International Journal on Emerging Technologies **11**(2): 251-260(2020)

ISSN No. (Print): 0975-8364
ISSN No. (Online): 2249-3255

Evolving a Hybrid Appointment System for Patient Scheduling in Primary Healthcare Centres in Dubai: Perceptions of Patients and Healthcare Provider

A. Aburayya[1], A. Al Marzouqi[2], I. Al Ayadeh[3], A. Albqaeen[4] and S. Mubarak[5]

[1]Quality and Excellence Officer, Department of Quality & Excellence, Dubai Healthcare Corporation (Dubai), UAE.
[2]Assistant Professor, Acting Dean, College of Health Sciences, University of Sharjah (Sharjah), UAE.
[3]Excellence Specialist, Customer Care Department, Roads and Transport Authority (Dubai), UAE.
[4]Senior Excellence Specialist, Department of Quality & Excellence, Dubai Healthcare Corporation, (Dubai), UAE.
[5]Senior Officer Excellence, Department of Quality & Excellence, Dubai Healthcare Corporation, (Dubai), UAE.

(Corresponding author: A. Aburayya)
(Received 02 January 2020, Revised 18 March 2020, Accepted 19 March 2020)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Access to family doctors for consultations is a paramount health policy matter. Accessing healthcare services is a challenging task as it considers a major barrier to quality care and adversely affects the quality of service and establishment of a friendly customer relationship. Given the recent concerns among public policy health advocates and patients regarding long waiting time as well as patients' lack of opportunities to book appointments prior to meeting the doctors, this paper explored the views of healthcare providers and patients in primary healthcare centres in Dubai regarding the need to introduce Hybrid Appointment System (HAS) which schedules patients attendance by doctors on the basis of their preference thereby reducing the systems total time loss. This study adopts a quantitative method and a survey research design to elicit the perceptions of healthcare providers and patients regarding the need to introduce HAS. A self-administered questionnaire is used to collect data from patients and staff across 8 healthcare centers throughout Emirate of Dubai, UAE. A total of 1448 patients and 624 staff responses are analyzed. The outcomes of the study showed that a significant number of patients (74.40 per cent) approved the notion of establishing the HAS framework. Specifically, Emirati patients including married women as well as well-educated patients and those aged 55 years and below supported the idea of introducing the system of appointment. Similarly, a high number of staff in clinics (78.90 percent) also supported the introduction of the appointment system. The respondents, mainly patients and healthcare providers perceived accessibility, availability, saving time through reduced waiting time as the central benefit of using the appointment system. However, they admitted the following disadvantages; difficult to get appointment, now show and it is not beneficial for patients with acute cases. Nevertheless, the respondents indicated a positive attitude towards the establishment of HAS, especially in primary healthcare centres in the region. The results of the study will contribute significantly to a nationwide effort directed to conduct a study and implement the outcomes to enhance patients' access to Dubai primary healthcare facilities. In this respect, the study provides invaluable information for policymakers and managers to enable them to design and implement novice methods efficiently in providing timely access to primary healthcare in the area.

Keywords: Advance Access, Appointment System, Hybrid Appointment System, Open Access, Patient Scheduling, Primary Healthcare Services, Walk-ins, Waiting-time.

Abbreviations: HAS, Hybrid Appointment System; UAE, United Arab Emirates; MILP, Integer Linear Programming; GP, General Practitioners; SPSS, Statistical Package for Social Sciences; AAP, Advanced Access practices.

I. INTRODUCTION

Dubai has 21 public primary healthcare centres and 940,391 patients visited the family medicine practitioners across these stations in 2018 [3, 16]. A recent study on healthcare needs in Dubai found that the patient population has declinedcontinuously every year, an indication that a high number of the patients make appointments and confirm a day before the walk-in date through call or SMS but do not seek treatment medical attention. Such deficiency in seeking medical help has become a major concern among administrators and staff in primary healthcare centres as well as politicians concerned about outpatient accessibility which discourages people from seeking treatment from healthcare centres. Notably, several studies underline challenges in accessing healthcare services as a major barrier to quality care and adversely affects the quality of service and establishment of a friendly customer relationship [1, 3, 8]. Al-Neyadi *et al.*, and Aburayya *et al.*, asserted that healthcare administrators, as well as policy-makers, consider barriers to access as a major issue especially in primary healthcare centres as it affects the efficiency of patients' flow hence leaving a high number of the patients not only dissatisfied but also distressed. In this regard, healthcare organisations need to find strategies and adopt efficient techniques to facilitate easy patients' accessibility to services in healthcare facilities to make them competitive in terms of good patient experience by minimising waiting time when they visit health centres [8, 3].

In healthcare, an appropriate scheduling system facilitates patients' access to clinics [14]. Hence, an inefficient or poorly coordinated schedule results in long patient waiting time. In turn, this leads to increased patient complaints and dissatisfaction. As noted by Suss *et al.*, comprehending and acknowledging the essence of proper patient scheduling will encourage outpatient clinics to adopt varied scheduling techniques to reach a balance between patient satisfaction and resource utilisation [38]. Indeed, healthcare consumers acknowledged the use of appointment systems in outpatient clinics as a show of proficient service delivery [15]. Most consumers believe that the appointment system has compelling positive impacts on improving patients' accessibility as well as their gratification [15]. In a conclusive statement, Spüntrup *et al.,* noted that the reliability of the appointment system, especially in clinics has been widely accepted as an approach for ensuring better patient healthcare and organisational reward [35]. Nowadays, there are two widely used scheduling methods in healthcare namely, walk-ins and appointment systems [22]. Walk-ins scheduling methods are common due to their capacity to maintain a steady patient flow. The system guides patients' service on the basis of first come first serve [12]. The appointment system operates differently that it consists of specific demarcated periods or slots in a schedule left open in order to accommodate patients on a particular same day of getting a patient request or application for an appointment. Schoenfelder *et al.*, underlined that each of the scheduling methods attempts to optimise the performance of a given measure at the expense of another measure. Consequently, it might be challenging to attain a balance between patient satisfaction and resource utilisation in terms of appointment lead-time while employing one particular scheduling approach [33]. As a result, HAS comprises of the two scheduling methods to raise its capacity to reach patients' needs as well as that of the clinic. The appointment system lowers the appointment lead-time while walk-ins enable the patients to visit the facility without any prior appointments hence offering greater flexibility [6]. In supporting the efficiency of introducing HAS to healthcare clinics, Srinivas and Khasawneh (2017) quoted "Adopting a HAS, will result in a simpler scheduling policy as the scheduling manager will know the optimal rejection rate and the overtime rate that minimizes the total loss for their clinic. Adopting a HAS significantly reduces the appointment lead-time and provides greater flexibility to handle varying patient calls and physician service time" [37].

Dubai's primary healthcare industry requires an upgrading in process efficiency and a reduction in patients waiting time [3]. Currently, patients visiting family medicine service providers in Dubai are attended on the basis of walk-ins; first, arrive first helped. To carry out HAS efficaciously, it is essential to study patients' and healthcare providers' perceptions in outpatient clinics regarding the introduction of HAS. Furthermore, a literature review on this field of the study showed that there is inadequate information related to the execution of HAS [7, 21, 31, 36, 37, 39] particularly in the Gulfstream area [7, 21]. To the best of the authors' knowledge, no study has been conducted on the introduction of HAS specially in UAE. In this regard, the current study explored the views of patients as well as and healthcare providers in various primary healthcare centres in Dubai concerning the introduction of HAS meant to schedule patients on the basis of their preference. The paper addressed this literature gap by analysing HAS and introducing it to the patient scheduling system in outpatient healthcare centres in Dubai. The results of the study will contribute significantly to a nationwide effort directed to conduct a study and implement the outcomes to enhance patients' access to Dubai primary healthcare facilities. In this respect, the report provides invaluable information for policymakers and managers to enable them to design and implement novice methods efficiently in providing timely access to primary healthcare in the area.

II. LITERATURE REVIEW

Patient scheduling has been at the centre of numerous studies as it plays a major part in determining the duration patients wait to be attended or the waiting time, idle time, as well as system overtime. Brahimi and Worthington established that the outpatient clinics used single queues where patients are required to make long queues based on arrival time. However, such a method is not effective as patients have different needs. Brahimi and Worthington also noted that while some might be visiting the centre just for consultation on matters not related to health, others might require urgent doctors' attention. As such, there is a need for a more effective scheduling strategy to ensure improved operational efficiency. Notably, each patient is allocated a particular time hence if one client fails to show up, such time might be wasted [11]. Concurrently, Aburayya *et al.,* added that in such a situation, the health centre loses revenue [3].

Arguably, it is not possible to avoid no-shows since this might result from different causes on the patient side. However, as suggested by Laiyemo *et al.,* such a challenge can be reduced by using various approaches such as telephone reminders where the patient is reminded to attend the scheduled clinic or appointment system scheduling [23]. He *et al.,* approved the use of telephone reminders recommending an automated phone call to the client a day or hours before the set visit date [20].

In a related study, Samorani and LaGanga concluded that same-day appointments are given for possible shows while future day appointments forecasted likely no-shows [32]. Srinivas and Khasawneh (2017) noted that the coefficient of variation of service duration for an outpatient clinic varies between 0.25 and 0.45. However, Srinivas and Khasawneh (2017) concluded that it is challenging to determine the duration required for each appointment for varied types of patients because the entire procedure is stochastic [37]. Gupta and Denton noted that a high variance in service times not only increase patient waiting time but also harms the performance of the healthcare providers [19].

Cayirli and Güneş underlined that clinics are accountable for total care of the patients thus they should also consider including walk-ins in their systems to offer more efficient care [13]. According to Khalaf *et al.,* [21], such a form of arrival occurs frequently in

primary care clinics where patients are offered service without appointments or pre-set time slots. In this respect, Srinivas and Khasawneh (2017) recommended that walk-in should not only be expected but also planned while developing an appointment system [37]. This can be done by observing patient arrival patterns [10]. Based on these findings, clinics that deny access to walk-ins might further disadvantage such patients. In a further study to examine the essence of including walk-ins in clinics, Cayirli and Güneş explored the impact of adjusting clinics' capacity by including intra-week seasonality of walk-ins and varied appointments policies to determine the most suitable model appointment system accommodating seasonal walk-ins. They concluded that the performance of clinics in terms of patient wait time improved significantly by taking into account seasonality in walk-ins compared to the ones that did not adjust for seasonal walk-ins [13].

Researchers consensually concluded that appointment system in such service centres is important to solve efficiency issues related to patient waiting time, process efficiency and patient satisfaction [3, 21, 26, 37]. However, those opposed to the adoption of the appointment system inpatient scheduling assert that it is challenging to execute such a system and it might also reduce the continuity of care. Nonetheless, Patrick refuted such a view by maintaining that if the patient waiting duration of the walk-ins approach is high, then such a clinic should adopt a hybrid scheduling strategy that incorporates advanced access methods [27].

Qu *et al.,* [29] proposed a closed analytical tactic to determine the maximum proportion of advanced access appointments appropriate for a given provider capacity. However, such percentage depends on the demand for an appointment system, the capacity of the provider, as well as the no-show rates. In another study, Peng *et al*., suggested the use of a genetic algorithm-based method in order to determine the best schedule template for use in a HAS. The final schedule should reserve a list of slots for open access appointments. This provision will cater to patients without appointments and also compensate for the time that might be lost during service. They concluded that the optimal template is considerably affected by the no-show rate, changing demand, as well as cost coefficients hence including slots for open access will help minimise the loss [28].

Lee and Yih assert that the configuration of an appointment system changes, depending on the environmental conditions in which it is used [24]. Concurrently, Green *et al*., noted that it is essential to consider the changes in the environmental factors during the modelling of the system and incorporate such variations. Moreover, patient calls for appointments vary throughout the day, depending on time-of-day [18]. Lee and Yih noted that clinics that operate with advanced access slots tend to have more calls at the beginning of the day hence the chance of getting requests for appointments at the same time is high. Also the rate of patient no-show also determines the behaviour of an appointment system [24]. The average patient no-show rate for outpatient clinics is between 12 per cent and 42 per cent [18]. On the other hand, the rate of individual patient no-show depends on the time of appointment. In other words, a patient booking an appointment for the following day has a low no-show rate than the one booking an appointment a week later.

Remarkably, accessibility and availability are two essential features of an efficient primary healthcare system. Srinivas and Khasawneh (2017) agreed to this assertion asserting that current literature is concerned with timely access to health care facilities, including family physicians. Srinivas and Khasawneh (2017) recommended a combined integer linear programming (MILP) paradigm for a HAS model, that schedules patients depending on their preferences. Notably, the proposed HAS consists of three scheduling methods, including namely walk-ins, open-access, and pre-booked. The model enables decision-makers in determining the health system rates of rejection and overtime. Additionally, the HAS is assessed for the impact of various parameters, including the percentage of those requesting open access, no-shows, the variation of service time, optimal rejection rate, as well as rate of overtime. The outcome illustrated that the HAS model can handle variations in operational factors of a clinic. Precisely, HAS can handle a variation of more than 20 per cent in open access ratio as well as service time. Besides, sensitivity analysis showed that the HAS model is not affected when the fluctuation of demand is within 40 per cent [37].

According to Munavalli *et al*., a clinic should also comprise of integral patient scheduling framework which includes the department status as well as information in the outpatient clinic. The model should also outline the pathways directing patients, upon arrival to the optimal path. The hybrid system further shows the optimal path to lower the patient waiting duration as well as the cycle time from reception to exit. The findings showed that the hybrid model cut the average patient waiting time by about 33 per cent and the cycle time by more than 18.45 per cent. Additionally, variability in patient waiting duration and the cycle time were also minimised. Furthermore, the model reduced the proportion of patients taking more than 2 hours from 13.5 per cent to about 8.4 per cent [26].

In another related study, Khalaf *et al*., examined the perspectives of patients and physicians regarding introducing HAS model in primary care centres. The findings illustrated that the majority of patients (79.60 per cent) approved the idea of establishing the HAS model primary care centres. Similarly, a high proportion of the physicians (95.70 per cent) also supported the introduction of the HAS model. As such, Khalaf *et al.,* concluded that all the respondents indicated positive attitudes towards the use of the HAS model in primary healthcare facilities [21].

Bodenheimer and Pham (2010) explored the state of primary care in the US. The researchers discussed the forecasted shortage in the country's primary care practitioner workforce and suggested various remedies to the increasing issue of lack of patient access to primary care. Bodenheimer and Pham (2010) found most of the centres have already introduced an appointment scheduling system which allows patients to get prompt appointments. They also underlined the need to balance the demand for appointments with the centres capacity to provide appointment slots to sustain this innovation [10].

In a further study conducted in the UK, Salisbury *et al.*, compared the priorities and experiences of various patients consulting in primary healthcare centres that do or do not allow advanced access. The findings showed that most patients got their appointments faster in Advanced Access practices but they were not likely to book in advance. According to Salisbury *et al.*, patients were able to be seen by a doctor sooner than those who were in control practice, nevertheless they were not satisfied with the appointment system. Further established that although the different patients had different priorities, most patients preferred being seen on a chosen day rather than being seen quickly. They also noted that most patients in Advanced Access practices had less of a change to be given an appointment which corresponded with their needs compared to patients in control practices. However, they established that how fast the patients get access is not as critical than the appointment choice as most consultations have to do with long-standing health issues. As such, Salisbury *et al.*, conclude that appointment systems should be flexible to meet different patients' needs [31].

Ansell *et al.,* systematically examined the literature to determine effective interventions undertaken to minimise wait times for patients in primary care appointments in Canada. The findings of Ansell *et al.*, study showed that a high number of primary care centres have already executed an appointment system and attained a notable reduction in patients' wait time following appointments. The findings implied that most patients preferred same-day appointments, especially younger patients. However, a high population of elderly patients preferred pre-booked appointments. Together with other studies, Ansell *et al.*, study approved HAS scheduling as an ideal patient-centred model to accommodate the preferences and needs of diverse patient populations [9].

Rose *et al.*, study showed that utilisation of the HAS model lowered patient waiting time, improved no-show rates, continuity of care, as well as patient satisfaction [30]. Such findings were also supported by Mehrotra *et al.*, [25] whose study concluded that utilisation of different scheduling models in outpatient clinics significantly reduced patients' waiting time. In an additional study in southeast England, Ahluwalia and Offredy discovered that while most practice managers and receptionists viewed advanced access as having a significant positive impact on their working lives, general practitioners (GPs) responses were uncertain. According to Ahluwalia and Offredy, most receptionists reported enhancements in their work with changes in their roles from gatekeepers for appointments to offering access to appointments. They also reported a decline in confrontations with patients and increased job satisfaction. Similarly, practice managers reported a decline in work stress from fewer patient complaints, improved time utilisation, and increased flexibility for contingency planning [5]. On the other hand, GPs acknowledged some benefits, such as enhanced consultations, but were concerned about the effects of the model on workload as well as continuity of care. That is, advance access has boosted work conditions for receptionists by changing their roles from gatekeepers to access facilitators while practice managers said patients were more satisfied. None the less, responses by GP were ambivalent because they experienced both negative and positive effects.

The literature review shows that the HAS model has potentially significant positive impacts on patient scheduling in primary healthcare. Those impacts include its capacity to handle variations in healthcare centre's operational factors, such as open access ratio as well as service time, thereby considerably affecting various outpatient clinic's performance measures. Ideally, the use of an HAS will facilitate a simpler scheduling policy because the scheduling manager will understand the optimal no-show rate and the rate of overtime which minimises the total operating loss for the clinics. In this regard, the scheduling manager is aware of the number of patients who should be given appointments and make decisions based on each patients' needs. Additionally, using an HAS pointedly lowered patient waiting time, boosts operational efficiency, and raises patient satisfaction. The model is also effective in helping patients access primary healthcare on time and offers greater flexibility to handle patient calls for varied needs and physician service time.

III. METHODS

The researcher deployed a descriptive-analytical approach based on a non-probability sampling technique. The study used a cross-sectional survey where various clinic staff and patients in Dubai primary healthcare sector were randomly chosen and included to examine their views regarding the essence of using the HAS model in the patient scheduling systems. Precisely, the study was carried out at primary healthcare clinics in Emirate of Dubai engaging 8 healthcare centres between 1st December, 2019 and 28th December, 2019. The study lasted for four weeks to gather data from clinics run by family medicine services also known as "walk-in clinics" and also those managed by specialist services "appointment clinics." In such the medical centres, a walk-in patient who visited the centres were seen by any family medicine doctor on duty while follow-up patients include those given appointments by family medicine doctors to be attended by specialist doctors who normally see them continuously.

In the current study, the researcher first analysed data on all patients of both genders, apart from those who had emergency medical situations or aged below 18 years. The next data analysis unit included all non-medical and medical staff respondents at the chosen healthcare centres including quality managers, the CEO, frontline delivery staff, directors of departments, clinical and non-clinical supervisors, and heads of healthcare centres. The choice for these staff was based on Sit *et al.*, view that such categories possess adequate valuable knowledge on their organisational practices, particularly process management and understand the level of client satisfaction as well as waiting time for service delivery in their given organisations [34].

The researcher employed a single cross-sectional design where data was collected from the respondents once only. A questionnaire was used as the primary

quantitative tool to gather data using a self-administered approach based on the drop-off strategy. The questionnaire used was adapted from Al Haqwi and Al Shehri [7] and Khalaf *et al.*, [21] studies where question naires were designed to explore the patients' and staff's views with the introduction of the HAS model healthcare centres. Two different questionnaires were employed to gather data where the first one was self-administered and filled by staff by offering their levels of contentment with the current walk-in arrangement and their views on the adoption of an appointment system. Additionally, the questionnaire required respondents to note the potential benefits and shortfalls of an appointment system. The patients' respondents were also surveyed using a self-administered questionnaire that included their demographic data and their satisfaction with the current walk-in systems. They were also asked if they would support the plan to introduce the appointment system and their views on the possible advantages as well as disadvantages of such an appointment system.

Additionally, informed consent was sought from the prospective respondents prior to enrolling them in the survey. In the current study, it was difficult to obtain respondents in the target healthcare centres, the researcher had to employ a non-probability sampling technique precisely the convenience sampling method was used. Convenience sampling was chosen based on Easterby-Smith *et al.*, [17] view that it is cheap, the process requires little, and facilitates the involvement of a large sample. Additionally, the approach is commonly used in research since it is "-well-convenient."

The researcher personally distributed the questionnaires to the targeted participants based on their numbers in each target healthcare centre. Precisely, the questionnaires were distributed in healthcare centres within several regions in Dubai. The data was gathered by giving out the questionnaires to the targeted participants including patients and staff and allowing them 72 hours to complete them. Later, follow-up processes, including phone calls and personal visits to the centres were made to obtain the questionnaires for further research actions.

Data analysis was performed using a descriptive content analysis approach with frequency percentages and distribution to analyse patients' demographical data, their satisfaction level on the current walk-in system, as well as their views on the advantages and drawbacks of the existing appointment system.

Patients' contentment was cross-tabulated with varied variables to identify any conceivable correlation between the variables. The correlation was tested using the Chi-Square Test and a P value of less than 0.05 described as significant. The data obtained were analysed using the Statistical Package for Social Sciences (SPSS). Notably, the sample population represented the entire primary healthcare sector population which consists of a total of 2300 people employed in the primary healthcare sector.

A study sample of 302 was used in this survey at a confidence level of 95%. Regarding the patients, a sample size of 78300 patients visits the primary healthcare sector in the country monthly. In this regard, a sample size of 382 was needed in the current study at a 95% confidence level.

Notably, the study required a large sample in order to reduce the sampling error, which could occur due to a non-probability sampling approach and to boost the accuracy of the sampling outcomes as well as its generalizability. Accordingly, 2000 patients and 800 staff questionnaires were distributed for data collection. Out of the total, 624 staff and 1448 patients responded adequately implying that the response rate was 87.00% for staff and 72.40% for patients.

IV. RESULTS AND DISCUSSION

A. Results

Patients' Views

The patients' sample consisted of Emirati 68.9 per cent and non-Emirati 31.1 per cent. The disparity in composition was because the study was conducted in the public health sector, where a high population of Emirati patients have health insurance and received free charge services. Table 1 summarises nationality affiliation of the respondents

Table 1: Patients Nationality.

Nationality	Frequency	%	Valid %	Cumulative %
Emirati	998	68.90	68.90	68.90
Non- Emirati	450	31.10	31.10	100.0

The sample population comprised both males and females but a different percentage. Data in table 2 indicate that 61.8 per cent of the patients' sample population were female and 38.2 per cent were male as shown in Table 2.

Table 2: Gender Analysis.

Gender	Frequency	%	Valid %	Cumulative %
Female	895	61.80	61.80	61.80
Male	553	38.20	38.20	100.00

Patients demography also indicates that about 97.6 per cent of the patients were aged 55 years and below as indicated in Table 3.

Table 3: Age Analysis.

Age Bracket	Frequency	Percentage	Valid percentage	Cumulative percentage
18-24	207	14.30	14.30	14.30
25-34	532	36.70	36.70	51.00
35-44	490	33.80	33.80	84.80
45-54	184	12.80	12.80	97.60
55 and above	35	2.40	2.40	100.00

Concerning patients' distribution by marital status, the majority of them (67.5%) were married, while the rest (32.50%) were single, divorced, or widowed as evident in Table 4.

Table 4: Marital Status Analysis.

Single	399	27.60	27.60	27.60
Married	978	67.50	67.50	95.10
Divorced	49	3.90	3.90	99.00
Widowed	12	1.00	1.00	100.00

Respondents had different education levels as illustrated in Table 5.

Table 5: Education Level.

Less Than High School	179	12.4	12.4	12.4
High School	633	43.7	43.7	56.1
Bachelor	496	34.3	34.3	90.4
Master	89	6.1	6.1	96.5
Doctorate	51	3.5	3.5	100.0
Total	1448	100.0	100.0	

Data on table 5 demonstrates that about 9.60% of the patients had postgraduate degrees, that is, Master and Ph.D. degree, 34.30% of them have Bachelor degrees, 43.70% attained a high school certificate, while 12.40 per cent of them only attained less than secondary school certificates implying that more than 45 per cent of participants are well educated, hence, they could provide adequate data relevant to this study.

Remarkably, a high number (54.40 per cent) of patient respondents said that they were contented with the existing walk-in scheduling arrangement, figure 1 illustrates that close to 74.40 per cent of the patients involved in this study supported the idea to introduce an appointment system to operate concurrently with the current walk-in system or a mixed system. Indeed, only 11.50 per cent of them disagreed and 14.9 per cent of them were not decided. Fig. 1 illustrates patients' attitudes toward the establishment of an appointment system.

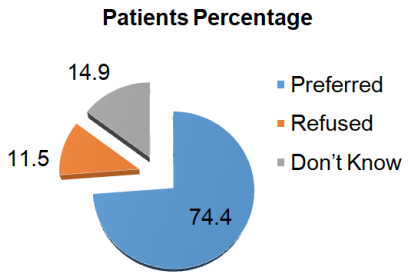

Fig. 1. Patients Attitude towards the Introduction of an Appointment System.

Nonetheless, a higher proportion (82.8%) of women compared to men (76.2%) and Emirati patients 68.90 per cent approved the notion to introduce the appointment structure in primary healthcare centres particularly clinics with considerable differences at P = 0.001 and P = 0.003 respectively as sown on Table 6.

Table 6: Nationality.

Variable	Preferred%	Don't Know(%)	Refused (%)	Chi-Square; P-value
Emirati	68.90	19.70	11.40	11.351; 0.003
Non-Emirati	49.80	27.90	22.30	

Additionally, Table 7, 8 and 9 demonstrate that a similar trend of relation was established with other variables such as gender, age, education as well as marital status.

Table 8 shows that patient respondents aged less than 55 were 82.90 per cent and those married consisted of 93.90 per cent at P=0.002

Table 7: Gender.

Variable	Preferred%	Don't Know%	Refused%	Chi-Square; P-value
Female	82.8	4.9	12.3	18.861; 0.001
Male	76.2	20.1	3.7	

Table 8: Age.

Category	Preferred%	Don't Know%	Refused%	Chi-Square; P-value
18-24	89.30	4.80	5.90	14.3380; 0.002
25-34	84.70	6.80	6.70	
35-44	86.80	5.10	8.10	
45-54	70.60	19.50	9.90	
Above 55	49.40	27.30	23.30	

Table 9: Marital Status.

Status	Preferred%	Don't Know%	Refused%	Chi-Square; P-value
Single	75.50	4.90	19.60	4.229; 0.004
Married	93.90	2.40	3.70	
Divorced	81.70	9.80	8.50	
Widowed	68	19.90	12.10	

Table 10: Education Levels Status.

Level	Preferred%	Don't Know%	Refused%	Chi-Square; P-value
Less Than High School	41.90	36.80	21.3	15.861; 0.002
High School	43.70	29.60	26.7	
Bachelor	87.30	5.70	7	
Master	91.10	2.90	63.8	
Doctorate	92.50	3.70	3.8	

Table 10 shows that 90.40% of those with education qualification above school certificate supported the introduction of the appointment model in primary healthcare clinics with considerable differences at P = 0.002.

About the advantages and disadvantages of using the suggested appointment system to operate together with the concurrent walk-in system (HAS model), the outcomes indicate that a decline in the waiting time ranked first (80.22%) as the key benefit of establishing an appointment system. The other benefit noted by 79.20 per cent of patients who participated was time-saving. The top disadvantages outlined about introducing the system include difficult to get appointment, inflexibility, the system suits hospital setting only, and that is not beneficial for other cases such as acute care and at certain risk such as pregnant women. These sentiments were reported by 19.80 per cent, 13.10 per cent, 10.20 per cent and 8.40 per cent respectively.

Healthcare Providers' Views: The study involved 624 staff members including 61 clerks, 189 physicians, 319 nurses, and 55 different health providers. Regarding the existing walk-in system, 59.60 per cent of the providers were satisfied with it, 18.9 per cent not satisfied while the rest 21.50 per cent were not decided. Further results

showed that the majority of clinics' staff respondents (78.90 per cent) approved the introduction of the new appointment system. Remarkably, only 8.20 per cent did not agree and 12.90 per cent of the respondents were not decided as sown on Fig. 2.

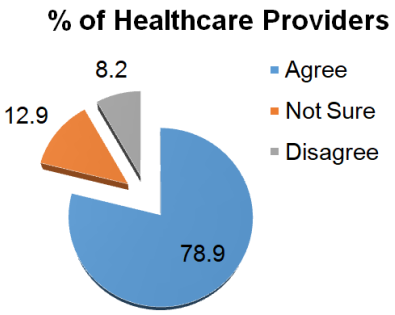

Fig. 2. Attitude of Healthcare Providers towards Introducing Appointment System.

Healthcare providers who partook in this survey perceived the availability and flexibility as major benefits but they underlined several disadvantages including clinic overloading, difficulties following up appointments, particularly those with chronic disorders, and long waiting time. Providers outlined that the advantages of using an appointment system enhanced quality of healthcare, improved organisation of time for both patients and staff, improved relationship between doctors and patients, allowed for easier follow-up for individual patients who visit the centre regularly with chronic illnesses, reduced need for more spaces in the waiting rooms, reduced waiting time, and reduced risk of cross-infection. On the other hand, they identified issues of no-shows, late arrivals, and not being beneficial for acute cases as the disadvantages of an appointment system. Nevertheless, the providers were confident that the appointment system will improve the efficiency of care particularly for chronic disorders and will enhance flexibility to serve all the patients at their preferred time.

V. DISCUSSION

The literature review showed that the primary healthcare sector in Dubai suffers from a continuously declining total number of patients implying that most patients currently do not seek medical services [1, 3]. Additionally, despite that the average patient waiting time in Dubai is within the acceptable range compared to the results of studies in the primary healthcare sector, Aburayya *et al.*, [3] resolved that such waiting time seems to be lengthy. Moreover, some factors that affect waiting time were established in Dubai primary healthcare centres including lack of adequate work processes, heavy workload as well as poor or lack of administrative and medical facilities [3]. These inadequate facilities contribute to inaccessibility and long waiting time in primary healthcare settings [3]. In this regard, it is essential to use various methods and employ efficient strategies to enable patients' access to quality healthcare services for the centres remain competitive and boost patient's experience by minimising the waiting time. Notably, the attempts implemented by Dubai top management in healthcare in following patients' access to the centres and the waiting time is impressive and notable progress has occurred to move forward to get proper remedies such as using a hybrid scheduling system. Therefore, the current study explored the views of patients as well as and healthcare providers in various primary healthcare centres in Dubai concerning the introduction of HAS meant to schedule patients on the basis of their preference. Remarkably, it should be noted here that the study's objective does not have any hypothesis.

The outcome of the current study designates that patients and healthcare providers approve the idea of adopting a hybrid appointment system in Dubai primary healthcare to operate alongside the current walk-in system (HAS model). The use of this model is supported by the results of different studies [7, 9, 20, 21, 31, 37]. For example, Khalaf *et al.*, explored the perspectives of patients and physicians regarding the introduction of HAS in primary care centres. The outcomes demonstrated that the majority of consumers (79.60 per cent) braced the notion of using the HAS model. Equally, a high number of physicians (95.70%) favoured the introduction of the HAS model [21]. As such, Khalaf *et al.*, [21] concluded that both physicians and patients indicated positive attitudes towards adopting the HAS model in primary healthcare facilities. Al Haqwi and Al Shehri further explored opinions and satisfaction of consumers and providers of care in primary healthcare regarding walk-in and the introduction of the appointment system. The results proved that the majority of consumers and providers of care were in favour of introducing appointments despite their satisfaction with the existing walk-in system. They concluded that both consumers and providers supported the idea of introducing the appointment mixed system in primary care [7].

Using a HAS considerably lowers patient waiting time, boosts operational efficiency, raises patient satisfaction levels, ensures timely access to primary healthcare, and offers greater flexibility to attend to varying patient calls as well as physician service time [3, 9, 20, 21, 26, 30, 36, 37]. To enhance the efficiency of primary care scheduling, studies have established that most outpatient clinics have already introduced the utilisation of the HAS model. For instance, Aburayya *et al.*, recommended that medical clinics should embrace the use of the appointment structure for typical medical visits such as follow-up patients and improve their scheduling systems [3]. Srinivas and Ravindran indicated that the use of HAS model results in a significantly lower expected cost. In other words, it minimizes the expected total cost - a weighted sum of excessive patient waiting time, resource idle time, resource overtime, and denied appointment requests [36]. Furthermore, Srinivas and Khasawneh suggested a mixed-integer linear programming (MILP) paradigm for use in a HAS model that schedules patients based on their preference in the US. The findings illustrated that the HAS can handle variations in the clinic's daily operational factors, particularly variation of at least 20 per cent in open access ratio and service time [37]. Likewise, Munavalli *et al.,* recommended an integral patient scheduling approach that combines the status as well as information of the departments together with all

conceivable pathways to direct patients upon arrival to the optimal path. The outcomes revealed that a hybrid model minimised patients' average waiting time by about 33 per cent and the average cycle time by about 18.450 per cent. Also, the model reduced the variability in patient waiting duration and cycle time. Furthermore, the proportion of patients taking more than 2 hours was reduced from 13.50 per cent to 8.40 per cent. Munavalli *et al.*, realised that the HAS model can help solve the growing issue of long waiting time as well as poor patient access to primary care. In other words, some management practices have already deployed appointment system scheduling to enable patients to get prompt appointments [26]. For Instance, in the UK, Salisbury *et al.*, uncovered that most patients obtained their appointments faster in Advanced Access practices (AAP). Most patients' top priority was to see the doctor or physician on a day of choice instead of being seen quickly. However, patients in AAP were neither more nor less likely to get appointments that corresponded to their needs and priorities than the ones in control practices. That is, patients are attended more quickly under AAP but the swiftness of access is not much essential to patients compared to the choice of appointments because of most of the consultations related to long-standing health problems [31].

In the current study, local patients particularly Emirati citizens, well educated, married women as well as those aged below 55 years were considered were the majority of those who supported the use of appointment systems in primary healthcare centres. Notably, Emirati patients have diverse outlooks for healthcare services compared to expats in terms of specialised treatment as well as speed access to health services given the lifestyle in the country which supports fast service delivery in all both private and government entities. Besides, female patients particularly married women approved the idea of adopting an appointment system most likely due to their responsibilities at home and time constraints. Equally, young people and well-educated respondents favoured the idea of executing an appointment system conceivably because they are technology aware. Markedly, such a group has comparatively significant technology assets and has positive views about the benefits associated with online platforms. The other group consisting of older and less educated individuals with significant difficulties with technology awareness or health-related disabilities is largely physically and psychologically detached from digital tools and services. Such outcomes were reinforced by abundant studies [7, 21].

Remarkably, prolonged waiting times are the leading cause of dissatisfaction among patients [1, 2, 3]. In this regard, it is unsurprising that lowering the waiting time was among the top benefits noted by the patients. Healthcare providers underline the following benefits of an appointment system: improved healthcare quality, improved time organisation for both staff and patients, improved relationship between doctors and patients, improved follow-up for patients regularly visiting the clinics with chronic diseases, reduced requirement for more spaces, especially in the waiting room, minimal waiting time, and reduced risk of cross infections. Healthcare providers also identify some shortcomings for an appointment system including the issues of no attendance or no show, issue of late arrivals, and also less beneficial to acute care cases. Therefore, an appointment system needs to be flexible and consist of walk-in and appointment to avoid such perceived drawbacks. Essentially, Aburayya *et al.,* made similar recommendations noting that medical clinics not only in Dubai but also other regions should embrace the use of the appointment structure for typical medical visits such as follow-up patients and improve their scheduling systems [3]. These outcomes were further approved by many studies including [21, 36, 37, 40]. In the current study, about 35 per cent of the respondents said that most doctors were rushed during consultation implying that the patients are aware of the pressure doctors experience during the consultation. Most likely, this resulted from the unpredictable high workload of the "Walk-In System" among other factors such as the dynamic consumer expectations [3, 7]. Nonetheless, this issue can be addressed through efficient time management consisting of the appointment system as recommended [3, 31, 36].

VI. CONCLUSION

Challenges in access to healthcare providers and services have been widely acknowledged as a major hindrance to care as it affects not only service quality but also building rapport with customers. Healthcare policy-makers and administrators consider difficult access as a serious issue, especially in primary healthcare centres because it is one of the most tedious phases of the procedure in the healthcare system, as it acts as a hindrance to efficient flow of patients, thereby leaving the patients not only distressed but also dissatisfied. Particularly, access to family doctors for consultations is a paramount health policy matter. Given the recent concerns among public policy health advocates and patients regarding long waiting time as well as patients' lack of opportunities to book appointments prior to meeting the doctors, this paper aimed to explore the views of healthcare providers and patients in primary healthcare centres in Dubai regarding the need to introduce HAS which schedules patients attendance by doctors on the basis of their preference thereby reducing the systems total time loss. The current study approved the outcome of different researches, which favour the idea of establishing the appointment framework in the primary healthcare sector. The study proposes a HAS consisting of two appointment scheduling methods; appointment system and walk-ins. The outcomes of the study showed that the majority of patients approved the notion of establishing the HAS framework. Specifically, Emirati patients including married women as well as well-educated patients and those aged 55 years and below supported the idea of introducing the system of appointment. Similarly, the majority of clinics' staff also supported the introduction of the appointment system. The respondents, mainly patients and healthcare providers perceived accessibility, availability, saving time through reduced waiting time as the central benefit of using the appointment system. However, they admitted the following disadvantages; difficult to get appointment, now show and it is not beneficial for

patients with acute cases. Nevertheless, the respondents indicated a positive attitude towards the establishment of HAS, especially in primary healthcare centres in the region. This study further concluded that adopting the HAS model considerably lowers patient waiting time, boosts operational efficiency, raises patient satisfaction levels, ensures timely access to primary healthcare, and offers greater flexibility to attend to varying patient calls as well as physician service time.

VII. FUTURE SCOPE AND LIMITATIONS

Nonetheless, the researchers acknowledge that the data presented in this study might not represent the entire population because of public healthcare centres to Dubai. Therefore, further studies are needed. In addition, the adoption of an appointment system in primary healthcare centres should be flexible. Furthermore, an effective appointment system in the centres should be properly funded and supported with necessary information technology and an effective communication system. Finally, some limitations were experienced in this research study that should be considered in future research on this topic. First, despite this study adopted a cross-sectional design with data collected using survey questionnaires and a short period for data collection, it is noteworthy that longitudinal research design could be employed to have precise evidence of the application of HAS model over time. This study was also carried out in 8 different healthcare centres, the differences in terms of the structure and operations in different centres could have affected the outcomes. Besides, the data required in the current study were obtained using a survey questionnaire. Therefore, further studies should use different data gathering means or utilising data triangulation strategies such as interviews and observations for patients as well as healthcare providers in order to obtain a clear picture regarding the use of HAS model.

ACKNOWLEDGEMENT

The authors would like to acknowledge the contributions of the anonymous reviewers whose valuable comments and insightful suggestions led to the improvement of the preliminary version of this paper.

Conflict of Interest. The authors declare no conflict of interest associated with this work.

REFERENCES

[1]. Aburayya, A., Marzouqi, A., Alawadhi, D., Abdouli, F., & Taryam, M. (2020). An empirical investigation of the effect of employees' customer orientation on customer loyalty through the mediating role of customer satisfaction and service quality. *Management Science Letters*, *10*(10), 2147-2158.

[2]. Aburayya, A., Alawadhi, D., & Taryam, M. (2019a). A conceptual framework for implementing TQM in the primary healthcare centers and examining its impact on patient satisfaction. *International Journal of Advanced Research, 7*(3), 1047-1065.

[3]. Aburayya, A., Alshurideh, M., Albqaeen, A., Alawadhi, D., & Ayadeh, I. (2019b). An investigation of factors affecting patients waiting time in primary health care centers: An assessment study in Dubai. *Management Science Letters, 10*(6), 1265-1276.

[4]. Adegboyega, K., & Musa, H. (2019). Managing Health Records in the Context of Service Delivery: Issues and Challenges. *Covenant Journal of Business and Social Science, 10*(2), 1-11.

[5]. Ahluwalia, S., & Offredy, M. (2005). A qualitative study of the impact of the implementation of advanced access in primary healthcare on the working lives of general practice staff. *BMC Family Practice*, *6*(1), 1-9.

[6]. Ahmadi-Javid, A., Jalali, Z., & Klassen, K. J. (2017). Outpatient Appointment Systems in Healthcare: A Review of Optimization Studies. *European Journal of Operational Research*, *258*(1), 3-34.

[7]. Al Haqwi, A.I., & AlShehri, A. M. (2007). Appointment system in primary care: opinion of consumers and providers. *Journal Family Community Med.*, *14*(3), 99-102.

[8]. Al-Neyadi, H. S., Abdallah, S., & Malik, M. (2018). Measuring Patient Satisfaction of Healthcare Services in the UAE hospitals: Using SERVQUAL. *International Journal of Healthcare Management, 11*(2), 96-105.

[9]. Ansell, D., Crispo, J., Simard, B., & Bjerre, L. (2017). Interventions to reduce wait times for primary care appointments: a systematic review. *BMC Health Services Research, 17*(295), 1-9.

[10]. Bodenheimer, T., & Pham, H. H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs*, *29*(5), 799–805.

[11]. Brahimi, M., & Worthington, D. J. (1991). Queueing Models for Out-Patient Appointment Systems: A Case Study. *The Journal of the Operational Research Society*, *42*(9), 733–746.

[12]. Cao, W., Wan, Y., Tu, H., Shang, F., Liu, D., & Tan, Z. (2011). A web-based appointment system to reduce waiting for outpatients: a retrospective study. *BMC Health Service Res.*, *22*(11), 318.

[13]. Cayirli, T., & Gunes, E. D. (2013). Outpatient appointment scheduling in presence of seasonal walk-ins. *Journal of the Operational Research Society*, *65*(4): 512–531.

[14]. Chang, W., & Chang, Y. (2018). Design of a Patient-Centred Appointment Scheduling with Artificial Neural Network and Discrete Event Simulation. *Journal of Service Science and Management, 11*(1), 71-82.

[15]. Dantas, L. F., Julia, F. L., Oliveira, F. L. C. & Hamacher, S. (2018). No-shows in Appointment Scheduling–A Systematic Literature Review. *Health Policy*, *122*(4), 412-421.

[16]. Dubai Health Authority (2019). Open Data. Available at :< https://www.dha.gov.ae/en/Pages/Opendata.aspx> [Accessed 1 February 2020].

[17]. Easterby-Smith, M., Thorpe, R., & Jackson, P. R. (2012). *Management research: An introduction.* 2nd Ed. London: Sage Publications Ltd.

[18]. Green, L. V., Kolesar, P. J., & Whitt, W. (2007). Coping with time varying demand when setting staffing requirements for a service system. *Production and Operations Management*, *16*(1), 13–39.

[19]. Gupta, D., & Denton, B. (2008). Appointment scheduling in health care: challenges and opportunities. *IIE Transactions*, *40*(9), 800–819.

[20]. He, Y., Li, M., Sala-Diakanda, S., Sepulveda, J., Bozorogi, A., & Karwowski, W. (2013). A hybrid modelling and simulation methodology for formulating overbooking policies. *Proceedings of Industrial and Systems Engineering Research Conference*, San Juan, Puerto Rico, 1358–1366.
[21. Khalaf, S. K., Al-Asadi, J. N., Abed, A. H., & Shami, S. A. (2014). Evolving an appointment system in PHC centers in Basrah: Opinion of physicians and patients. *Thi-Qar Medical Journal*, *8*(1), 13-24.
[22]. Koornneef, E., Robben, P., & Blair, I. (2017). Progress and Outcomes of Health Systems Reform In The United Arab Emirates: A Systematic Review. *BMC Health Services Research, 17*(1), 1-13.
[23]. Laiyemo, A.O., Williams, C.D., Burnside, C., Moghadam, S., Sanasi-Bhola, K.D., Kwagyan, J., Brim, H., Ashktorab, H., Scott, V., & Smoot, D. T. (2014). Factors associated with attendance to scheduled outpatient endoscopy. *Postgraduate Medical Journal*, *90*(1068), 571–575.
[24]. Lee, S., & Yih, Y. (2010). Analysis of an open access scheduling system in outpatient clinics: a simulation study. *Simulation*, *86*(8–9), 503–518.
[25]. Mehrotra, A., Keehl-Markowitz, L., & Ayanian, J. (2008). Implementation of Open Access Scheduling in Primary Care: A Cautionary Tale. *Ann Intern Med*, *148*(12), 915–922.
[26]. Munavalli, J. R., Rao, S.V., Srinivasan, A. & Merode, F. A. (2019). Integral patient scheduling in outpatient clinics under demand uncertainty to minimize patient waiting times. *Health Informatics Journal*, *1*(14), 1-14.
[27]. Patrick, J. (2012). A Markov decision model for determining optimal outpatient scheduling. *Health Care Management Science*, *15*(20), 91–102.
[28]. Peng, Y., Qu, X., & Shi, J. (2014). A hybrid simulation and genetic algorithm approach to determine the optimal scheduling templates for open access clinics admitting walk-in patients. *Computers & Industrial Engineering*, *72*(13), 282–296.
[29]. Qu, X., Rardin, R. L., & Williams, J. A. (2011). Single versus hybrid time horizons for open access scheduling. *Computers & Industrial Engineering*, *60*(1), 56–65.
[30]. Rose, K., Ross, J. S. & Horwitz, L. (2011). Advanced access-scheduling outcomes: A systematic review. *Arch Intern Med, 171*(13), 1150–1159.
[31]. Salisbury, C., Goodall, S., Montgomery, A., Pickin, D., Edwards, S., Sampson, F., Simons, L., & Lattimer, V. (2007). Does Advanced Access improve access to primary health care? Questionnaire survey of patients, *British Journal of General Practice, 3*(2), 615-621.
[32]. Samorani, M., & LaGanga, L. R. (2015). Outpatient appointment scheduling given individual day-dependent no-show predictions. *European Journal of Operational Research*, *240*(1), 245–257.
[33]. Schoenfelder, J., Bretthauer, K. M., Wright, P., & Coe, E. (2020). Nurse Scheduling with Quick-Response Methods: Improving Hospital Performance, Nurse Workload, And Patient Experience. *European Journal of Operational Research*, *283*(1), 390-403.
[34]. Sit, W-Y., Ooi, K-B., Lin, B., & Chong, A. Y. L. (2009). TQM and Customer satisfaction in Malaysia‟s service sector. *Industrial Management and Data Systems*, *109*(7), 957–975.
[35]. Spüntrup, F. S., Dalle A. G., Imsland, L., & Harjunkoski, I. (2019). Optimal Maintenance Scheduling for Washing of Compressors to Increase Operational Efficiency. *Computer-Aided Chemical Engineering*, *46*(1), 1321-1326.
[36]. Srinivas, S., & Ravindran, A. (2020). Designing schedule configuration of a hybrid appointment system for a two-stage outpatient clinic with multiple servers. *Health Care Management Science*.https://doi.org/10.1007/s10729-019-09501-4.
[37]. Srinivas, S., & Khasawneh, M. T. (2017). Design and analysis of a hybrid appointment system for patient scheduling: an optimization approach. *International Journal of Operational Research*, *29*(3), 376-399.
[38]. Suss, S., Bhuiyan, N., Demirli, K., & Batist, G. (2017). Toward Implementing Patient Flow In A Cancer Treatment Centre To Reduce Patient Waiting Time And Improve Efficiency. *Journal of Oncology Practice, 13*(6), 530-537.
[39]. Yang, K. K., & Cayirli, T. (2019). Managing clinic variability with same-day scheduling, intervention for no-shows, and seasonal capacity adjustments. *Journal of the Operational Research Society*, *71*(1), 133-152.
[40]. Zhao, P., Yoo, I., Lavoie, J., Lavoie, J., & Simoes, E. (2017). Web-Based Medical Appointment Systems: A Systematic Review. *J. Med. Internet Res.*,*19*(4), 1-17.

How to cite this article: Aburayya, A., Marzouqi, A. Al, Ayadeh, I. Al, Albqaeen, A. and Mubarak, S. (2020). Evolving A Hybrid Appointment System for Patient Scheduling in Primary Healthcare Centres in Dubai: Perceptions of Patients and Healthcare Provider. *International Journal on Emerging Technologies*, *11*(2): 251–260.