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Evaluation of pharmacy value-added services in public health facilities: Staff perception and cost analysis

Izzati Yussof *, Nor Haizan Ibrahim, Asilah Che Ayub, Norsyazana Ab Hashim, Ching Ju Choon, Chew Yee Chee, Asma Amalina Abdul Rani, Helmi Hafiz Hashim

Pharmaceutical Services Division, Jabatan Kesihatan Wilayah Persekutuan Kuala Lumpur & Putrajaya, 50590 Kuala Lumpur, Malaysia

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ABSTRACT

Background: Pharmacy Value Added Services (VAS) were introduced in Malaysian public health facilities to facilitate the process of medicine collection. Examples include Drive-through pharmacy, Medicine by Post, SMS Take&Go, Appointment Card and medicine locker, commonly referred to as Medibox.
Objectives: To assess the perception of VAS among pharmacy staff, and to compare the time and cost needed to prepare medications for VAS and conventional counter service.
Methods: A cross-sectional study was conducted in 17 public health facilities across Kuala Lumpur and Putrajaya from May until September 2020. There were two parts of this study: 1) a survey on the perception of VAS among pharmacy staff, which assessed respondents' experience of handling VAS and their perception towards the services; and 2) a cost analysis to compare the direct cost of preparing refill medications for VAS and conventional counter service, estimated from average salary and direct non-medical cost.
Results: 290 respondents answered the survey. Most respondents had a positive opinion about VAS. Lack of storage and insufficient manpower were the top two barriers in VAS utilisation and implementation as perceived by pharmacy staff. The average time (in minutes) needed to prepare one prescription was highest for Medicine by Post service (10.31), followed by Medibox (10.25), Appointment Systems (6.24) and conventional counter service (3.99). Medibox had the highest average cost per prescription (RM5.49), followed by Medicine by Post (RM5.05), Appointment Systems (RM2.89) and conventional counter service (RM1.75).
Conclusions: The majority of the respondents involved in this study acknowledged the benefits of VAS to patients, but there were aspects of the services that could be improved. Preparation of patient medication for VAS requires significantly more time and cost than conventional counter service, indicating the need to review and streamline implementation of the services.

1. Introduction

Effective medicines supply management is a key component of accessible, sustainable, and equitable healthcare. Ensuring medication accessibility and an uninterrupted medicine supply is crucial for patients with chronic diseases to maintain their quality of life and reduce long-term healthcare costs.[1] To improve medication accessibility and continuous supply of medicine, various methods have been introduced worldwide, such as mail-order pharmacy and drive-through pharmacy. With the advent of the Coronavirus Disease 2019 (COVID-19) pandemic, the utilisation of these alternative services for medication collection is more important than ever.[2] Reducing congestion in public areas has become a worldwide priority to curb the spread of COVID-19, and pharmacists can contribute by limiting avoidable patient visits to the pharmacy.[3]

In Malaysia, government-funded healthcare services provided by public hospitals and health clinics cater for a large proportion of the population due to their affordability and accessibility. The number of outpatient visits in public health facilities in 2018 was reported to be 66.9 million, compared to approximately 3.8 million outpatient visits in private health facilities in the same year.[4] This resulted in congestion and long waiting time for patients in public health facilities. With the aim of improving patient access to medicines and reducing congestion at public health facilities, pharmacy Value Added Services (VAS) were introduced in 2003 by the Pharmaceutical Services Division, Ministry of Health Malaysia (MOHM).[5] Types of VAS

Abbreviations: VAS, Value Added Service; MOHM, Ministry of Health Malaysia; UMP, Medicines by Post (*Ubat Melalui Pos*); SMS, Short Message Service; SPUB, Integrated Drug Dispensing System (*Sistem Pendispensan Ubat Bersepadu*); RM, Malaysian Ringgit (*Ringgit Malaysia*).

* Corresponding author at: Pharmaceutical Services Divisions, Jabatan Kesihatan Wilayah Persekutuan Kuala Lumpur & Putrajaya, (Kuala Lumpur & Putrajaya Health Department), Jalan Cenderasari, 50590 Kuala Lumpur, Malaysia.
E-mail address: izzati.yussof@moh.gov.my (I. Yussof).

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available in Malaysian public health facilities include Medicines by Post (better known as *Ubat Melalui Pos* or UMP), Drive-through pharmacy, medicine lockers (better known as Medibox), Appointment Card and other appointment-based systems where clients can directly contact the pharmacy to choose their preferred medicine collection time using short message service (SMS), telephone, WhatsApp, e-mail and other online-based methods. Medibox is a unique service that allows medicine supply through specialised medicine lockers located in public areas for easy access.[6] These services allow for a faster and more convenient experience for patients who need to refill their medicines.

In the year 2019, all facilities under MOHM were required to supply at least 20% of patients' refill medication through any of the available VAS as an effort to promote their use and improve uptake by patients. The pandemic increased the necessity of VAS, and there was a 27.3% increase in VAS uptake in 2020 compared to 2019 among patients of public health facilities in Kuala Lumpur and Putrajaya.[7] VAS are routinely offered to patients prescribed with long-term chronic medicines, and registration is required for UMP and Medibox services. By default, the first medicine supply after a doctor's appointment needs to be dispensed at the pharmacy counter to ensure that any changes in medication regime are verified and patients can be properly counselled. Proper documentation is important in VAS to ensure records can be traced efficiently. The workflows involved in medicine refills for conventional counter service and VAS are compared in Fig. 1.

Past studies have shown the benefits of these alternative services, including reduced patient waiting time at outpatient pharmacies,[8] increased patient satisfaction[9] and improved medication adherence.[10] Studies that explored patients' knowledge, attitude and perception towards VAS have shown that patients were overall satisfied with the service.[9,11,12] However, there were relatively few studies that look at delivery of these services from healthcare providers' perspective, and most of these focus on the cost analysis of mail-order pharmacy in the United States in terms of co-payment and reimbursement, which is markedly different from the system in Malaysia.[13,14] Due to the pandemic, MOHM increased promotion of VAS and even offered free postal fee for UMP service during the first nationwide movement control order, which resulted in over fourfold increase in uptake by patients.[15] The pandemic highlighted the importance of VAS, and it is imperative that the services are reviewed and evaluated to ensure continuous improvement. The objectives of this study were to assess the perception of VAS among pharmacy staff in public health facilities of Kuala Lumpur

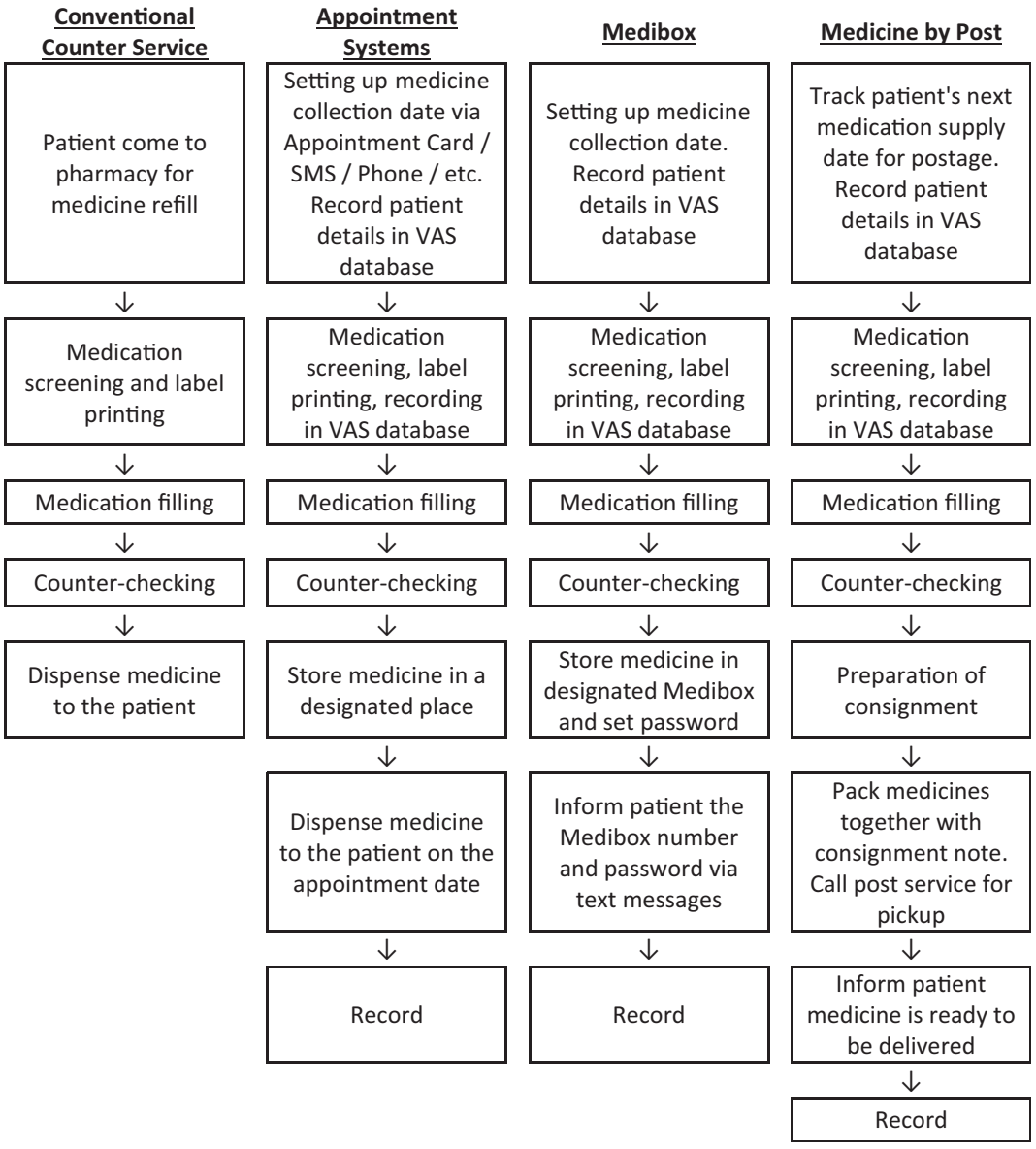

Fig. 1. Flow process of conventional counter service and VAS.

and Putrajaya, as well as to assess the impact of VAS implementation on staff workload by analysing the time and cost needed to prepare medications using VAS and conventional counter service.

2. Methods

2.1. Study design

A cross-sectional study was conducted in public health facilities of Kuala Lumpur and Putrajaya, involving a government hospital and 16 health clinics actively involved in the provision of VAS. Data collection was conducted from May until September 2020 and consisted of two main parts: (i) questionnaire on the perception of VAS among pharmacy staff, and (ii) cost analysis comparing different types of VAS and conventional counter service. The study was registered with National Medical Research Register (NMRR-19-3881-51845), and permission to conduct the study was obtained from Medical Research and Ethics Committee, MOHM.

2.2. Data collection - questionnaire

The target population for the questionnaire was pharmacists and assistant pharmacists (commonly referred to as pharmacy technicians) working in the outpatient pharmacy of a public hospital and health clinics in Kuala Lumpur and Putrajaya. Those who were exclusively involved with administrative work, logistic pharmacy, inpatient service, and other services unrelated to outpatient pharmacy service were excluded from the study. Using Raosoft sample size calculator, a total of 176 respondents were required for this study based on the computed values of population size = 332, margin of error = 5%, confidence level = 95%, and response distribution = 50%.[16]

A self-developed questionnaire was used for the study, created based on the input from group discussion among researchers who had been directly involved in VAS, as well as information from past studies that explored patient perception of VAS.[7–9] The questionnaire was divided into three main sections: (i) respondent's demographic information, (ii) general information on VAS in respondent's facility, and (iii) general perception towards VAS. The third section evaluated respondent's perception of VAS in terms of benefits to patients, impact on staff, service delivery and effect on pharmacy service using 5-point Likert items. To identify the most important barriers that prevented patients from using VAS, scores were calculated based on frequency distribution and weighted values of the answers (Strongly agree = 5, Agree = 4, Neutral = 3, Disagree = 2, and Strongly Disagree = 1). An open-ended question asking for suggestions for improvement of VAS was included at the end of the questionnaire. The responses were read by different investigators, who identified codes and extracted relevant information throughout the entire dataset to identify related themes from the suggestions. Through group discussion, the codes that have similar concepts were combined to create potential themes.

The questionnaire was validated for its content by three experts in pharmacy practice to assess the suitability of language and overall content. The content was further validated in a pilot study through cognitive debriefing involving 18 pharmacy staff from various health clinics to assess comprehension, retrieval, judgment, response, and response burden. The questionnaire was prepared using Google form and distributed to respondents through their facilities' e-mail. A pharmacist from each facility was appointed as data collectors, who distributed the questionnaire to all eligible staff in their facilities through convenience sampling.

2.3. Data collection – cost analysis

The cost analysis was conducted from healthcare provider's perspective, based on personnel cost and any additional transport cost needed to prepare repeat prescriptions. The time allocated for dispensing was not included as the duration of dispensing varies widely depending on various other factors. For this study, VAS were divided into three main categories based on the steps involved in medicine preparation: Appointment Systems, UMP, and Medibox. Most VAS were grouped into Appointment Systems, which include Drive-through pharmacy, Appointment Card, SMS Take&Go, and other VAS that involve setting up an appointment date for medicine collection and collection of medicines from pharmacy staff. UMP and Medibox were considered distinct as they required additional steps in drug preparation and did not require medicine collection from pharmacy staff.

New prescriptions and prescriptions for acute conditions were excluded for cost analysis. The number of prescriptions needed for analysis was estimated using Raosoft sample size calculator[16] based on the total number of service uptake from January until December 2019. The minimum number of repeat prescriptions to be analyzed for cost analysis was 337 for both conventional counter service and the Appointment Systems. UMP service and Medibox service required 307 and 92 prescriptions, respectively. The minimum figures were divided among the facilities involved in data collection, based on the service uptake at each facility.

Data collectors appointed from each facility were trained to standardise data recording. A standardised workflow for the steps involved in drug preparation was prepared for each service, and every facility was also given a standard data collection form and time-motion sheet to be filled during the data collection. Only direct medical cost (personnel cost) and direct non-medical cost (the cost of delivery to medicine lockers located in separate public buildings) were included in the analysis. The cost incurred by patients to collect medicine was not included. Personnel cost was calculated based on minute wages, determined by pharmacists' and assistant pharmacists' basic annual salary following the pay scale of the Federal Civil Service Officers of Malaysia. The salary used for calculation was RM0.538/min and RM0.329/min for pharmacist and assistant pharmacist, respectively. Delivery cost for Medibox service was calculated based on the mileage claim for the journey between the health facility and Medibox location. The rate of mileage claim was RM0.85/km. A summary of the processes involved and cost calculation for each service are defined in Table 1.

2.4. Statistical analysis

Data were recorded in Microsoft Excel 2013 and analysed using IBM SPSS Statistics version 24. Normality of data was checked before analysis based on skewness, kurtosis and normality test in SPSS. Kruskal-Wallis and Dunnett T3 tests were used to compare the time and cost needed to prepare medicine through VAS and conventional counter service. Descriptive statistics such as frequency and percentage were used to represent the data collected from the survey (e.g.: type of facility, profession, perception of VAS), and mean ± standard deviation was used for continuous data (e.g.: duration of service, time spent doing VAS, score for VAS barriers).

3. Results

3.1. Questionnaire

A total of 290 respondents answered the survey, with a response rate of 87.3%. Out of these, 174 (60%) were directly involved in the preparation of

Table 1
Summary of processes involved and cost calculation for each service.

Service	Cost Calculation
Conventional Counter service	Time needed for screening prescription + drug filling + counter-checking
Appointment Systems	Time needed for screening prescription and recording patient details on VAS database + drug filling + counter-checking + storing of medicine in designated space
Medicine by Post	Time needed for screening prescription and recording patient details on VAS database + drug filling + counter-checking + preparing consignment + packing the drugs for postage + sending reminder messages to patients
Medibox	Time needed for screening prescription and recording patient details on VAS database + drug filling + counter-checking + storing of medicine in designated Medibox located in a separate facility + sending messages to patients to inform Medibox number and password

VAS and were directed to answer questions related to VAS involvement, such as duration of VAS involvement and time spent doing VAS activities during and after office hours. Answers from all respondents were pooled together to determine the methods of VAS promotion used in each facility. This is summarised in Table 2.

UMP (N = 97, 33.4%), Drive-through pharmacy (N = 66, 22.8%) and SMS Take&Go (N = 33, 11.4%) were the top three preferred VAS, voted based on the perspective of a health care personnel. The types of VAS most frequently voted as least preferred were Integrated Drug Dispensing System (N = 81, 27.9%), UMP (N = 61, 21.0%) and Call&Collect (N = 33, 11.4%). Among the respondents who were directly involved with VAS preparation, 62 (35.6%) respondents from 12 facilities had encountered a medication error among patients using UMP and Medibox services.

Overall, the majority of the respondents were optimistic about the benefits of VAS to patients, and the respondents agreed or strongly agreed that VAS are beneficial to patients (N = 259, 89.3%), help to reduce waiting time at the counter (N = 256, 88.3%), create higher satisfaction among patients (N = 216, 74.5%) and simplify the process of medication collection for patients (N = 222, 76.6%). However, there was relatively less optimism regarding the impact on staff, with 60.7% (N = 176) of respondents feeling that drug preparation for VAS was more time-consuming than standard counter dispensing. Regarding service delivery, less than half of respondents agreed or strongly agreed that they have sufficient space to store prepacked VAS medication (N = 81, 27.9%) and manpower to promote and provide VAS (N = 130, 44.8%). Respondents were also asked about their perception of VAS impact on pharmacy service regarding medication wastage, medication error and adherence, with relatively mixed responses. A summary of respondents' perceptions towards VAS is shown in Table 3.

Table 4 summarises the implementation issues and barriers in VAS utilisation. Lack of storage (Score = 4.01 ± 1.01) was considered the biggest barrier, followed by insufficient staff to handle VAS (Score = 3.76 ± 1.01), lack of interest among patients and clients to try new services (Score = 3.69 ± 1.02), high burden of repeat prescription (Score = 3.66 ± 1.01), and lack of standardisation of VAS between different MOH facilities (Score = 3.64 ± 1.01).

A total of 82 respondents provided suggestions to improve the implementation of VAS. Four main themes were identified: space, manpower, system and promotion. With the increasing number of patients using VAS, respondents expressed the need for more space to store prepacked VAS medication and more manpower to handle VAS activities. There were also suggestions to improve the system, such as standardisation of workflow and limiting available types of VAS by emphasising selected services that are more manageable. Respondents also suggested extending VAS promotion to mass media and social media and ensuring that other healthcare personnel are also aware of the types of available services. The suggestions are summarised in Table 5.

Table 2
Respondent demographics and VAS Information.

Characteristics	N (%)/Mean ± SD
Participant's facility:	
Hospital	18 (6.3%)
Health clinic	272 (93.7%)
Profession:	
Pharmacist	228 (78.6%)
Assistant pharmacist	62 (21.4%)
Duration of service (years):	6.04 ± 4.42
Status of involvement with VAS:	
Direct	174 (60.0%)
Indirect	116 (40.0%)
Duration of VAS involvement (years):	2.87 ± 2.69
Time spent doing VAS in working hours per week (hours):	
Hospital	21.17 ± 15.96
Health clinic	8.56 ± 9.56
Overall	9.43 ± 10.56
Work after office hours to prepare VAS medication in the past three months?	
Never	120 (69.0%)
Rarely (once in several months)	24 (13.8%)
Sometimes (once a month)	20 (11.5%)
Often (several times in a month)	6 (3.5%)
Always (every week)	4 (2.3%)
Time spent doing VAS after office hours per month (hours):	
Hospital	9.58 ± 16.95
Health clinic	0.60 ± 1.21
Overall	1.22 ± 4.98
Types of VAS offered by facilities:	
Medicine by Post	17 (100.0%)
Appointment Card	17 (100.0%)
Integrated Drug Dispensing System*	17 (100.0%)
Leave&Take	16 (94.1%)
Appointment requests**	15 (88.2%)
Drive-through Pharmacy	8 (47.1%)
Park&Take	5 (29.4%)
Medibox	5 (29.4%)
Methods of VAS promotion by facilities:	
Verbal promotion – dispensing and counselling	17 (100.0%)
Banners and posters	17 (100.0%)
Promotion to other healthcare staff	17 (100.0%)
Pamphlet	16 (94.1%)
Electronic advertising and displays	13 (76.5%)
Local health carnivals	10 (58.8%)
Webpage or social media	10 (58.8%)
Sticker on patient's appointment book	1 (5.9%)

* Integrated Drug Dispensing System refers to a system that allows patients to collect their refill medication from another public hospital or clinic without additional payment.

** Appointment requests refer to prescription collection at dispensing counter via appointments made through SMS (commonly referred to as SMS Take&Go), telephone, e-mail, WhatsApp and QR code.

3.2. Cost analysis

The average time and cost needed to prepare one prescription are summarised in Table 6. Although not included in the final calculation, the time and cost needed to dispense medicine were also measured for conventional counter service (N = 346; Mean time per prescription ± SD = 1.14 ± 0.87 min; Mean cost per prescription ± SD = RM0.61 ± 0.47). We conducted a sensitivity analysis by varying the time needed to prepare each prescription using the 95% confidence interval minimum and maximum values. The change in cost was less than 10%, with the largest difference found in counter service (8.9%), followed by Medibox (8.4%), Appointment Systems (4.8%) and UMP (2.4%). The difference in total cost was also less than 10% when changes in salary were made. Even with the 8.9% change, there was still a substantial difference between the cost of preparing medication through conventional counter service and VAS. Therefore, the cost analysis model was considered to be robust.

The average time needed to prepare each step of the medication preparation process was compared and shown in Fig. 2. The time needed to screen VAS prescriptions was longer than conventional counter service, with the longest time recorded to screen Medibox prescriptions (2.68 min) compared to conventional counter service (1.42 min). The time needed for medication filling was similar across all types of services, but there was again a marked difference in the counter-checking process, with the longest time recorded for UMP (1.90 min) compared to conventional counter service (0.67 min).

4. Discussion

The results revealed that the time and cost needed to prepare medications with VAS were considerably higher compared to conventional counter service. The cost was highest for Medibox, followed by UMP and Appointment Systems. The elevated cost was attributed to the increased time needed to prepare the medications due to additional steps involved, such as recording in the VAS database, medicine packing, sending reminders, and storing medications. UMP has a lengthy procedure, with the additional steps of preparing consignment, packaging and postage of medicine. Medibox has a relatively shorter workflow than UMP, but the

Table 3
Perception of staff towards VAS.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Benefits to Patients					
I think that VAS is beneficial to patients	11 (3.8%)	0 (0%)	20 (6.9%)	105 (36.2%)	154 (53.1%)
With VAS service, patient waiting time at the counter can be reduced	11 (3.8%)	2 (0.7%)	21 (7.2%)	121 (41.7%)	135 (46.6%)
The use of VAS creates higher satisfaction among patients	10 (3.4%)	2 (0.7%)	62 (21.4%)	140 (48.3%)	76 (26.2%)
VAS simplifies the process of medication collection	13 (4.5%)	8 (2.8%)	47 (16.2%)	132 (45.5%)	90 (31.0%)
Impact on Staff					
Drug preparation for VAS is more time consuming than standard counter dispensing	19 (6.6%)	32 (11.0%)	63 (21.7%)	108 (37.2%)	68 (23.4%)
Uncollected VAS medicine adds to staff workload	13 (4.5%)	9 (3.1%)	38 (13.1%)	115 (39.7%)	115 (39.7%)
VAS helps to reduce workload in the pharmacy	41 (14.1%)	56 (19.3%)	70 (24.1%)	91 (31.4%)	32 (11.0%)
VAS simplifies the process of drug filling and preparation for patients	24 (8.3%)	43 (14.8%)	76 (26.2%)	93 (32.1%)	54 (18.6%)
Service Delivery					
There is sufficient space for storage of pre-packed VAS medication in my facility	53 (18.3%)	86 (29.7%)	70 (24.1%)	51 (17.6%)	30 (10.3%)
We do not have sufficient manpower to promote and provide VAS	19 (6.6%)	28 (9.7%)	113 (39.0%)	73 (25.2%)	57 (19.6%)
In my facility, non-pharmacy staff are aware about the VAS services available at the pharmacy	9 (3.1%)	23 (7.9%)	104 (35.9%)	114 (39.3%)	40 (13.8%)
I always encourage patients to use VAS	11 (3.8%)	5 (1.7%)	59 (20.3%)	149 (51.4%)	66 (22.8%)
Effect on Pharmacy Service					
VAS may increase medication wastage	21 (7.2%)	38 (13.1%)	88 (30.3%)	98 (33.8%)	45 (15.5%)
VAS can help to reduce medication error	23 (7.9%)	44 (15.2%)	129 (44.5%)	62 (21.4%)	32 (11.0%)
VAS helps to improve medication adherence	20 (6.9%)	37 (12.8%)	112 (38.6%)	93 (32.1%)	28 (9.7%)

additional transport time and cost of sending prepacked medicines to Medibox located in separate facilities increased the average cost of preparing the medicines. Overall, each pharmacy staff had to spend nine hours per week for VAS activities, roughly equivalent to one full work-day, indicating the need for dedicated staff for this service.

In contrast to our findings, a study by AbuBlan et al. in Jordan found that the average time required for overall processing in mail-order prescriptions was 3.17 min shorter than pharmacy counter service.[17] Their mail-order service also involved additional steps such as obtaining patient contact information, data entry and handing over of medicines to courier service, but they observed shorter time for billing, filling and checking medicine in the mail-order workflow. However, the reason for reduced time for these steps compared to the conventional counter service was not discussed, and it was not clear whether the number of items per prescription was comparable. Their analysis also included time-saving obtained from the dispensing step, which was not incorporated in our study. However, based on our results, the time and cost for dispensing step were only 1.14 min and RM0.61, respectively. Therefore, the time and cost for processing UMP were still considerably higher than conventional counter service.

Satisfaction among VAS users in the Malaysian population had been verified in several local studies.[9,12,18] Our study showed that most pharmacy staff involved with the provision of VAS also believed that the services were beneficial to patients. Similarly, a study assessing perception of drive-through pharmacy among pharmacists in Jordan showed that the pharmacists involved acknowledged the benefits of the service, although there were concerns that the service may negatively affect the public image of pharmacy profession and provision of patient counselling.[18]

Table 4
Barriers in VAS utilization and implementation.

Barriers	Mean Score ± SD
Lack of storage space to implement VAS	4.01 ± 1.02
Insufficient staff to handle VAS	3.76 ± 1.01
Lack of interest among patients and clients to try new services	3.69 ± 1.02
High burden of repeat prescription	3.66 ± 1.01
Lack of standardisation of VAS between different MOH facilities	3.64 ± 1.01
Delayed delivery of medicine causing patients to lose confidence	3.62 ± 1.13
Lack of funding to promote and implement VAS	3.59 ± 0.98
Lack of interest among patients as they are satisfied with the waiting time at the pharmacy counter	3.58 ± 1.01
Additional cost for patients to enroll in VAS service	3.56 ± 1.01
Insufficient promotion to other non-pharmacy staff	3.49 ± 0.92
Insufficient promotion to the public	3.49 ± 0.92

Because of similar concerns, VAS in Malaysia is primarily reserved for repeat prescriptions and patients with stable conditions.[5] Respondents in this study were less optimistic regarding the impact of VAS on medication

Table 5
Respondents' suggestions on how to improve VAS.

Theme	Comment	Quote
Space	More space is needed to store prepacked VAS medications to accommodate the increasing number of patients enrolled with the service. Designated space is needed to ensure medicines can be easily searched when needed.	"increase patient in VAS means we need more space to put medicines" (Respondent 64, Health clinic)
		"Having sufficient spaces for storing VAS medication properly, with an organized storage that will make the staff finding the medication easier for the patients" (Respondent 69, Health clinic)
Manpower	Sufficient staff is needed to manage VAS, with more time allocation for VAS activities and the appointment of a designated staff primarily focused on handling VAS-related issues.	"Allocate more staff and device (computer and printer)." (Respondent 17, Hospital)
		"…allocate whole day only for VAS that requires more preparation steps (UMP, [appointment card]). Provide one [pharmacist] to promote VAS and tackle VAS related issues" (Respondent 217, Health clinic)
System	Provision of VAS should be based on the patient's request and not imposed for the sake of achieving a predefined target. Standardisation of workflow and focusing on selected VAS may help to reduce confusion among patients and healthcare staff.	"Implement/promote VAS to patients according to patient's need not only for the KPI." (Respondent 41, Health clinic)
		"Standardisation of workflow across the nation" (Respondent 114, Health clinic)
		"Focus on a few effective and manageable VAS, rather than having many types of similar VAS, causing confusion among patients and pharmacy staff." (Respondent 214, Health clinic)
Promotion	Promotion on VAS needs to be made among other healthcare staff to avoid any misinformation. Increase promotion on mass media and during public events to increase public reach.	"Non-pharmacy staff [especially doctors] need to know the basic flow of VAS. To avoid communication failure between patient, pharmacy and non-pharmacy staff." (Respondent 122, Health clinic)
		"More promotion in tv, booth, radio, advertisement" (Respondent 283, Health clinic)

Table 6
Summary of time and cost needed to prepare one prescription.

Services	N	Average Number of Items per prescription	Time per prescription (minutes)/Mean ± SD	*Preparation Cost per prescription (RM)/Mean ± SD
Medicine by post	572	3.85	10.31 ± 2.98	5.05 ± 1.52
Medibox	116	3.38	10.25 ± 4.66	5.49 ± 3.11
Appointment	372	3.91	6.24 ± 2.94	2.89 ± 1.45
Counter	346	4.05	3.99 ± 3.36	1.75 ± 1.49

* Preparation cost calculated based on the time to prepare a prescription, transportation cost for delivery of medicine to Medibox location and average salary. The cost of medicines was not included.

wastage and medication error, but more than 40% of respondents agreed that VAS could help to improve medication adherence. Several overseas studies have shown that patients using mail-order pharmacy had higher adherence than those utilising conventional counter service, with up to 21.4% higher adherence among users of mail-order pharmacy.[19–21] Improving access to medicines can positively impact patients, and the study by Schwab et al. even showed that mail-order pharmacy can help improve glucose control.[21]

According to the respondents in this study, lack of storage was considered the biggest barrier in VAS implementation. Similarly, the issue of space for medication storage was also mentioned in the study by AbuBlan et al. The authors highlighted that additional space was needed for processing, packing and storing the packages before posting the medicines to patients.[17] A qualitative study among Malaysian patients revealed several barriers preventing VAS uptake among potential users, such as indifference to new services and lack of information on the services due to insufficient promotion to the public.[22] Patient's lack of interest to try new services was also considered an important barrier by the respondents in this study, but this is influenced by personal preferences. Some patients preferred to come to the pharmacy counter as they could directly speak with pharmacists regarding their medicine, as shown in the previous study.[22] However, insufficient promotion was not considered a main issue by the respondents in this study and was ranked the lowest among the barriers listed for consideration. Promotion may have been insufficient five years ago, but after the COVID-19 pandemic, promotion for VAS had increased substantially especially for UMP, to ensure that patients could receive their medication refill amidst the nationwide lockdown.[23]

The top three preferred VAS voted in this study were UMP, Drive-through pharmacy and SMS Take&Go, with various reasons cited for their choice. UMP was generally preferred due to the contactless nature of the service, and the preparation for postage could be done at a convenient time when the pharmacy was less busy. For drive-through pharmacy, the respondents perceived that the ability to communicate with patients made it easier to handle any issues detected with their medication while also reducing congestion at the pharmacy. The respondents who preferred SMS Take&Go perceived that it required the least time to prepare and was more accessible to patients. In comparison, a previous local study that assessed patient preference found that Drive-through pharmacy, Call&collect and UMP were in the top three,[9] while UMP, Appointment card and Integrated Drug Dispensing System were preferred by patients in another study.[12] Preference in VAS is diverse, and the types of VAS offered by each facility should reflect their own patients' needs, which may explain the multiple types of VAS offered by the facilities. However, offering too many types of VAS may also confuse patients and create more workload.

Despite the extra documentation and procedures needed for VAS that resulted in increased cost, the potential benefits of reduced patient waiting time,[8] reduced congestion at health facilities[24] and improved adherence[10] may outweigh these extra costs. Reviewing and streamlining the processes involved may help to alleviate the problem. Ensuring adequate computers and provision of specialised printers for consignment preparation may help to save time. Centralising UMP service based on regions may also help to increase efficiency and limit the cost to prepare equipment and device. In addition, staffing allocation may need to be re-evaluated for facilities with a large number of VAS clients to prevent burnout due to frequent overtime. It may also be beneficial to limit the types of services available and critically select suitable VAS to be implemented, as each facility may have different patient needs and different resources available to them.

This study has limitations. Due to the small number of clients using Medibox service, there were fewer prescriptions evaluated compared to other types of VAS. The average number of medicines per prescription were also lower than the other services, but Medibox still required a longer time for drug preparation than conventional counter service. The comparison was only made for medicine preparation process, and dispensing was not included in the analysis, although the workflow for conventional counter service and the Appointment Systems would only be finished at medicine dispensing. However, as the time needed for drug preparation in Medibox and UMP was considerably higher, the overall results would remain the same if the dispensing step was included. Another limitation was that this study only looked at the direct cost of medicine preparation and did not compare the full costs of service implementation. Future studies

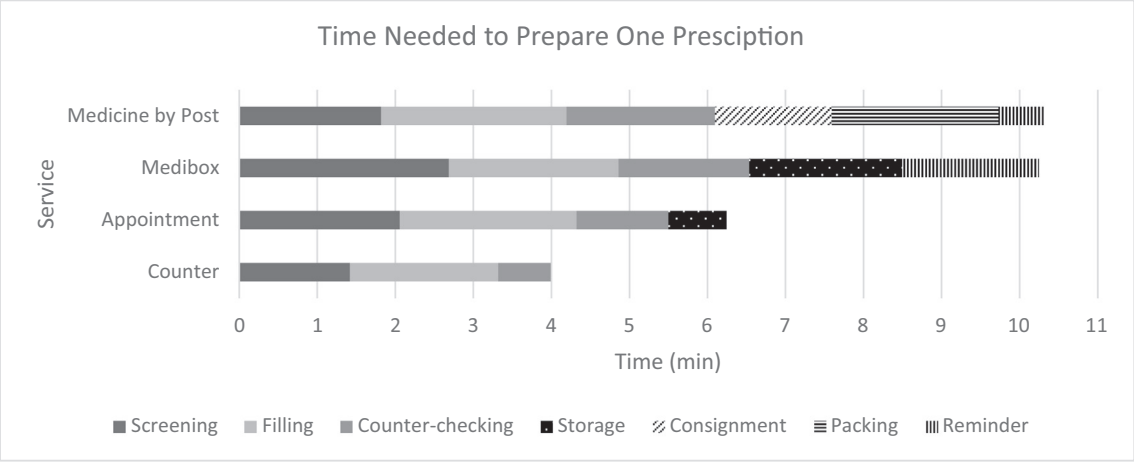

Fig. 2. Average time needed to prepare each prescription.

may need to conduct a comprehensive cost-benefit analysis to further understand the costs of these services.

5. Conclusion

The current study showed that the implementation of VAS comes with extra costs for healthcare providers, and some barriers need to be overcome to further improve the delivery of this service. The direct cost needed to prepare medications for VAS was significantly more than traditional counter service, with the highest cost recorded for Medibox, followed by UMP and Appointment Systems. In the era of the COVID-19 pandemic, VAS can potentially contribute to reducing congestion at health facilities, and its importance is now more prominent than ever. The majority of the respondents involved in this study acknowledged the benefits of VAS to patients, but there were aspects of the service that could be improved. Measures need to be taken to ensure a seamless and efficient process. There is a need to streamline and standardise the procedures and supply sufficient workforce capacity to ensure the service can continuously expand and cater for patient needs.

Declaration of interest

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Credit authorship contribution statement

Izzati Yussof: Conceptualization, Methodology, Investigation, Visualization, Writing – original draft, Writing – review & editing. **Nor Haizan Ibrahim:** Conceptualization, Methodology, Investigation, Writing – review & editing. **Asilah Che Ayub:** Methodology, Investigation, Visualization, Writing – original draft, Writing – review & editing. **Norsyazana Ab Hashim:** Conceptualization, Methodology, Investigation, Writing – original draft. **Ching Ju Choon:** Conceptualization, Methodology, Investigation, Writing – original draft. **Chew Yee Chee:** Conceptualization, Methodology, Investigation, Writing – original draft. **Asma Amalina Abdul Rani:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing. **Helmi Hafiz Hashim:** Conceptualization, Methodology, Investigation, Project administration.

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