an academic health system and have experience with self-scheduling technology at some stage in the implementation. Panelists with direct expertise in the implementation of the

technology were sought to ensure the validity of the consensus statement (Hasson & Keeney, 2011). The author sent a communication to seventy-four potential participants between December 16, 2020, and January 6, 2021, inviting them to participate in the study. The goal was participation from 40 to 60 participants based on other research studies that developed a consensus about a complex subject involving different stakeholders (Santaguida et al., 2018). Fifty-three agreed to participate; 41 academic health systems were represented. Panelists were from all US Census Bureau-designated regions. (Table 3 presents the count of Delphi panelists by region.) The outpatient enterprises of the academic health systems represented by the panelists ranged from 500,000 to more than four million patient encounters per annum.

Table 3. Count of Delphi Panelists by Region

Region	**Count of Panelists**
South	20
Midwest	15
West	6
Northeast	12
Total	**53**

Delphi Technique. The first Delphi survey was distributed between January 6, 2021 and February 21, 2021, via an online survey tool (SurveyMonkey®) to participants' email addresses. In Round 1, data on participant demographics were collected to include role, training, and geography. The first round featured an open-ended response to avoid introducing bias in the study (Custer et al., 1999; Sinha et al., 2011). Participants were asked: "Describe six factors that negatively shape the implementation of self-scheduling at your organization" and "Describe six factors that positively shape the implementation of self-scheduling at your organization." The responses were documented as barriers or facilitators and mapped in alignment with the

Consolidated Framework for Implementation Research (CFIR) (CFIR Guide, 2021). CFIR enabled the research to be presented in a standard, evidence-based framework, thereby facilitating the opportunity for industry adoption of the research findings (Birken et al., 2017; Damschroder et al., 2009).

The second survey was distributed between March 2, 2021 and April 4, 2021. Participants scored agreement or disagreement with statements on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree): "To what extent do you agree with this statement." The survey was self-administered, thus allowing participants to respond without risk of influencing one another's answers (Jairath & Weinstein, 1994). To describe the relative importance of each item, the median and interquartile range were calculated (J. Jones & Hunter, 1995). A consensus point of 80% was determined to prioritize the determinants (Fink et al., 1984; Lynn, 1986; Powell, 2003). During the second round of the online survey, four barriers and 11 facilitators received equal or greater than 80% of participants' votes. The 15 factors were compiled for the next round of the survey.

The third and final step of the Delphi was initiated with the panel on April 27, 2021. Responses were collected through May 26, 2021. The third and final survey included the 15 factors that received greater than 80% of participants' agreement during the second round. From these, participants were asked to rate each determinant using a Likert scale of 1 to 5 ranging from 1 (strongly disagree) to 5 (strongly agree): "To what extent do you agree with this statement:" Then, the median and interquartile range were calculated (J. Jones & Hunter, 1995). Participants were also asked to place in rank order the most important determinants of self-scheduling by health care organizations. The percent of the expert panel ranking the factor in the top 10 was also calculated to support the informants' consensus (Katcher et al., 2006). This iterative process permitted

participants to reassess their views considering the aggregated results (Khayatzadeh-Mahani et al., 2020). See Figure 4: Process of Expert Panel Consensus Using Three-Stage Modified Delphi Method.

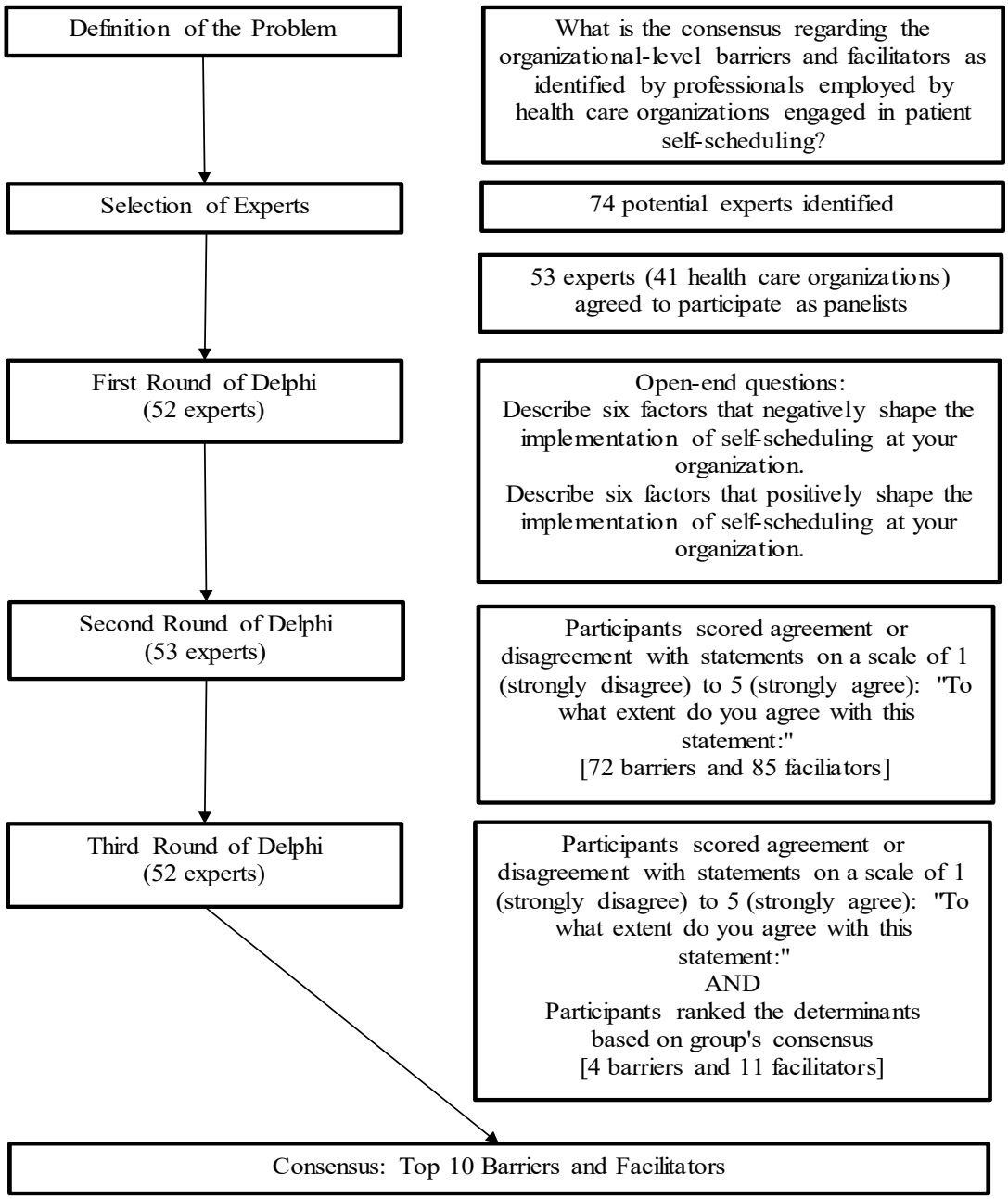


Figure 4. Process of Expert Panel Consensus Using Three-Stage Modified Delphi Method

The Institutional Review Board (IRB) determined that this research study does not qualify as human subjects research as defined by DHHS regulations 45 CFR 46.102, and therefore did not require IRB oversight. All participants provided informed consent to take part at the beginning of the process as a component of the online survey.

RESULTS

Of the 74 informants identified to take part in the research study, 53 agreed to contribute. Of the 53 who agreed to participate, 52 responded to the first round, 53 in the second round, and 52 in the third round. Up to four reminders were sent to encourage participation for each round beginning on the survey due date. The 53 participants were from 41 academic health systems and all geographic regions of the United States. The participants represented three categories of stakeholders at their respective organizations: technology professionals (n=9), management professionals (n=41), and other stakeholders in self-scheduling (n=4). Management professionals included roles such as the executive director of ambulatory operations, chief access officer, and vice president of ambulatory services. Participants could select more than one role. Eight participants were clinicians by training; 44 were not; one was unknown. All participants were individuals employed by academic health systems and experienced with a past, current, or future implementation of automated self-scheduling at their organization.

In the first round, a total of 530 factors that contributed to the implementation of self-scheduling by academic health systems were identified. Fifty-two participants cited a total of 277 factors that negatively shape the implementation of self-scheduling at their organization (barriers) and 253 positively shape the implementation of self-scheduling at their organization (facilitators). Participants submitted an average of 10.2 barriers and facilitators.

Fifty-three key informants responded to the second survey. The author categorized responses from Round 1 into 72 barriers and 85 facilitators based on CFIR. (See Appendix 3 for List of Barriers and Facilitators Identified by Delphi Panel.) The key informants were asked to rate the 157 determinants using a five-point Likert scale. Fifteen factors were identified based on a consensus of 80% and higher than 1.0 interquartile range (IQR).

The fifteen factors were presented to the expert panel in the third and final round. Fifty-two participants rank-ordered the 15 factors between 1 (most important) and 15 (least important). The participants were also asked to rate each factor using a five-point Likert scale. The top ten factors in rank order were compiled. The consensus of the panel is presented in Table 4.

Panel members gave the highest ranking to the facilitator that reflected the patients' needs: "Convenience for patients to schedule appointments via our self-scheduling solution." The determinant also had the highest consensus, median, and percentage of experts who agreed or strongly agreed. Two other facilitators topped the list: the organizations' culture to support access and the relative advantage of self-scheduling compared to the call center (at which agents facilitate the scheduling process over the telephone). Other facilitators were identified as peer pressure from competitors, the engagement of the academic health systems' executives, and the buy-in of leaders. Complexity was the primary barrier, as well as providers' resistance based on specialization and the variability of scheduling protocols.

Table 4. Delphi Panel Ranked Top 10 Barriers and Facilitators

CFIR Domain	CFIR Construct	B/F	Factor	Ranking*	Consen-sus^	Median~	Experts+
Outer Setting	Patient Needs & Resources	Facilitator	Convenience for patients to schedule appointments via our self-scheduling solution.	1	96%	5	92%
Inner Setting	Culture	Facilitator	Culture to improve access to care.	2	90%	5	88%
Intervention Characteristics	Relative Advantage	Facilitator	Advantages of patients being able to schedule, as compared to our access (call) center.	3	92%	5	74%
Intervention Characteristics	Complexity	Barrier	Scheduling workflows must be customized by specialty	4	92%	4	73%
Characteristics of Individuals	Knowledge & Beliefs about the Intervention	Barrier	Providers are resistant to self-scheduling because they [providers] are too specialized.	5	92%	4	74%
Outer Setting	Peer Pressure	Facilitator	Necessary to be competitive in our market.	6	87%	5	73%
Inner Setting	Readiness for Implementation - Leadership Engagement	Facilitator	Executive leaders are engaged in our solution.	7	87%	4	68%
Inner Setting	Readiness for Implementation - Leadership Engagement	Facilitator	Buy-in of leaders.	8	88%	5	74%

Outer Setting	Patient Needs & Resources	Facilitator	Ease of use for patients to schedule appointments via our self-scheduling solution.	9	88%	4	80%
Intervention Characteristics	Adaptability	Barrier	Variability about scheduling protocols across providers or specialties within a department.	10	90%	4.5	74%

**Ranking of 1 represents most important.*
^Consensus represented by "4" (agree) or "5" (strongly agree)
~Median rating score using five-point Likert scale (5 represents strongly agree)
+Percent of expert panel ranking factor within the top 10.
Next five most highly rated determinants: providers are concerned about the loss of control (as it related to scheduling via self-scheduling); self-scheduling is a necessity, not a luxury, in the current environment; ability to set parameters regarding appropriate visit types for our self-scheduling solution; the ability for the user to search by availability; and contactless experience for patients to schedule an appointment via our self-scheduling solution.

The expert panelists identified seven facilitators and three barriers. Four of the five domains of the Consolidated Framework for Implementation Research (CFIR) were incorporated in the ten determinants considered most important to panelists, providing evidence of the broad array of components that influence the implementation of automated self-scheduling. The CFIR domain of "process" was the only one not included in the consensus of key factors. The results of the Delphi panel confirmed myriad determinants of effective implementation of technology by health care organizations (Durlak & DuPre, 2008).

DISCUSSION

With this study, stakeholders rated the determinants of implementation for automated self-scheduling by academic health systems. The use of the modified Delphi technique successfully yielded a consensus of the top determinants of implementation to automated self-scheduling as offered by academic health systems. The development of an evidence-based consensus of

implementation determinants can be used to further the diffusion of the technology. To the best of the author's knowledge, this was the first study of its kind for the technology. The discussion of the determinants is presented in the framework of the eight CFIR constructs represented in the panelists' top-ten list.

Patient Needs and Resources. The most-cited determinant by the Delphi panel was a facilitator based on the users' needs: "Convenience for patients to schedule appointments via our self-scheduling solution." Recognition of the need for innovation is the initial stage of Rogers Diffusion of Innovation Theory (Rogers, 2003). Awareness of the users' interest was also evident in another top-ten determinant cited by the expert panel: "ease of use for patients." Implementation may have been hindered historically by a lack of attention to patients' needs. A perceived benefit for patients has led to implementation success by health care organizations (Shortell et al., 2004; Waneka & Spetz, 2010). Proactive, clear communication about the benefits of the technology for patients facilitates implementation (Studer, 2005).

Culture. Panelists documented and prioritized an organizational culture to promote access to care. There is evidence that culture affects the success of technology implementation (Harper & Utley, 2001; Ostroff et al., 2003; Police et al., 2010). The determinant tracks closely with the awareness of the need for the technology to facilitate access for patients, yet it establishes the panel's perceived priority of the organization's culture to achieve it.

Relative Advantage. Automated self-scheduling can effectively replace the same transaction over the telephone. The ranking of the relative advantage may reflect the panelists' beliefs that automated self-scheduling reduces personnel costs (Kamo et al., 2017), improves access outside of normal operating hours (Ryan et al., 2019, 2020), enhances staff utilization (P. Chen et al., 2017; J. P. Friedman, 2004; Ganguli et al., 2020; Volk et al., 2020; Yanovsky & Das,

2020; X. Zhang et al., 2015, 2014) and saves patients time (Denizard-Thompson et al., 2011; R. Jones et al., 2010; Judson et al., 2020). Regardless of the source of the advantage, the perception that such exists is an essential condition for successful technology implementation (Greenhalgh et al., 2004).

Complexity. Acknowledging and analyzing complexity to avoid inadvertent consequences is crucial to the effectiveness of an implementation (Kochevar & Yano, 2006). The ranking of this determinant as the highest barrier may reflect the panel's perception that current solutions may not adequately diagnose or address complexity. There is an adverse association between the perception of complexity and the success of an intervention (Greenhalgh et al., 2004; Gustafson et al., 2003). Automated self-scheduling is a technology purchased, built, and deployed by provider organizations. Unlike other well-studied technology solutions like electronic health record systems, however, the primary user is the patient, not the organization, provider, or employee. The implementation of a patient-facing solution adds to the complexity and may increase the challenges of implementation (Lewy, 2015).

Knowledge and Beliefs about the Intervention. Providers' resistance has been demonstrated in studies about novel health care technology (Rathert et al., 2019). Factors include fear and dissatisfaction with roles and responsibilities (Boonstra & Broekhuis, 2010), a lack of trust (Schreiweis et al., 2019), resistance to change (Kruse et al., 2016), and uncertainty (Moxey et al., 2010). Studies regarding physician receptivity, however, have centered on implementing electronic health record systems or their components. Similar barriers may exist for administrative technology. The rationale regarding "specialization" in the determinant may reveal the source of resistance, one that tracks closely with the previous barrier related to complexity.

Peer Pressure. The need for the organization to be competitive was revealed as the sixth facilitator to self-scheduling implementation. Panelists may consider self-scheduling as a requirement, rather than a luxury. This may reflect a mimetic response by health care organizations as it relates to competitors, considered to be highly influential for technology adoption (Greenhalgh et al., 2004). The competitive environment for health care organizations is significant, with mergers and acquisitions predicted to increase in the future based on policy changes and financial positions (Carroll, 2021). Reacting to peers has been demonstrated to be particularly influential for organizations that are late adopters (Walston et al., 2001).

Readiness for Implementation – Leadership Engagement. The expert panel concluded the involvement of leaders is an important facilitator. The engagement of leaders has been determined to be of significance in all facets of technology implementation in health care (Moxey et al., 2010; Yusof et al., 2007; Studer, 2005). Including two determinants related to the involvement of leaders in the top-10 list promotes its import as a facilitator of implementation. The ranking of executive leadership engagement may reveal that direct management support is not sufficient for implementation success. As self-scheduling involves stakeholders both internal and external to the organization, executive leaders may be crucial facilitators for automated self-scheduling.

Adaptability. The final top-10 determinant, "variability about scheduling protocols across providers or specialties within a department" reflects an intervention characteristic. Adaptability is recognized as a critical factor when an intervention is disseminated more broadly within an organization (Mendel et al., 2008). Ease of modification is positively correlated with an effective implementation (Gustafson et al., 2003; Leeman et al., 2007; Rogers, 2003).

The Delphi panel's consensus of key barriers and facilitators for self-scheduling offered insight into experts' perceptions of determinants of implementation success. The factors that are

absent from the list may be of equal import. “Process” was the only CFIR domain that was not represented in the consensus of determinants. According to CFIR (CFIR Guide, 2021), the domain, which incorporates engaging, executing, planning, reflecting, and evaluating, is the “single most difficult domain to define, measure, or evaluate in implementation research.” The lack of the domain being considered as a barrier or facilitator may confirm the placement of automated self-scheduling at the beginning of the technology’s life cycle.

The absence of cost (a construct within the “intervention characteristics” domain of CFIR) and available resources (a construct within “inner setting”) may indicate that financial outlay for the technological solution is not a barrier. Time, effort, and resources, however, may be needed for health care organizations to address barriers to patients’ technology acceptance, a journey which has been determined to be present, complex, and nonlinear (Loncar-Turukalo et al., 2019; Nadal et al., 2020). The digital divide has been well documented for other technologies (J. E. Chang et al., 2021; Hochmuth et al., 2021), and its absence as a barrier may reflect the stage of the technology’s life cycle. As the technology is diffused, additional research regarding possible digital inequities is warranted.

OPPORTUNITIES FOR RESEARCH

Further research is warranted to identify actions that may address the barriers and facilitators to the implementation of self-scheduling technology. The research ascertained the determinants. Provider organizations may now proactively tackle the barriers and seek facilitators to increase the diffusion of the technology. For example, organizations may survey patients regarding their expectations for a digital access experience, using reports that feature the voice of the customer to draw the organizations’ attention to the most important facilitator, the delivery of convenience. An inventory of competitors’ capabilities may be shared with leadership to address

peer pressure. Known barriers such as providers' resistance may be addressed by open dialogue with providers about the technology. This discourse is a vital step that may have otherwise been overlooked in the belief that the technological solution was solely administrative. Table 5 lists actions for provider organizations to consider for removing barriers and promote facilitators based on the determinants identified by the expert panelists. Further research is warranted to identify effective actions to address each determinant.

Table 5. Potential Actions for Organizations to Reduce Barriers and Enhance Facilitators to Automated Self-Scheduling

Factor	**Sample Actions to Address Determinant**
Convenience for patients to schedule appointments via our self-scheduling solution.	Query patients via survey instrument (for example, post-call survey in contact center).
Culture to improve access to care.	Integrate access into the strategic plan for an organization.
Advantages of patients being able to schedule, as compared to our access (call) center.	Measure and report wait time, cost, and satisfaction associated with appointment scheduling via self-scheduling technology versus the telephone.
Scheduling workflows must be customized by specialty.	Create specialty teams: map the customer journey and create algorithms for data-driven provider/patient mapping.
Providers are resistant to self-scheduling because they [providers] are too specialized.	Engage providers from the initiation of self-scheduling technology implementation.
Necessary to be competitive in our market.	Perform an external survey of the digital access strategies of other health care organizations in the market.
Executive leaders are engaged in our solution.	Prepare and present materials regarding patient experience and expectations for senior leaders.
Buy-in of leaders.	Integrate leadership into implementation efforts to demonstrate active support and participation of leaders at all levels of the organization.
Ease of use for patients to schedule appointments via our self-scheduling solution.	Analyze and improve user interface and experience.
Variability about scheduling protocols across providers or specialties within a department.	Create standard workstreams for appointments, optimizing automation for appropriate provider matching and clinical navigation.

LIMITATIONS

The Delphi technique has been criticized for the potential for bias in participant selection and engagement (Sackman, 1974). This study strived to overcome the bias through the variety of participants as it relates to geography, professional roles, and training (Khayatzadeh-Mahani et al., 2020). The value of the Delphi technique is determined by the quality and stability of the panel of participating experts and the time between rounds, which were proactively managed by the author (Rathert et al., 2019). Participants represented various roles in academic health systems; however, they may not have exemplified persons from all areas of responsibility for implementation. The panel did not contain the opinions of suppliers (persons creating the technology) or patients (persons using the technology). As the research study aimed to develop a consensus for the implementation of the technology by health care organizations, these stakeholders were purposely excluded. This may have introduced bias in the results. The panel of experts represented health care organizations that were academic health systems; the outpatient clinics associated with these health care organizations are large and complex. Gathering consensus from experts who represented academic health systems may limit the generalizability of the results.

CONCLUSION

The purpose of this study was to provide consensus from a panel of experts engaged in automated self-scheduling about the barriers and facilitators to this novel technology. The Delphi method was effective in identifying a consensus of ten, rank-ordered determinants of implementation success. Fifty-three experts representing 41 academic health systems recognized seven facilitators and three barriers. The leading determinant was a facilitator for implementation: the organization understood and prioritized patients' need for convenience. Next in the ranking of importance were the facilitators of the organizations' supportive culture and the relative advantage

of the intervention as compared to the incumbent method of scheduling over the telephone. Leadership engagement and competitive pressures were regarded as promoters, as well as patients' ease of use. Barriers were of import, with evidence of the complexity of scheduling, providers' resistance to the technology, and the challenges of accommodating variability. Neither the process of implementation, the cost of the intervention, nor the availability of resources, were deemed to be factors.

The research may inform stakeholders about current priorities to consider the deployment and dissemination of this technology within provider organizations, thus contributing to the adoption of evidence-based practices to promote improvement efforts in managing service, access, and utilization of the outpatient enterprise. Further research is recommended to identify actions to address each determinant.

CHAPTER THREE: EXPLORATORY CASE STUDY

BACKGROUND

Automated self-scheduling represents a self-service technological solution that allows patients to book appointments. The intervention is aimed to improve the administrative transaction of appointment scheduling for health care organizations. The technology offers broader benefits to provider organizations, in the form of reducing labor costs, improving service, and increasing arrival rates (Zhao et al., 2017). Self-service in health care may contribute to the much-needed transformation of an operational "choke point" in health care (Asch et al., 2019). Uptake of the intervention by provider organizations remains limited. The intervention has been available since the turn of the 20th century; however, health care organizations likely encounter barriers and facilitators to implementing the intervention that impact uptake.

The limited evidence of the determinants of implementation related to automated self-scheduling motivated the research. The goal of this exploratory case study was to answer the research questions: What is the uptake of automated self-scheduling for a provider organization? What are the characteristics of users of automated self-scheduling at the organization? What is the demonstrable benefit of automated self-scheduling for the organization? The literature offers limited evidence of barriers and facilitators to automated self-scheduling for provider organizations. This case study aims to answer a fourth question: what are the barriers and facilitators to automated self-scheduling for the organization? These questions are posed in the context of an exploratory case study of a large, 400-provider, predominantly primary care medical practice affiliated with an academic health system.

METHODS

Through an examination of the intervention at a health care organization, information may be collected to better understand the factors that promote or impede automated self-scheduling. The subject of the case study is Johns Hopkins Community Physicians (JHCP). JHCP is a large, predominantly primary care medical practice with more than 400 physicians and advanced practice providers.[2] The practice maintains 40 sites serving the greater Baltimore market, including Maryland and Washington, DC. The practice is affiliated with Johns Hopkins Medicine, a large academic health system headquartered in Baltimore. The electronic health record (EHR) system is Epic.

Appointment scheduling at JHCP is facilitated by an agent over the telephone via a centralized contact center or as the patient departs the practice site in the event of a recommended follow-up encounter if the opportunity allows. Patients are offered the option of scheduling appointments through a patient portal tethered to the EHR system. The patient can access the automated, self-service appointment reservation system through a computer or a smartphone. The patient portal also offers patients to sign up for an automated waitlist, which notifies them if a sooner appointment becomes available and allows them the option to self-schedule. The intervention commenced in 2018 for patients established with JHCP.

The research questions were approached using two methods. The use of different methods to assemble data contributes to validation through triangulation (Patton, 2002). First, I evaluated the uptake, characteristics, and benefits of the intervention through an analysis of data about appointments booked between January 1, 2019 and June 30, 2021, except for April 1, 2020 to

[2] *Eighty-six percent of completed encounters were in Internal Medicine, Family Practice, Pediatrics, and Obstetrics and Gynecology during the period of January 1, 2019 and July 31, 2021, according to management reports.*

August 31, 2020. Data associated with appointments during the five months that JHCP management reported the COVID-19 pandemic disrupted appointment scheduling were excluded. Second, I conducted semi-structured interviews with intervention stakeholders within the organization.

For the quantitative research, the unit of the analysis is the appointment. A limited data set provided key variables associated with the appointments: the date of appointment booking, the appointment date, the patients' age, the insurance company at the time of booking, and the outcome of the booking.[3] Only appointments with providers were included in the data set; each appointment transaction may have involved multiple services (e.g., physician examination and phlebotomy). Appointments were either kept (patient presented for the appointment that was reserved and patient was seen); canceled (the appointment was canceled); missed (patient did not show up for the appointment that was transacted); or left without being seen (patient presented to the appointment that was transacted and subsequently left without being seen). The main outcome variable was whether the appointment was kept, canceled, missed, or the patient left without being seen.

I examined uptake in the completed appointments by identifying the percentage of kept appointments booked via automated self-scheduling over time, based on the month of the appointment date. To evaluate the characteristics and organizational benefit, I used the complete data set comprising the kept, canceled, missed, and left appointments. I analyzed the characteristics of users' age and insurance coverage. Mean, median, and standard deviation were derived for users' age based on all appointment bookings. The data were compared to the appointments transacted by self-scheduling and the appointments booked via JHCP agents. I calculated the

[3] *The HIPAA limited data set also contained the gender of the patient. Because gender is not a required field, however, there was inadequate data to analyze gender.*

percentage of patients covered by insurance who used self-scheduling compared to agent-based scheduling. I mapped the insurance coverage at the time of booking into major insurance categories. I analyzed the data about users based on the major category of insurance at the time of booking. Then, I compared the outcomes based on the method of booking. The percentage of self-scheduling users who kept, canceled, missed, or left appointments was compared to the results of users who booked via a JHCP agent. Data analysis was performed in Microsoft® Excel and GraphPad Software® Prism.

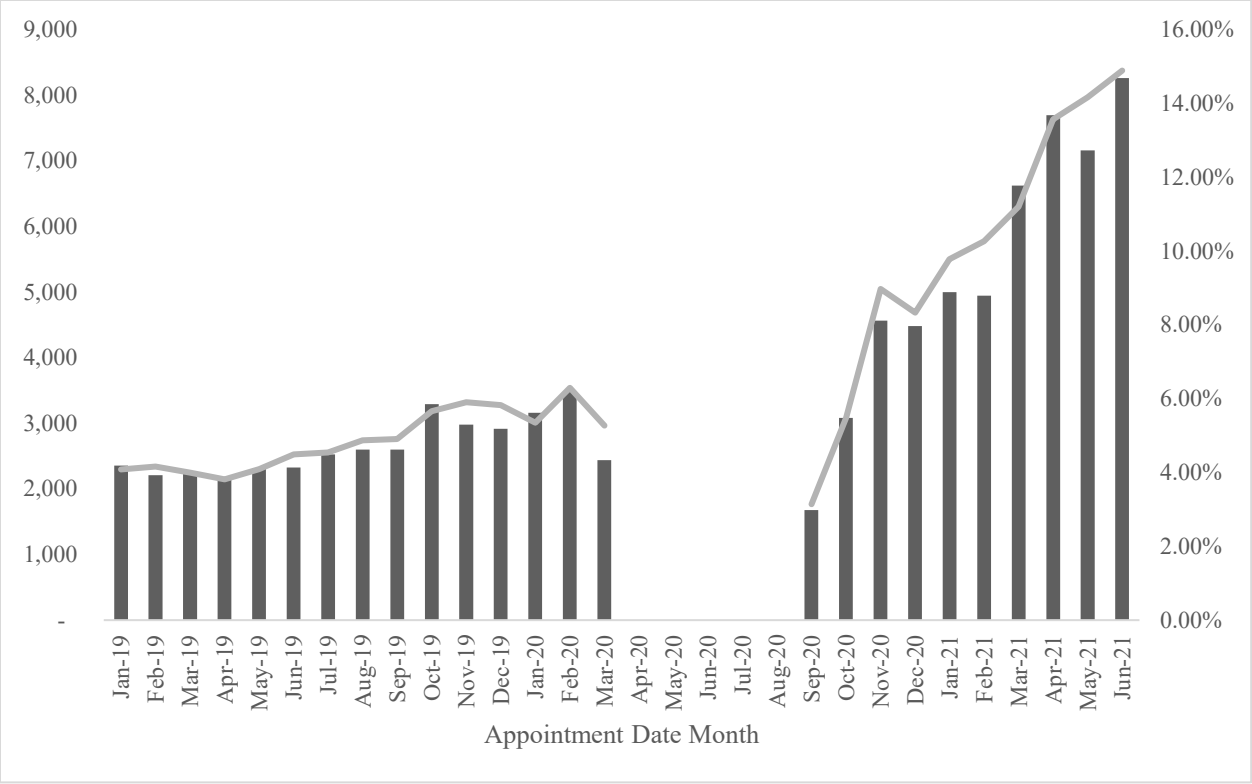
For the qualitative research, the barriers and facilitators of the automated self-scheduling solution at JHCP were explored through semi-structured interviews with stakeholders of the intervention. The interviews were guided by the Consolidated Framework for Implementation Research (CFIR), which synthesizes essential constructs from leading organizational and implementation science theories. CFIR guided the qualitative research by constructing a standard, evidence-based path of identifying, organizing, and communicating the dimensions of the implementation determinants. The interviews were pursued in order to glean the perspectives of persons engaged in the intervention from various perspectives: technology, administration (practice- and health system-level), and providers. Interviews were conducted virtually in August 2021; the interviews were performed and recorded in Zoom Cloud Meetings and transcribed in Microsoft® Word.

The Institutional Review Board (IRB) determined that this research study was exempt based on the use of a limited data set. The exemption was defined by DHHS regulations 45 CFR 46.102, and therefore does not require IRB oversight.

RESULTS

For appointments scheduled for the dates between January 1, 2019 and June 30, 2021 (except for the COVID-19 disruption period of April 1, 2020 to August 31, 2020), 1,995,909 appointments were transacted at JHCP. These data represented all activities related to the appointments to include keeping, canceling, missing and leaving appointments.

Research Question 1: What is the uptake of automated self-scheduling for a health care organization? Of the total appointments booked at JHCP, 1,349,377 were kept. Of these kept appointments, 93,094 (6.9%) appointments were completed by patients who used automated self-scheduling to book their appointment. The uptake of automated self-scheduling at JHCP has accelerated over time. In January 2019, the percent of kept appointments scheduled via automated, self-scheduling was 4.08%. In June 2021, the percent increased to 14.88%. Figure 5 displays the uptake of volume based on kept appointments by appointment date month.



P-value = <.0001, calculated using the x^2 (chi-squared) test with Prism 9.2.0 software (GraphPad Software, San Diego, CA). '

No data were collected for the appointment transactions made between April 1, 2020, and August 30, 2020, due to operational disruptions related to the COVID19 pandemic.

Figure 5. Uptake of Automated Self-Scheduling

Research Question 2: What are the characteristics of users of automated self-scheduling at the organization? The research examined the data associated with all appointments to determine the characteristics of patients who booked appointments at JHCP during the period of study. The mean [SD] and the median age for all JHCP appointments were 47.2 [23.7] and 50.0 years. The mean [SD] and the median age of patients who used the self-automated scheduling technology were 40.1 [19.57] and 41.0 years, respectively. The age compared to those who were serviced by the traditional method of scheduling of an agent for the appointment, at 47.8 [23.92] and 51.0 years, respectively. Table 6 displays the age distribution by decade, comparing the bookings

performed by agents to those conducted by automated self-scheduling technology. Patients in the age range of 30 to 39 at the time of booking were most likely to use automated self-scheduling.

Table 6. Distribution by Decade based on Age at Time of Booking for All Appointments

Age Category	Agent		Automated Self-Scheduling		Grand Total	Grand Total %
	Subtotal Count	% of Subtotal	Subtotal Count	% of Subtotal		
0-9	168,607	9.2%	13,828	8.9%	182,435	9.1%
10-19	93,480	5.1%	8,452	5.4%	101,932	5.1%
20-29	134,239	7.3%	17,205	11.0%	151,444	7.6%
30-39	232,676	12.6%	31,422	20.1%	264,098	13.2%
40-49	230,384	12.5%	30,749	19.7%	261,133	13.1%
50-59	278,256	15.1%	25,611	16.4%	303,867	15.2%
60-69	299,150	16.3%	18,100	11.6%	317,250	15.9%
70-79	247,635	13.5%	8,354	5.4%	255,989	12.8%
80-89	124,312	6.8%	2,042	1.3%	126,354	6.3%
90-99	30,157	1.6%	305	0.2%	30,462	1.5%
100+	891	0.0%	15	0.0%	906	0.0%
NULL	37	0.0%	2	0.0%	39	0.0%
Grand Total	**1,839,824**	**100%**	**156,085**	**100%**	**1,995,909**	**100%**

P-value = <.0001, calculated using the x^2 (chi-squared) test with Prism 9.2.0 software (GraphPad Software, San Diego, CA).

The majority (99.7%) of JHCP's appointment bookings represented patients with insurance coverage; the remaining 0.3% are self-pay. The use of appointment booking methods varied by the insurance coverage of patients. Sixty-seven percent of appointments booked by self-scheduling were performed by users with commercial insurance. Appointments made by commercially insured patients represented 54.5% of agent-based bookings, by comparison. Usage by Medicaid and Medicare recipients varied by the method of scheduling: 5.2% v 7.1% of appointments were booked by users with Medicaid for automated compared to agent, and 7.3% v 23.2%, respectively, for Medicare. As Medicare is the insurance for adults over 65 years of age in the US, this relative

usage provides further evidence of a younger population of users. Table 7 displays the insurance coverage status by major insurance category at the time of the appointment booking.

Table 7. Distribution by Major Insurance Category based on Insurance Coverage at Time of Booking for All Appointments

	Agent		Automated Self-Scheduling			
Category	**Subtotal Count**	**% of Subtotal**	**Subtotal Count**	**% of Subtotal**	**Grand Total**	**Grand Total %**
Commercial	1,002,158	54.5%	104,554	67.0%	1,106,712	55.4%
Medicaid	129,841	7.1%	8,077	5.2%	137,918	6.9%
Medicare	427,664	23.2%	11,420	7.3%	439,084	22.0%
Tricare/Other Gov't Programs	25,196	1.4%	6,129	3.9%	31,325	1.6%
Self-pay	5,047	0.3%	21	0.0%	5,068	0.3%
Other	249,918	13.6%	25,884	16.6%	275,802	13.8%
Grand Total	**1,839,824**	**100%**	**156,085**	**100%**	**1,995,909**	**100%**

"Medicaid" includes Medicaid, Medicaid Pending, Managed Care Organization (MCO), and Priority Partners.
"Commercial" includes EHP (Employee Health Plan), which is the commercial plan for Johns Hopkins University employees, as well as Aetna, BCBS, Cigna, Commercial, Managed Care, and United.
"Medicare" includes Medicare and Medicare Advantage.
"Other" includes International, NULL (no information gathered), Special Other, and Worker's Compensation.
P-value = <.0001, calculated using the x^2 (chi-squared) test with Prism 9.2.0 software (GraphPad Software, San Diego, CA).

Research Question 3: What is the demonstrable benefit of automated self-scheduling for the organization? Health care organizations gain from reducing the number of missed appointments (Huang et al., 2017; Lagman et al., 2021; Adams et al., 2020; Kaplan-Lewis & Percac-Lima, 2013; Senderey et al., 2020; Comer et al., 2019). If there was a demonstrable benefit from automated self-scheduling, the missed appointment rate should be lower for patients who booked their appointments using the intervention as compared to the traditional, agent-based method. The outcome of each appointment was analyzed based on the method of booking.

Of the 1,839,824 appointments booked through a JHCP agent, 68.3% were kept, 4.6% were missed, 27.0% were canceled, and 0.1% left without being seen. For appointments made through

the automated self-scheduling technology, 59.6% were kept, 2.7% were missed, 37.6% were canceled, and 0.1% left without being seen. No-shows were lower among self-scheduled appointments compared to the traditional agent-based scheduling (2.7% v 4.6%); cancellations were higher for self-scheduled appointments (37.6% v 27.0%). Table 8 presents the outcomes of appointments scheduled by an agent as compared to automated self-scheduled patients.

Table 8. Distribution by Outcome for All Appointments

	Agent		Automated Self-Scheduling			
Arrival Status	**Subtotal Count**	**% of Subtotal**	**Subtotal Count**	**% of Subtotal**	**Grand Total**	**Grand Total %**
Completed	1,256,281	68.3%	93,096	59.6%	1,349,377	67.6%
No Show	85,531	4.6%	4,247	2.7%	89,778	4.5%
Cancel	496,502	27.0%	58,645	37.6%	555,147	27.8%
Left Without Being Seen	1,510	0.1%	97	0.1%	1,607	0.1%
Grand Total	**1,839,824**	**100.0%**	**156,085**	**100.0%**	**1,995,909**	**100%**

Completed includes 47 transactions that were not documented as "completed" (agent = 45; self = 2)
P-value = <.0001, calculated using the x^2 (chi-squared) test with Prism 9.2.0 software (GraphPad Software, San Diego, CA).

Research Question 4: What are the barriers and facilitators to automated self-scheduling for the organization? The interviews provided information about barriers and facilitators to the intervention for JHCP. Barriers are negative influencers; facilitators refer to positive influencers. Figure 6 documents the key determinants organized and presented in alignment with the Consolidated Framework for Implementation Research (CFIR). The quotes presented in the figure are examples reported during the interviews to illustrate the findings. The factors determined in the research were included in all five CFIR domains. Evidence and relative advantage were named as leading facilitators. Stakeholders could not cite or quantify them, however, except for personal experience and acknowledgement that the technology's uptake was rising. Self-scheduling was presented as an alternative to patients' calling, thereby saving labor costs while recognizing that some patients would always call based on the perception of obtaining a better product (in the form

of a “better” appointment). Calls, however, had not declined as hoped. There was anecdotal evidence that patients continued to desire the traditional method of scheduling. Other facilitators included culture, peer pressure, readiness for implementation, design quality, and packaging, with “encouragement” the most-oft cited term to describe efforts to promote the intervention.

	Barriers	Facilitators
Domain 1: Intervention Characteristics		
Evidence		"My patients love it"; Usage rates
Relative Advantage	"[Patients] call us because they think we can see something else"; "[Perception of] appointments...we are hiding"	"Less need for staff to answer the phone"; "Prevent unnecessary UC/ED visits"
Adaptability	"Harmonizing with the health system is hard."	
Complexity	"Internally we struggle with...finding a good solution to complex appointments"	
Design Quality and Packaging	"Limited marketing and patient education"	"Encouragement"; "Promoting…"
Cost	"A ton of work…a lot of time"; "Shifting work… to monitor [appointments]"	
Domain 2: Outer Setting		
Patient Needs and Resources	Technology access and literacy	Patient experience; "…Provide choice for our patients in how and when they schedule their care"
Peer Pressure		"If we don't adopt, we could lose patients [to competitors]"
Domain 3: Inner Setting		
Culture		"Some [practices] are 'early adopters' and more engaged"
Implementation Climate	"Priority" [funding and projects]	
Readiness for Implementation		"Senior leadership commitment"
Domain 4: Characteristics of Individuals		
Knowledge and Beliefs about the Intervention	· "[F]ear about patients scheduling things that they shouldn't"; "Physicians…don't like losing control of their templates"	
Domain 5: Process		
Engaging		"Physician champion telling…experience, 'it can be done'"
Executing	"Shift of responsibility…cleaning up after patients"; "Solution [upkeep] is burdensome"	"'Persistent' talent"

Source: CFIR (CFIR Guide, 2021). Constructs not mentioned by interviewees were suppressed. Representative quotes are presented to illustrate findings.

Figure 6: Barriers and Facilitators to Automated Self-Scheduling

Complexity was presented as a critical barrier, with interviewees elaborating on details about the challenges the intervention presented because of its inability to support the scheduling nuances of the organization. Table 9 highlights factors related to scheduling complexity identified during the interviews. The listing represents areas of opportunity for action steps that suppliers can take to address this implementation barrier. In refining the solution, health care organizations need to recognize the importance of avoiding the creation of a solution that is too formidable or frustrating for users to avoid creating an alternate barrier (Dehnavi et al., 2021).

Table 9. Factors to Address Complexity as a Barrier to Automated Self-Scheduling

Complexity Factor	**Description**
Location	Recognition of location related to the patient's residence, as the geographical distance may impact attendance.
Diversity, Equity, & Inclusion	Accommodation of patients respecting their culture, ethnicity, language, and other needs and preferences (e.g., written material available in the patient's preferred language).
Urgency	Identification of symptoms that may indicate an urgent clinical need that may need to be escalated and addressed in a certain timeframe.
Terminology	Discovery of patient-friendly nomenclature related to symptoms, complaints, or diagnoses
Information	Instruction regarding prior medical record documentation that may be recommended (to avoid duplicate tests) or necessary (for diagnostic purposes) to advance in the scheduling process; e.g., a biopsy result
Resources	Inclusion of rules related to resources that may be required such as special equipment or personnel.
Event	Detection of episodes that may impact factors such as time; e.g., a well-female physical exam requiring more time than a visit based on a limited chief complaint.
Time	Insertion of guidelines related to the time horizon based on recommendation (e.g., an 18-month well-child exam with immunizations); or need (e.g., the timing of a pre-operative exam required prior to surgery).
Relationship	Acknowledgement of the patient/provider relationship, with ability to tier encounters based on provider, care team, and practice site.
Delivery	Ability to discern appropriate platforms for care delivery: in-person, phone, virtual, home, etc.
Usage	Recognition of challenges with the technology related to form or function in order to intervene if a user abandons.
Exceptions	Incorporation of special circumstances; e.g., changes to COVID19 symptoms that drive the care location of the patient from in-person to virtual

Safety	Integration of alternatives to address patient safety; e.g., the ability to communicate with a triage nurse if patients attempt to self-schedule based on a high-acuity symptom at 2 a.m.
Itinerary	An amalgamation of appropriate sequencing of actions; e.g., imaging study prior to physician consultation.
Financial Transparency	Understanding of service(s) that may have financial implications; e.g., informing the patient about their financial responsibility for a diagnosis that may not be covered by their insurance – or one that requires an insurance authorization.
Compliance	Assimilation of rules to conform with access to protected health information; e.g., allowing a parent to schedule a well-child exam for their child as a proxy.
Expertise	Appreciation for the physician's training, skills, expertise, and experience; e.g., scheduling a patient with Parkinson's with a neurologist trained in movement disorders.
Options	Presentation of appropriate alternatives for patients; e.g., disallowing new patients from scheduling with a physician who has a closed panel or does not accept the patient's insurance.

Adaptability was raised by interviewees as a barrier when the intervention was standardized at the health system level. Costs were acknowledged as a barrier, with a focus on personnel time, not financial outlay. The knowledge and beliefs of physicians as represented by concern and fear about the intervention were presented as an impediment: anxiety about patients' use and the loss of control of schedules. Interviewees discussed the validity of these concerns with varying opinions. Stakeholders interviewed for the research study concluded that patient needs and resources were both a facilitator (providing convenience, ease, accessibility, and flexibility to patients) and a barrier (citing concerns about access for certain patients based on technology access and literacy).

DISCUSSION

The exploratory case study offered insight into the barriers and facilitators of a health care organization that implemented automated self-scheduling intervention. An examination of characteristics, benefits, usage, and determinants through a case study contributes to knowledge about the intervention.

Characteristics. Users who booked using the automated solution were younger on average for patients who kept appointments (40.1 v 47.8 years). In the cohort of patients over 70 years of age, usage dropped from 21.9% to 6.9% based on all appointments. Other studies have determined similar patterns related to the age of users (Ganguli et al., 2020; R. Jones et al., 2010; Ryan et al., 2020; Yanovsky & Das, 2020; X. Zhang et al., 2015). Younger patients are more comfortable with the technology (Yanovsky & Das, 2020) and have expressed the value of self-scheduling (Cao et al., 2011; Habibi et al., 2019; Santana et al., 2010).

Appointment No-Shows. Missed appointments represent a financial burden for health care organizations (Huang et al., 2017; Lagman et al., 2021). Appointment non-attendance adversely impacts the quality of care (Adams et al., 2020; Kaplan-Lewis & Percac-Lima, 2013; Senderey et al., 2020). Further, Comer et al. (Comer et al., 2019) concluded that missed appointments represent a "potential surrogate marker for lack of access to care." In the case study, patients who transacted their appointments via the automated self-scheduling solution were less likely to miss the appointment (2.7% v 4.6%). This finding is consistent with other studies (Craig, 2007; Paré et al., 2014; Parmar et al., 2009; Siddiqui & Rashid, 2013; Yanovsky & Das, 2020).

The interviews performed during this research revealed stakeholders' perceptions that automated self-scheduling was better than the historical method of scheduling with an agent. The intervention may reduce labor costs (J. P. Friedman, 2004; Idowu et al., 2014; R. Jones et al., 2010; Lee et al., 2020; Zhao et al., 2017). Call volumes associated with agent-based scheduling were reported to be rising due to growth (of patient volume), making the correlation too difficult for stakeholders in the case study to quantify or justify the comparative benefit. Instead of tracking call volumes, therefore, disseminating the rates of missed appointments to stakeholders may elucidate the relative advantage of the intervention. This may promote the intervention within the

organization among participants who are undecided or doubtful about its advantages. This may aid in addressing the rising concerns about the cost of time associated with the intervention and its execution, as expressed by JHCP interviewees.

While missed appointments decreased with the use of the intervention, the rate of cancellations increased with the usage of automated self-scheduling as compared to agent-based scheduling (37.6% v 27.0%). Engagement through self-service has myriad benefits for health care organizations (Endriss, 2016; Whitaker et al., 2018); however, evidence from other industries revealed that it must be thoughtfully and intentionally managed (Shiwen et al., 2021). The timing, impact, and management of cancellations may be of import for provider organizations that deploy automated self-scheduling.

Digital Inequity. The findings of the case study demonstrated lower usage rates of automated self-scheduling by Medicaid recipients. The result is consistent with other studies (Ganguli et al., 2020; Judson et al., 2020). The usage pattern may be evidence of digital inequity. Medicaid coverage is associated with racial minorities (KFF, 2021) and low-income status (Patient Protection and Affordable Care Act, 2010). Broadband access in the US is lower for racial minorities, and those with reduced economic status (Pew Research, 2021). Stakeholders who were interviewed for the case study expressed concerns about the adverse impact of reduced technology access and literacy on patients' use of the automated self-scheduling intervention. Other studies have identified the digital divide as a potential obstacle to self-scheduling use (Zhao et al., 2017; Denizard-Thompson et al., 2011; Siddiqui & Rashid, 2013; X. Zhang et al., 2012, 2015, 2014; Mendoza et al., 2020).

Patients' access to using the solution may represent a barrier. The intervention featured in the case study is integrated within JHCP's patient portal, a common method of deploying the

solution. The portal required an email address to register; the intervention cannot be accessed without it in its present state. The usage rates of patients with reduced access to technology or lower technology literacy may be adversely impacted by self-scheduling solutions that are tethered to larger technology offerings such as portals. Self-motivation (Otokiti et al., 2020), willingness (Schrauben et al., 2021), and technology design (Samuels-Kalow et al., 2021) were factors that positively influenced the use of technology in patient cohorts that have historically suffered from a digital divide. Users' perceived ease of use and usefulness also shaped digital inequity (Mackert et al., 2016).

Acknowledging and addressing these factors may offer an opportunity to overcome the challenges associated with technology access and literacy affecting lower usage rates. Training of patients has been cited as a positive influence for patients' use of other health care technology (Almathami et al., 2020). Evidence supported by interviewees in this case study noted that self-scheduling uptake was motivated by provider encouragement and the use of workstations to help patients understand, register for, and use the intervention.

OPPORTUNITIES FOR RESEARCH

Automated self-scheduling may benefit health care organizations. Balancing the components of complexity required by health care organizations to effectively deploy the technology with the necessity of retaining ease of use for patients warrants further exploration.

This research may contribute to studies related to evaluating the root causes of missed appointments. The rate of missed appointments dropped with automated self-scheduling in the case study. The most recent systematic literature review about appointment no-shows, which identified over 40 potential predictors, did not incorporate the impact of using an automated self-

scheduling solution (Dantas et al., 2018). Future studies about reducing missed appointments should encompass the method of booking based on automated self-scheduling.

If patients can be serviced more effectively and efficiently than the current constrained systems of scheduling appointments, one interviewee believed that unnecessary care could be avoided. Further research may glean information about the impact of automated self-scheduling in the broader context of high-quality, cost-effective health care. Can self-scheduling contribute to a health care organization's pursuit of the Triple Aim: experience, population health, and costs (Berwick et al., 2008)? The role of automated self-scheduling as a component of value-based care deserves further attention.

LIMITATIONS

The case study represented a primary care practice associated with a large academic health system. Gathering quantitative and qualitative data from this setting may limit the generalizability of the results. Participants incorporated various roles in the practice; however, they may not have represented persons from all areas of responsibility. The research did not extend to the supplier of the technology. Results may, therefore, be biased. The self-scheduling solution is dynamic. The results of the research may be affected by changing technological capabilities deployed over time by the provider organization under study. The organization enabled (and disabled) various features during the period of research. For example, pre-operative visits for adults were made available for booking in March 2021. Rules and algorithms were altered based on organizational requirements, system issues, and preferences. The changes to the technology solution may have introduced a bias in the results. The COVID-19 pandemic occurred during the period of the study. With guidance from management, the data were removed for the period during which the automated self-

scheduling tool was disrupted. The effects of the pandemic may remain in the data set used for the case study, which may influence results.

CONCLUSION

The purpose of the exploratory case study was to evaluate self-scheduling in the context of a provider organization that implemented the solution. The case study identified the uptake, characteristics of users, outcomes, and implementation determinants for the organization under study. Uptake increased with time, from 4% to 15%. Users were younger and more likely to be commercially insured. There is evidence of digital inequity based on lower usage rates by Medicaid patients, which may have been complicated by access to the intervention through a larger technology offering. Missed appointments were lower for patients who used the intervention, which presented a demonstrable advantage for the organization. A higher rate of cancellations was observed for patients who used the intervention. The relative advantage of the intervention was named as an implementation facilitator, yet the benefit could not be quantified in the form of reduced call volumes or labor savings. Complexity was cited as a determinant, accompanied by factors delineated for suppliers to address to overcome the implementation barrier.

Through data analysis and interviews, the exploratory case study may inform stakeholders about barriers and facilitators. The case study may contribute to the promotion of automated self-scheduling technology to improve service, access, and utilization of appointments. Further research is recommended to address concerns related to the level of complexity needed for the solution to be effective, and the opportunity for the solution to be considered in the context of value-based care.

CHAPTER FOUR: SUMMARY

Health care organizations have been slow to take up automated self-scheduling for outpatient appointments, despite demonstrable benefits, technological advances, and evidence of success with reservation systems in other industries. In the management of the outpatient enterprise, there are opportunities for provider organizations to improve patient satisfaction, appointment waits and delays for patients, and the wasteful use of providers' time. However, little is known about why there has been limited adoption. This research builds on the existing literature by exploring the limited uptake of self-scheduling by provider organizations in the face of evidence of its benefits. The goal of my research was to fill this knowledge gap: the research aimed to identify the barriers and facilitators to patient self-scheduling by health care organizations; construct a consensus statement of experts regarding these organizational-level barriers and facilitators; and identify user characteristics, usage rates, benefits, and organizational factors related to automated self-scheduling in a case study at a provider organization. The Consolidated Framework for Implementation Research (CFIR) was applied to organize and present the findings, allowing consistency across the manuscripts.

A common theme that emerged from the manuscripts was the existence of implementation determinants that have created impediments to the uptake of automated patient self-scheduling, despite demonstrable value to the health care organization. Barriers related to complexity, which have been documented since the initiation of the technology near the turn of the 21st century, remain a prominent determinant. Facilitators included the opportunity to benefit patients through offering convenience, the organization's culture, and the competitive landscape.

DISCUSSION OF SIGNIFICANT FINDINGS

Manuscript One: Thirty full-text articles were included in the scoping review, which aimed to identify and catalog the existing evidence of the barriers and facilitators to self-scheduling for health care organizations. A scoping review was selected as the research method to synthesize a broad and heterogeneous range of literature. The intervention was defined: automated self-scheduling is the real-time, synchronous booking and automated fulfillment of appointments by patients online or via a smartphone application for themselves. Results demonstrated that self-scheduling initiatives have increased over time, indicating the broadening appeal of the intervention. Uptake, however, remained low despite evidence of demonstrable advantages for health care organizations. The body of literature regarding intervention characteristics is appreciable. Outer setting factors to include national policy, competition, and the response to patients' needs and technology access, have played an increasing role in influencing implementation over time. Scholarly pursuit lacked recommendations related to the framework's inner setting, characteristics of individuals, and process as determinants of implementation. Future discoveries regarding the determinants associated with these CFIR domains may help detect, categorize, and appreciate organizational-level barriers and facilitators to self-scheduling to advance knowledge about the solution.

The scoping review cataloged evidence of the existence, advantages, and intervention characteristics of patient self-scheduling. Gaps in knowledge of the uptake of self-scheduling by health care organizations were identified to inform future research.

Manuscript Two: Fifty-three expert panelists representing 41 academic health systems took part in three rounds of surveys to reach a consensus on the barriers and facilitators to the implementation of self-scheduling by academic health systems in the United States. In Round One,

panelists documented 530 determinants. In round two, the determinants were grouped into 72 barriers and 85 facilitators, each of which participants rated on a five-point Likert scale. Fifteen determinants met the 80% threshold and 1.0 IQR. The final round concluded with a top-10, rank-ordered listing of determinants (seven facilitators and three barriers) that incorporated a median rating score using a five-point Likert scale.

The most prominent determinant was the organization's focus on patient needs related to convenience, followed by a culture to improve access and the relative advantage of using self-scheduling compared to the call center. Barriers reflected the challenges related to customization and providers' resistance based on specialization. The leading factors did not include processes, cost, or available resources. The consensus may aid health care organizations and suppliers engaged in adopting and developing self-scheduling technology to improve implementation success. Further research is recommended to identify action steps to facilitate promoters and overcome barriers to implementation.

Manuscript Three: An exploratory case study was performed of a large, predominantly primary care practice that implemented automated self-scheduling. Uptake increased in the health care organization over 25 months from 4% to 15%. Data analysis showed that younger patients and patients with commercial insurance coverage had higher usage. The facilitator of focusing on patients' needs was a priority for the organization; however, there was evidence of a digital divide based on lower usage by Medicaid patients. Administrative restrictions imposed by a larger technology offering may have complicated patients' use. Demonstrable advantages in the form of missed appointments benefited the organization. A higher rate of canceled appointments was noted for bookings via the automated self-scheduling intervention. The relative advantage of automated self-scheduling as compared to the traditional method of scheduling was cited as a facilitator, yet

the gains related to call volumes and labor associated with the scheduling call center could not be quantified. Complexity was raised as a barrier, with considerations to address them to allay providers' fears and concerns.

MANAGERIAL AND POLICY IMPLICATIONS

Key themes that may have managerial and policy implications emerged from the research performed for the three-part dissertation.

Implementation Framework. The scoping study revealed myriad studies focused on the intervention characteristics of self-scheduling, as presented in the Consolidated Framework for Implementation Research. Intervention characteristics include the intervention source, relative advantage, adaptability, trialability, complexity, and design quality and packaging. Characteristics, however, were presented as effects of the intervention, not determinants of implementation. There is evidence of intervention characteristics, however, opportunities remain for a deeper understanding of their impact on implementation.

Impact of External Environment. Ten studies included in the scoping review revealed the importance of the external environment as a determinant in implementing self-scheduling (H. H. Chang & Chang, 2008; J. P. Friedman, 2004; Judson et al., 2020; Lee et al., 2020; Mendoza et al., 2020; Samadbeik et al., 2018; Volk et al., 2020; M. Zhang et al., 2014; X. Zhang et al., 2015, Habibi et al., 2018). The prioritization of this factor as a competitive advantage for the health care organization increased with time (Lee et al., 2020; Volk et al., 2020). The Delphi panel echoed the immediacy of the factor, with the outer setting factor, "necessary to be competitive in our market." Experts concluded that this factor was the sixth most important determinant of implementation. This concern, which was also revealed in the case study, about the external market may reflect the increasingly competitive landscape for provider organizations in the US (Kocher et al., 2021;

Berenson et al., 2020). In the international environment, the scoping study provided evidence of the impact of the external market as an important force for change, albeit based on the effect of government policy in nations outside of the US (Paré et al., 2014; R. Jones et al., 2010; Parmar et al., 2009; Cao et al., 2011; M. Zhang et al., 2014; X. Zhang et al., 2015; Samadbeik et al., 2018; Santana et al., 2010). New regulations in the US about interoperability may propel future changes (CMS, 2021).

Patient Expectations. Considered by many to be the father of quality assurance, Avedis Donabedian acknowledged the role of the patient in health care quality: "It is their [patients'] expectations that should set the standard for what is accessible, convenient, comfortable, or timely (Donabedian, 1992)." The scoping study, Delphi panel, and case study provided evidence of the increasing attention of health care organizations to patients' needs related to the convenience that automated self-scheduling can deliver. Patients value convenience (Bous et al., 2021), yet there is evidence that health care organizations may not be sufficiently accounting for patients' perspectives (Perfetto, 2018). There may be changing differences in expectations for convenience in health care based on patients' age (Majors, 2018), although even "Baby Boomers" are migrating to the convenience offered by technology (Reddington, 2018). The generational difference in utilization of the intervention was evident in the case study. Understanding patients' expectations is crucial for health care organizations, as patient satisfaction is dependent on whether expectations are met (Bowling et al., 2013). Offering a solution to an administrative process like scheduling may affect patient experience. There is evidence that system-level factors affect patients' expectations (Chiou et al., 2019). Patients report expectations of the organization that may be separate from the individuals working within it (El-Haddad et al., 2020). Therefore, patients' needs require consideration at the organizational level. If the organization does not account for patients'

needs, it may not matter how effective efforts are at the local level. With increasing access to technology, patients' expectations related to scheduling may be changing from a normative state to an ideal state (Thompson & Sunol, 1995). To even meet basic expectations of convenience, health care organizations may need to offer automated self-scheduling. If not, patient satisfaction may be adversely impacted.

Relative Advantage. The measurement of outcomes was featured in the literature incorporated in the scoping review; however, the strength and quality of evidence was not positioned as a determinant in the uptake of self-scheduling by the organization. The perceived benefit may not be a factor in the decision of the organization to adopt self-scheduling, a finding supported in the literature with other technology (Kurnia et al., 2015). However, the dissertation demonstrated the current import of the relative advantage of self-scheduling, as compared to the incumbent method facilitated by the telephone. This may reflect a response to increasing resource constraints and patient expectations, with provider organizations recognizing the value of the intervention for cost reduction and meeting patients' expectations. The relative advantage of self-scheduling, as compared to the method of scheduling over the telephone, was evident in the scoping study, Delphi panel (as put forth as an important facilitator), and the case study. Desired outcomes related to reduced labor costs were not quantified in the case study; however, there was evidence that this conclusion was based on an inability to isolate the intervention's effect. The case study demonstrated that self-scheduled patients had a lower missed appointment rate than patients scheduled by agents. The advantage can be quantified and reported. For organizations interested in technology diffusion, managers can incorporate an identification, assessment, and presentation of the relative advantage of self-scheduling compared to the incumbent process. Organizations

may consider communicating the specific advantages of changes to the missed appointment rate, which can be readily calculated as evidenced by the case study.

Improvement of Intervention. Complexity was cited as a challenge for health care organizations in the scoping study, placed as the highest-ranking barrier by the expert panel, and determined to be of significant concern in the case study. Despite its existence for several decades, the limited uptake may signal that the intervention requires improvement of the technology. Health care organizations have and continue to report complexity as a barrier. The intervention, as available in its current state, may not be effective. The basic vulnerabilities in health care technology that have been identified during the COVID-19 pandemic furthered this finding (Holmgren et al., 2020; O'Reilly-Shah et al., 2020). Therefore, health care organizations may need to exert pressure on suppliers to improve the intervention. Considerations for addressing complexity were incorporated and presented in this dissertation.

Relationships. The results of the scoping study, Delphi panel, and case study verified that myriad determinants impact the implementation of automated self-scheduling, a finding confirmed for technology implementation by health care organizations (Durlak, 2008). In contrast to the focus on dissecting individual components defined by an implementation framework such as CFIR, the success of implementation by a health care organization is influenced by the interdependence of the factors (Sarkies, 2020). Self-scheduling cannot be implemented and scaled without a comprehensive understanding of factors that promote or impede the uptake of self-scheduling by health care organizations. The exploration of enablers and obstacles through examining the linkages within health care organizations may inform implementation determinants for self-scheduling.

Tipping Point. Health care organizations are using an existing technology (telecommunications) and a replacement innovation (automated self-scheduling). There is evidence that simultaneous use will continue until the user experiences holistic value beyond gleaning sufficient benefit for particular circumstances (McNeish & Hazra, 2014). The literature review documented limitations on the technology enacted by health care organizations in the form of internally imposed slot unavailability (Paré et al., 2014) and inflexibility (X. Zhang et al., 2015). The scoping review, Delphi panel, and the exploratory case study confirmed stakeholders' concerns about the barrier of complexity. As evidenced by the case study, the solution could not meet the organization's needs in many ways, which had given rise to providers' hesitancy and concerns about patients' best interests. Complexity needs to be addressed for the technology to diffuse. Similar efforts to address usage rates need to be aimed at patients. This is of particular importance based on evidence of lower usage rates for Medicaid recipients in the scoping review and case study. Patients' technology acceptance is complex and nonlinear (Loncar-Turukalo et al., 2019; Nadal et al., 2020). Considerations regarding scheduling complexity and patients' intention to use and experience with the technology may aid provider organizations in achieving the tipping point of the utilization of automated self-scheduling.

Providers. The connectivity of the intervention to the product offered is largely unexplored in the research. There is an acknowledgment of the providers' role (Friedman J., 2004; Habibi M. A.-A.-H., 2019; Craig A., 2007; Paré, 2014); however, it is an ancillary one to the administrative and technical aspects of the intervention. The literature in the scoping study focused on patients as users. The Delphi panel concluded a key barrier to implementation was providers' resistance. This finding is supported in the literature (Choi WS, 2019), and was evident in the case study. Although self-scheduling may be considered an administrative technology, the proffering of providers' time

requires provider input. The provider is an important stakeholder; this group should not be overlooked in the implementation process as their insight about the complexity can benefit usage.

These studies highlighted the barriers and facilitators of automated self-scheduling for provider organizations. Automated self-scheduling offers benefits to provider organizations. The research findings suggest opportunities for organizations to influence the diffusion of technology.

CONCLUSION

This research aimed to improve provider organizations' uptake of a technology that has the potential to benefit organizations' management of the outpatient enterprise by identifying organizational-level barriers and facilitators to implementing self-scheduling. Appointment management in the outpatient enterprise is important for provider organizations as waits and delays lead to poor management outcomes: dissatisfied patients, scheduling disruptions, and wasted slots (Tuli, 2010 and Wang, 2019). By identifying the implementation determinants, the research may assist organizations seeking solutions to the management of the outpatient enterprise, ultimately benefiting patients through improved satisfaction, reduced disruptions, and enhanced utilization of providers' time.

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APPENDIX

Appendix 1. Search Strategies by Database

A. PubMed Search Strategy:

((Patients[MESH] OR patient* [tw]) AND ((((("Appointments and Schedules"[Mesh] OR schedul* [tw]) AND (online [tw] OR self-serve [tw] OR web-based [tw] OR internet-based [tw] OR self-service [tw])) OR "e-book*" [tw] OR "online appointment*" [tw] OR "online book*" [tw] OR "self-serve" OR "automated schedul*" [tw] OR "Web-based schedul*" [tw] OR "self-schedul*" [tw] OR "online schedul*" [tw] OR "e-schedul*" [tw] OR "Internet scheduling" [tw]) AND ("Evaluation Studies as Topic"[Mesh] OR Routin* [tw] OR Integrat* [tw] OR Facilitate* [tw] OR Barrier* [tw] OR Implement* [tw] OR Adopt* [tw]))) NOT ((Patients[MESH] OR patient* [tw]) AND ((((("Appointments and Schedules"[Mesh] OR schedul* [tw]) AND (online [tw] OR self-serve [tw] OR web-based [tw] OR internet-based [tw] OR self-service [tw])) OR "e-book*" [tw] OR "online appointment*" [tw] OR "online book*" [tw] OR "self-serve" OR "automated schedul*" [tw] OR "Web-based schedul*" [tw] OR "self-schedul*" [tw] OR "online schedul*" [tw] OR "e-schedul*" [tw] OR "Internet scheduling" [tw]) AND ("Evaluation Studies as Topic"[Mesh] OR Routin* [tw] OR Integrat* [tw] OR Facilitate* [tw] OR Barrier* [tw] OR Implement* [tw] OR Adopt* [tw])))

B. Scopus Search Strategy:

((TITLE-ABS-KEY ((patient* AND (appointment* OR schedul*) AND (online OR self-serve OR web-based OR internet-based OR self-service)))) OR (TITLE-ABS-KEY (("e-booking" OR "online appointment*" OR "online book*" OR ("self-serve" AND schedule*) OR "automated schedul*" OR "Web-based schedul*" OR "self-schedul*" OR "online schedul*" OR "e-schedul*" OR "Internet scheduling") AND (medical OR patient*)))) AND (TITLE-ABS-KEY (evaluation OR routin* OR integrat* OR facilitate* OR barrier* OR implement* OR adopt*))

C. CINAHL Search Strategy:

Interface - EBSCOhost Research Databases
Search Screen - Advanced Search
Database - CINAHL Plus with Full Text

#	Query	Results
S8	S6 AND S7	525
S7	((MH "Evaluation+") OR (MH "Health Services Accessibility+")) OR (Routin* OR Integrat* OR Facilitate* OR Barrier* OR Implement* OR Adopt*)	727,197

S6	S4 OR S5	1,850
S5	"e-book*" OR "online appointment*" OR "online book*" OR "self-serve" OR "automated schedul*" [tw] OR "Web-based schedul*" [tw] OR "self-schedul*" [tw] OR "online schedul*" OR "e-schedul*" OR "Internet scheduling"	983
S4	S1 AND S2 AND S3	898
S3	(online OR self-serve OR web-based OR internet-based OR self-service	92,651
S2	(MH "Patients+") OR (patient OR patients)	2,170,278
S1	((MH "Appointments and Schedules+")) OR schedul*	99,581

D. Business Source Ultimate Search Strategy:

Interface - EBSCOhost Research Databases
Search Screen - Advanced Search
Database - Business Source Ultimate

#	Query	Results
S12	S8 AND S11	116
S11	S9 OR S10	1,702,363
S10	Evaluation OR Routin* OR Integrat* OR Facilitate* OR Barrier* OR Implement* OR Adopt*	1,601,811
S9	(DE "PROJECT evaluation") OR (DE "RESEARCH" OR DE "EMPIRICAL research" OR DE "FEASIBILITY studies" OR DE "FIELD work (Research)" OR DE "OPERATIONS research" OR DE "QUALITATIVE research" OR DE "QUANTITATIVE research" OR DE "RESEARCH & development")	134,461
S8	S6 OR S7	470
S7	S1 AND S2 AND S3	260
S6	S4 AND S5	263
S5	patient* OR medical	873,418
S4	"e-booking" OR "online appointment*" OR "online book*" OR "self-serve" OR "automated schedul*" OR "Web-based schedul*" OR "self-schedul*" OR "online schedul*" OR "e-schedul*" OR "Internet scheduling"	11,600
S3	online OR self-serve OR web-based OR internet-based OR self-service	982,523
S2	patient*	215,814
S1	DE "SCHEDULING" OR (appointment* OR schedul*)	536,906

Appendix 2. Scoping Study Charted Data

[see attached spreadsheet]

Appendix 3. List of Barriers and Facilitators Identified by Delphi Panel

Barriers
Providers at our health care organization are not familiar with the evidence that supports self-scheduling.
Patients believe that they can get a better appointment by calling (versus using self-scheduling).
Patients can be overbooked by scheduling staff (to get an appointment sooner), as compared to the self-scheduling solution.
Scheduling workflows must be customized by specialty.
Scheduling workflows must be customized by the provider.
There is no consistency in our organization's approach to self-scheduling.
Providers have specific scheduling requirements and guidelines that cannot be accommodated by our self-scheduling solution.
Coordination with the providers or departments as it relates to self-scheduling is lacking.
There is variability in scheduling protocols across providers or specialties within a department.
Self-scheduling cannot accommodate our requirements related to insurance -- coverage, eligibility, referrals, authorizations - or other financial clearance matters.
Self-scheduling requires triage and/or review [of appointments] by the department.
Providers will or prefer to only see certain patients.
Self-scheduling cannot accommodate linking tests or other pre-appointment services to appointments.
Templates are not optimized.
Template management is decentralized.
Templates are not standardized.
The amount of information required upfront in order to schedule an appointment correctly cannot be accommodated by self-scheduling.
Self-scheduling does not allow appointments to be timed and/or allocated fairly. (Examples: Unable to randomly distribute appointments; unable to sequential scheduling; openings can only be displayed by first available.)
A barrier to self-scheduling at our health care organization is that self-scheduling cannot be integrated with our existing technology platform.
Our patients are not enrolled in the access point to self-scheduling. (Note that this typically refers to the 'patient portal' but can be any access point.)
Our patients do not use the access point for self-scheduling. (Note that this typically refers to the 'patient portal' but can be any access point.)
Self-scheduling is not accompanied by clear, helpful instructions for our patients.
Self-scheduling is presented in a manner where patients may think that something previously provided -- an access point -- is being taken away.
Patients are not aware of our organization's self-scheduling solution.
Patients are not willing to use our organization's self-scheduling solution.

Patients are not technically capable of being users of our self-scheduling solution.
Our organization's self-scheduling is confusing and difficult for patients to navigate.
Our self-scheduling solution does not offer the technological experience that patients expect.
There are limitations on our ability to schedule new patients through our organization's self-scheduling solution.
Self-scheduling requires the cost of staff who must triage and/or review for the department.
Self-scheduling requires the cost of staff who must proactively communicate with patients (i.e., outbound calls) before their appointment to gather information, prepare for the visit, etc.
Self-scheduling requires the cost of staff to register the patient(s) before they can use the solution.
Providers will not accept self-referred patients.
Patients schedule appointments on our organization's self-scheduling solution, but do not arrive (i.e., no show).
Our market size is so large that our organization cannot create a one-size-fits-all solution to account for geographical differences in our patient population.
Poor access results in 'unfriendly' self-scheduling (e.g., no slots are available).
Our organization's self-scheduling solution cannot accommodate compliance with regulations related to patient privacy.
Our health care organization lacks the structure to 'get out of the whirlwind.'
Our health care organization has challenges with patient access (i.e., providers have no availability, regardless of the mode of scheduling).
Our health care organization does not have an adequate transition of ownership from IT (information technology) to the owner of the solution (e.g., ambulatory care management) after the design/build of self-scheduling is complete.
Our health care organization lacks a coordinated approach to self-scheduling.
Our health care organization desires perfection not progress.
Our health care organization has a low-risk tolerance for innovation.
Participation in self-scheduling for providers is optional.
Our health care organization does not have templates constructed for self-scheduling.
Self-scheduling cannot be implemented because there is no organizational vision associated with self-scheduling.
Our health care organization lacks a strong administrative leader to guide the implementation of self-scheduling.
Our health care organization does not have a leader(s) to mandate or enforce self-scheduling with providers.
Our health care organization is that there is a lack of leadership buy-in for the self-scheduling initiative.
There is a lack of provider buy-in for the self-scheduling initiative.
There is a lack of organizational buy-in for the self-scheduling initiative.
Our IT (information technology) department does not have the resources for the design/build phase of the self-scheduling solution.

Our IT (information technology) department does not have the resources for the maintenance related to the self-scheduling solution.
Our IT (information technology) department does not have the understanding to successfully accomplish the self-scheduling build.
Our health care organization does not offer information about the self-scheduling solution for providers and staff to familiarize them with it.
Providers are frustrated by scheduling mistakes (e.g., 'mis-scheduled' patients).
Providers are concerned about the loss of control (as it relates to scheduling via self-scheduling).
Providers are resistant to or unwilling to implement self-scheduling.
Providers are concerned about the lack of records, testing, clinical review, authorization, etc., for self-scheduled patients.
Providers believe that their patients' needs do not qualify for self-scheduling.
Providers do not understand self-scheduling.
Providers fear patient abuse/misuse of self-scheduling.
Providers fear self-scheduling may result in 'wasted' visits.
Providers are resistant to self-scheduling because they [providers] are too specialized.
There is a lack of trust in patients, as they can 'game' the system when self-scheduling.
Providers fear that established patients will seek appointments outside of the desired frequency.
Some of our providers do not desire new patients.
Self-scheduling cannot be implemented because some providers want to restrict scheduling.
There is no champion for the self-scheduling initiative.
There is a lack of staff buy-in for the self-scheduling initiative.
There is a lack of staff understanding about the initiative.
The project timeline for the implementation of self-scheduling cannot be met.

Facilitators
There is evidence from providers who are using self-scheduling that are experiencing positive new patient growth.
There is evidence from providers who are using self-scheduling that are experiencing improvements in the arrival rate (e.g., reduced no-shows, reduced same-day cancellations).
There is evidence from providers who are using self-scheduling that are experiencing improvements in their patient satisfaction scores.
There is evidence from providers who are using self-scheduling that are experiencing improvements in their payer mix.
There is evidence from providers who are using self-scheduling that are experiencing improvements in the satisfaction of their staff.
There is evidence from providers who are using self-scheduling are experiencing improvements in their revenue.

There is evidence from providers who are using self-scheduling are experiencing higher slot utilization (i.e., more slots are filled).
There is evidence that our scheduling errors have declined.
There is evidence from our access (call) center that performance (e.g., service level and hold times) has improved.
There is evidence from our access (or call) center that labor costs have decreased.
There is evidence from our access (or call) center that phone volumes have decreased.
There is an advantage of patients being able to schedule 24/7, as compared to our access (call) center.
There is an advantage of integrating health promotion/preventive health reminders, as compared to our access (call) center.
There is an advantage of patients having increased exposure to all providers and all locations, as compared to our access (call) center.
There is an advantage of marketing providers by co-listing them on third-party sites, as compared to our access (call) center.
Our ability to customize our self-scheduling solution to meet the needs of our providers and departments.
Our ability to identify patients who have self-scheduled.
Our ability to seamlessly implement the solution without the knowledge of the providers.
The lack of triage required for self-scheduling.
Our ability to set time-based parameters for our self-scheduling solution (e.g., the time between the booking and the date of service [DOS]).
Our ability to set parameters regarding acceptable insurance types for our self-scheduling solution.
Our ability to set parameters regarding appropriate visit types for our self-scheduling solution.
The success of our self-scheduling pilots.
The ability to integrate other digital benefits such as reminders, wayfinding, test scheduling, and/or online payment.
The standard template build and use of visit types.
The evolution of technical features and capabilities in self-scheduling.
The ability for the user to search by availability.
The ability to access advanced tools, such as scheduling algorithms.
The high percentage of patients who have access to our self-scheduling solution (i.e., a large number of portal users).
The ability to display provider profiles via our self-scheduling solution.
Staff who explain the benefits of and encourage the use of self-scheduling to the patients.
Providers who explain the benefits of and encourage the use of self-scheduling to the patients.
Our marketing materials about the solution aimed at patients.
The ability to promote new providers.
The convenience for patients to schedule appointments via our self-scheduling solution.
The ease of use for patients to schedule appointments via our self-scheduling solution.

The autonomy for patients to schedule appointments via our self-scheduling solution.
The contactless experience for patients to schedule appointments via our self-scheduling solution.
The access for patients to schedule appointments via our self-scheduling solution.
The transparency of information for patients is available via our self-scheduling solution.
Our self-scheduling solution results in higher patient satisfaction.
Our self-scheduling solution results in higher patient engagement.
Patients are requesting access to it.
Or self-scheduling solution results in better access to appointments.
It is necessary to be competitive in our market.
It allows us to differentiate ourselves from our competitors.
The rise of telemedicine/virtual appointments.
The use of the solution to accommodate the COVID vaccine schedule.
The pressure of our EHR (electronic health record) vendor.
Self-scheduling is a necessity, not a luxury, in the current environment.
The ability to rapidly deploy associated technology for rapid situations.
The confidence of providers in technology gained by the rapid implementation of telemedicine/virtual care in 2020.
The necessity of financial stability in the current environment.
Our culture of patient-centeredness.
Our culture to improve access to care.
Buy-in of providers.
Buy-in of staff.
Buy-in of leaders.
Our ability to manage the expectations of staff and providers.
Our rapid response to issues as they develop.
Openness to change.
Our perception that it is necessary to offer self-scheduling to our patients.
Our perception that it is necessary to reduce our call volume.
The compatibility with virtual visits/telemedicine.
The collective perception of the importance of the self-scheduling solution as an organizational priority.
Opt-in is assumed unless a reason for opting out is given and approved.
The organization has established goals associated with self-scheduling.
Our clinical/provider leaders are engaged in our solution.
Our executive leaders are engaged in our solution.
Our leaders are mandating the self-scheduling solution.
Our organization's investment into the IT (information technology) build/design for self-scheduling.
Our organization's investment into the IT (information technology) maintenance for self-scheduling.

A resource team dedicated to self-scheduling.
Our organization's internal orientation and training for practices/departments related to our self-scheduling solution.
The interest and engagement of younger providers.
Frustration with our current manual process.
Growing confidence in our self-scheduling solution.
Our providers' willingness to see patients who have self-scheduled regardless of whether the patient is the 'right' patient.
Our providers' willingness to try self-scheduling.
Our providers' recognition of the benefits of self-scheduling.
Our methodical, controlled implementation of self-scheduling.
The adequate time allocated for the development and testing of our self-scheduling solution.
Our provider champions.
The internal 'word of mouth' positive feedback from providers who have implemented self-scheduling.
The partnership between operations/scheduling and IT (information technology) for our self-scheduling solution.