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Immunisation provider experiences with an automated short message service-based active surveillance system for monitoring adverse events following immunisation: A qualitative descriptive study

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Abstract

Objective: Currently, active surveillance systems to monitor adverse events following immunisation are limited to hospitals, and medical and immunisation clinics. Globally, community pharmacies represent a significant destination for immunisation services. However, until recently, pharmacies lacked active surveillance systems. We therefore wished to explore pharmacists' experiences with SmartVax: an active surveillance system that has recently been integrated for use in Australian community pharmacies. Specifically, we wished to explore pharmacists' perceived (1) benefits of using SmartVax, (2) areas for improvement in the system, and (3) issues with future/ongoing access to the system.

Methods: The present study forms the qualitative arm of a convergent mixed-methods pilot study. In the present study, we performed semi-structured interviews with pharmacist immunisers after a 21- to 22-week trial period with SmartVax. Thematic analysis of interview transcripts was performed independently by two researchers in QSR NVivo 12, using the framework method.

Results: Fifteen participants completed the semi-structured interviews. A broad range of perceived benefits were cited by participants, including the usability of SmartVax, the ease of patient follow-up facilitated by the system, and enhancement to the patient–pharmacist relationship. Participants voiced a desire for the system to have more granularity and a faster response time in the report generated for pharmacies. When asked about issues with future/ongoing access to SmartVax, cost concerns of the system were the prevailing theme.

Conclusions: The present study suggests that, among pharmacist immuniser end-users of SmartVax, the system is perceived to be easy-to-use, facilitates patient follow-up, and enhances the patient–pharmacist relationship.

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Introduction

Widespread vaccination has been demonstrated to be a successful, safe and cost-effective method of reducing the spread and burden of infectious disease.[1] For optimal protection, high immunisation rates are essential, and require a high level of public confidence in vaccines and vaccination programs.[2] This is especially pertinent when considering implementation of a novel coronavirus disease 2019

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(COVID-19) vaccination program globally. Accelerated development, along with limited safety data of the novel vaccine amplifies the need for a robust and rapidly scalable surveillance system to monitor vaccine safety and adverse events following immunisation (AEFI). It is therefore paramount that vaccine safety, confidence and integrity are maintained. Ongoing surveillance and monitoring for adverse events can assist in this maintenance, while also allowing for timely and appropriate changes in practice protocol, should any safety issues be identified.[3]

Embracing advancements in automation and digital health tools can assist in facilitating comprehensive vaccine safety surveillance, as well as the provision of quality health care.[4] Furthermore, integration of e-technology to optimise workflow processes while demonstrating end-user acceptability can have noteworthy implications for businesses, health care professionals and patient health outcomes.[5]

Globally, a range of surveillance systems are used to monitor vaccine safety.[6] Passive surveillance relies on voluntary reporting of adverse events by patients and health professionals, whereas active surveillance directly contacts patients after immunisation, and can capture adverse event data from large numbers of vaccinees in near-real time.[7,8] Active surveillance systems are widely regarded as superior to passive systems as they overcome the pitfalls of biased reporting, underreporting, and delayed detection of potential safety signals.[3,4]

The surveillance systems used, and the role of pharmacists in vaccination services varies globally, with countries including Australia, Canada, Ireland, New Zealand, Portugal, the United States of America and the United Kingdom having legislated to allow pharmacists to provide vaccination services.[9] Pharmacist-administered vaccinations have the potential to reach 655 million people, representing a significant public health benefit with a broad offering for vaccination services.[9] Despite these advantages, active surveillance has not yet been implemented in community pharmacies worldwide.

A review by Cashman et al.[10] identified 10 active surveillance systems utilising e-communication technology, in which post vaccination data collection was facilitated by a range of methods including diary cards, postcards, telephone, email, online surveys, short message service (SMS) contact and an app. Despite workflow benefits of automated systems, only two systems (SmartVax and Vaxtracker) collected patient AEFI data through direct patient contact via an automated information technology system, highlighting the underutilisation of automation in the monitoring of AEFIs.[10]

SmartVax is an automated, real-time active surveillance system which uses SMS technology to contact patients after immunisation to identify whether they experienced an AEFI, whether medical assistance was sought, and to obtain details regarding the nature and severity of any AEFI(s) experienced.[11] Feedback on these AEFIs is also provided to the immuniser via email.[11]

In 2020, SmartVax was integrated into 22 pharmacies across Western Australia; this constitutes a first effort in active surveillance of AEFIs in Australian community pharmacies. However, to date, no implementation or evaluation of the SmartVax surveillance system in a pharmacy setting has been undertaken. The present study therefore sought to explore pharmacists' perceived (1) benefits of using SmartVax, (2) areas for improvement in the system, and (3) issues with the future/ongoing access to the system.

Methods

The present study utilised a qualitative descriptive study design,[12] and forms part of a larger convergent mixed-methods pilot study.[13] The mixed-methods pilot study was conducted over three phases between March and October 2020: a comprehensive questionnaire focusing on the provision of immunisation services (Phase 1); SmartVax implementation via integration with MedAdvisor (a global, cloud-based, intuitive, automated application for pharmacy) for data collection (Phase 2)[13]; and semi-structured interviews (Phase 3, i.e. the present study).

Data for the present study were collected between July and August 2020; this time period was chosen as the pilot focused on surveillance for influenza immunisation services (as this is the main immunisation service provided by pharmacists in Western Australia). July to August represents the period soon after the end of the influenza immunisation period,[14] and therefore was chosen to ensure participants were able to comment on their experiences having completed all vaccination services for the season, while mitigating potential recall bias. Semi-structured interviews were chosen to improve flexibility of interview dates and thus recruitment rate, given the small number of pharmacies included in the pilot.

While the SmartVax-MedAdvisor integration has been described in more detail in a separate study (Phase 2),[13] the following is a brief summary of the integration: (1) following immunisation, immunisation providers will record the details, including mobile numbers, of participants who receive an immunisation service from a participating community pharmacy, into MedAdvisor; (2) MedAdvisor then interfaces with SmartVax, and SmartVax then sends a series of automated SMS text messages to all participants three to five days after immunisation, to enquire about AEFIs; (3) participants who respond with 'no' will not be sent further SMS messages, whereas 'yes' responders will receive a second SMS to enquire whether medical attention has been sought; finally, a third SMS will follow with a link to a short survey to identify the nature, duration and severity of all reactions.

Ethics

Ethics approval for this study was obtained from The University of Western Australia Human Research Ethics Office (RA/4/20/5907).

Semi-structured interviews investigating pharmacist experiences with SmartVax

Participants were recruited provided they were pharmacist immunisers who had experience using SmartVax (criterion-i purposeful sampling).[15] Given that, to date, SmartVax has only been piloted in 22 community pharmacies in Western Australia, participants needed to be pharmacists employed in at least one of these 22 pharmacies. Criterion-i purposeful sampling was chosen given the small number of pharmacists involved in the pilot, to ensure all participants who were eligible to participate in the study were invited to be recruited.[15] Recruitment was conducted via emails and telephone calls to the pharmacies involved in Phase 2 of the larger study, with provision of digital copies of participant information and consent forms to all potential participants; informed consent was sought prior to the interview. In attempts to mitigate unnecessary burden on additional participants' time, recruitment ceased soon after data saturation was deemed to have been reached. Data saturation was determined to be reached once no new themes could be identified in subsequent interviews; this determination is based on a preliminary decision by the two researchers who independently coded the interview transcripts (see the 'Data analysis' section), with a subsequent consensus discussion by all researchers on the team. Based on the research team's prior experience with the required sample size for data saturation to occur, the initial target was 15 participants, with the intention to recruit additional participants if data saturation had not been achieved by the 15th interview. Participants involved in an interview were provided a $50 e-gift card as a reasonable recompense for their time.

An interview guide (Appendix A) was developed by the researchers, exploring key topics such as immunisation and AEFI monitoring processes, feedback on and response to using the SmartVax system, and future access to the system. The development of the interview guide was informed by a preliminary review of the literature, discussions with members of the research team who have direct experience with the development of the SmartVax system, and piloted between the research team members. Participant demographic information was also collected to provide context to the study; however, given that the sample comprised pharmacists involved in a pilot study, demographic information were not utilised to enable exploration of the relationship between demographic information and the identified themes.

Interviews were conducted by two of the researchers either face-to-face (in a private consultation room with no non-participants/non-researchers present) or using Zoom video conferencing software (version 5.0.2; Zoom Video Communications Incorporated, San Jose, USA; with no non-participants/non-researchers present). Both interviewers received training from the senior author (a researcher with extensive experience in supervising and conducting qualitative research) prior to the first interview, and feedback on the first interview was provided to enhance the quality of subsequent interviews. Both interviewers were unknown to the participants prior to the study commence to mitigate responder bias. All interviews were recorded using two recording devices, with field notes being taken by the researchers. Interview recordings were reviewed by both researchers to ensure a consistent approach in conducting each interview. All transcripts were produced using the software Otter (Otter.ai, Los Altos, USA) and were cross-checked by the researchers against the recordings to ensure a clean verbatim transcription process was followed, with any identifiable information removed to ensure anonymity.

To ensure credibility and confirmability of the research, researchers utilised the following techniques described by Lincoln and Guba[16]: credibility was established by undertaking a peer debrief; confirmability was established by developing an audit trail of amendments to the interview guide, the interview guide used and all versions of the code book; and both criteria were established by using the analyst triangulation method (see the 'Data analysis' section) when thematically analysing the data. Additionally, the consolidated criteria for reporting qualitative research reporting guideline[17] for qualitative research was utilised in the reporting of this study to improve transparency (Appendix B).

Data analysis

Two researchers (NB, male, RN, female, both final year pharmacy students with experience in community pharmacy) used NVivo (version 12; QSR International, Melbourne, Australia) to independently code and thematically analyse the data to identify common themes.[18] Specifically, the framework method was used, an iterative process which involved data immersion, identifying codes, creating and applying an analytical framework, and preparing a framework matrix.[19] Themes were identified inductively. Analyst triangulation[16] was achieved through discussion between the two researchers following independent coding and analysis to discuss and reconcile analytical discrepancies. The senior researcher on the team was involved in instances where discrepancies could not be readily reconciled.

Results

A total of 15 semi-structured interviews were conducted with community pharmacists (each interview was ~30 min in duration). Each participant was from a different participating pharmacy. Data saturation was reached by the 12th interview. Table 1 presents the demographics of the interview participants.

In total, 14 themes pertaining to three main categories of interest (benefits, areas requiring improvement and factors influencing future access) were identified.

Benefits of SmartVax

When participants were asked about their experience using SmartVax, the majority responded that they viewed it as an essential part of their immunisation services and that they wished to continue using the system. Seven benefits in using the SmartVax system were identified in the present study. The themes are described in Table 2 with key illustrative quotes from participants.

Table 1. Demographics of interview participants.

	Participants ($n = 15$)
Median years as a community pharmacist (interquartile range)	10 (15)
Median years as a pharmacist immuniser (interquartile range)	3 (3)
Age	*n* (%)
21–30 years	5 (33)
31–40 years	5 (33)
41–50 years	3 (20)
Over 50 years	2 (13)
Gender	
Male	6 (40)
Female	9 (60)
Non-binary	0 (0)
Job title[a]	
Pharmacy owner/co-owner	6 (40)
Pharmacist manager	10 (67)
Pharmacist in-charge	2 (13)
Staff pharmacist	1 (7)

[a]Some participants had more than one job title.

Areas of SmartVax requiring improvement

A total of four themes arose relating to potential improvements to the SmartVax system. The themes are described in Table 3 with key illustrative quotes from participants.

As summarised in Table 3, participants desired the feedback from SmartVax to be categorised based on severity or on patient age, for ease of data interpretation and patient follow-up, and for more prompt feedback, particularly for reactions that were serious in nature. An additional suggestion was to expand SmartVax's method of communication with patients from text messaging alone to include emails and physical forms. The system could also be refined to provide a method of confirmation to show if SmartVax texts were received by patients. Furthermore, participants highlighted their inability to directly follow patients up using SmartVax, as the data was de-identified.

Factors influencing future access to SmartVax

When participants were asked to consider how they might access SmartVax beyond the study period, three themes arose relating to cost. Table 4 describes these themes with key illustrative quotes from participants.

Discussion

The present study reports the perceptions and experiences of pharmacists with the active vaccine safety surveillance system SmartVax, following a world-first initiative to integrate SmartVax in community pharmacies.

Principal findings

The majority of participants in this study were keen to continue using SmartVax as a result of the benefits they experienced. Key benefits of the SmartVax system, identified previously in a general practice setting, included ease of follow-up and the minimal impact of the system on immuniser workload.[4] Despite differences in clinical environments and workflow, similar benefits were reported by our participants in the present study. As well as this, the present study identified additional benefits such as reassurance to pharmacists about the safety of the vaccines administered, perceived improvement to the professional image of pharmacists as immunisers and enhanced patient–pharmacist relationships. Worldwide, the evolving role and expanding variety of services, including vaccinations provided by pharmacists has its benefits. However, the lack of appropriate automation and the untapped potential for integration with e-technology within vaccination programs

Table 2. Benefits of SmartVax, as described by interview participants ($n = 15$).

Themes	Description	Key illustrative quotes
Minimal impact on workload	Participants commented on how the implementation of SmartVax minimally influenced their workload.	"I haven't noticed any extra paperwork or anything, any more time during the whole process." – P 13 "...it's all integrated into MedAdvisor [pharmacy software]... as long as I put the phone number in there, there was no extra steps or anything else, it was pure seamless." – P 12
Useability	Participants commented on how easy the SmartVax system is to use.	"The system in itself is simple by design, simple implementation and its feedback is quite simple as well... I think it's a very effective system, easy to implement, easy to use." – P 8 "...my overall experience has been good. It's worked... we haven't had any technical problems with it" – P 1
Reassurance for the pharmacist of the safety of the vaccines administered	Participants commented that the ability to view data on AEFIs via SmartVax's provided additional reassurance about the safety of the vaccines they administer.	"...the majority of them [patients] don't have any reactions to it [vaccines], so I guess it gives you more confidence in promoting the service because you see everybody is okay, everything is working as it should, and it brings more confidence in the service" – P 6
Perceived improvement to the professional image of pharmacists as immunisers	Participants commented that the SmartVax system improved their professional image as an immuniser as it goes beyond a transactional service and reinforces that pharmacists provide patient follow-ups in line with other health professions.	"I think it's just a completion of service... This sort of finishes it off properly, because then they have the mechanism of reporting back. We've got additional data that can be referred to down the track to say hopefully that pharmacists aren't getting any additional adverse effects to GPs or nurses providing vaccinations and I guess, give the impression that we're all equal" – P 7 "It adds a bit more like legitimacy to pharmacies providing vaccinations. It's less like someone trying to sell them something... it's a bit more akin to the service you get going to a GP clinic or a vaccination clinic" – P 12
Ease of follow-up	Participants commented on the simplicity of SmartVax in enabling patient follow up of AEFIs.	"Up until now [after SmartVax's implementation] ... we've really had no easy and formal way to document reactions and follow it up." – P 5 "...one of the main reasons why we obviously didn't [follow-up]... [was] because certainly a lot of time in following up, unless you have a system like SmartVax that is all automated." – P 8
Enhances relationships between patients and pharmacists	Participants commented that SmartVax improved their relationship with patients as it extends patient care beyond the face-to-face encounter.	"... just the extension of the service, as it shows you are actually looking after the patient once they have left the pharmacy, reinforcing the pharmacist–consumer relationship as it shows you are concerned about their welfare." – P 6 "But I think it's just that... personal touch...

(continued)

Table 2. Continued.

Themes	Description	Key illustrative quotes
		every time you give a vaccine… where you can tell a patient and they know that there will be follow up to make sure that they responded well to the vaccine… it's more likely to help with customer loyalty and have them return to you because they like that you care and that you're following up with them." – P 1
Awareness of AEFI	Participants commented that SmartVax facilitates timely awareness of AEFIs, which they believe is particularly important for novel vaccines.	"… I think… there is this new vaccine that we're not so sure about… SmartVax is going to be really useful because we need to know early on what the adverse effects are, because without SmartVax, we're not going to know… pharmacy can get involved in COVID vaccinations with SmartVax, it's going to be a really good position to be in." – P 3

P: participant; GP: general practitioner; AEFI: adverse events following immunisation; COVID: coronavirus disease.

has the potential to hinder the quality of patient care provided. The example of e-prescribing illustrates similar practice-based benefits to SmartVax users such as improved workflow, as well as improved effectiveness and efficiency in the provision of health care services.[20] With time pressure being recognised as a significant hindrance in the provision of patient care, it is important to recognise the benefits SmartVax could bring to pharmacy practice globally.[21] Additionally, the enhanced patient–pharmacist relationship achieved via the integration of automated surveillance technology not only allows for the effective monitoring of AEFI, but also results in improved patient satisfaction and patient health outcomes holistically.[22]

In line with the principles of human factors (to enhance the efficiency, effectiveness and satisfaction via human interaction with tools), SmartVax provides an effective interface design, which can be easily incorporated into community pharmacy vaccination workflow.[23]

Effectiveness: Implementation of the automated active surveillance system was found to be effective and useful in following up patients who had been immunised by a pharmacist.
Efficiency: The system was found to have a high level of usability and reduced the time burden associated with post-vaccination follow-up. Increased productivity as a result of the automated process can lead to more effective allocation of energy and resources, and hence quality of care.
Satisfaction: A high level of end-user satisfaction and perceived effectiveness was achieved during the trial. Participants also found that actively contacting patients enhanced the professional relationship between pharmacists and patients, allowing for a greater quality of care without adversely impacting workload.

Using Rogers' five factors in the diffusion of innovation, a framework outlining characteristics associated with the adoption of innovation by an individual (relative advantage, compatibility, complexity, trialability and observability), it is evident that adoption of this tool should be encouraged.[24] SmartVax provides an advantage over traditional passive systems, with both practice-based and public health benefits. The system can also be easily integrated into existing pharmacy practice software and has a high degree of end-user satisfaction with observable benefits during its trial.

Participants generally found integration of SmartVax into their pharmacy system to be beneficial without infrastructure/technical difficulties. However, a number of refinements that could be made to the system were suggested by our participants, in order to make it even more useable in clinical practice. A prominent theme amongst participants was the desire to filter and categorise feedback data. This could potentially improve productivity and streamline workflow further, by allowing health care professionals to identify common adverse events and the demographics they occur in, as well as prioritise certain patients. Participants also requested prompt feedback, allowing for rapid notification of severe adverse events experienced, to allow for an efficient and appropriate response. Directly feeding back to the pharmacy for an identified patient would require collection of detailed patient identifiers as well as AEFI data, which may pose privacy issues. However, implementation of a dashboard-type web interface, including a notification system, has

Table 3. Suggested areas for improvement in the SmartVax system, as described by interview participants ($n = 15$).

Themes	Description	Key illustrative quotes
Desire for categorisation of data	Participants expressed a desire for data contained in the reports to allow greater granularity in categorising data such as symptoms (e.g. extensiveness of rash).	"...you could categorise... a mild temperature, rash, pain at injection site, but anything more severe you could then categorise and say... that one there needs to go straightaway to the pharmacy to let them know" – P 5 "I also touched on the report itself, maybe it... [could] be broken up into... different age groups." – P 11
Desire for prompt feedback	Participants expressed a desire for the pharmacy to be promptly notified of AEFIs experienced by their patients rather than a weekly report.	"...what could be improved... was maybe after they get the text, if someone does respond... a notification come to us, be like, what kind of response... instead of waiting for... a report" – P 11 "...at the moment we've been getting like a weekly report... what they could do is categorise the reactions and anything more than... mild would be reported immediately to the pharmacy." – P 5
Expansion and refinement of communication methods	Participants suggested that patients should be contacted by other means in addition/alongside SMS.	"I don't know if you get a good representation for people over sixty-five because most of them... still don't maybe use [text messaging]... is it offered through email or... take a form back... if you do experience something, maybe bring it back or just email it to us, give us a ring?" – P 11 "...if I entered the wrong phone number into the actual software, I'll get no response saying that this couldn't be delivered. There was no confirmation saying this message was sent to this person here." – P 12
Unable to utilise SmartVax data to follow-up	Participants expressed a desire for the data to have more details regarding individual patients (for the purpose of patient follow-up).	"It hasn't changed the way that we treat it [AEFIs] I guess, because we don't know who's had the reaction... it's an awareness thing, but it's not changed anything we do as far as contacting because... we don't know who they are." – P 3

P: participant; AEFI: adverse events following immunisation; SMS: small message service.

the potential to achieve the feedback requested. Similar use of dashboards has previously fit into established clinical workflow with ease, improved interprofessional collaboration between pharmacists and general practitioners, as well as identified patient risk when used in general practice to improve medication safety.[25]

Further research

The high level of end-user acceptability and the extensive range of benefits listed by participants provides a strong case for the implementation of SmartVax where traditional passive surveillance systems exist. The integration of SmartVax with a cloud-based pharmacy practice software (MedAdvisor PlusOne) ensures that it is rapidly scalable and can be implemented extensively, as MedAdvisor is currently used by a large proportion of pharmacies in Australia, with expansion into the UK and Asia.[26,27] Furthermore, SmartVax is integrated to national surveillance systems in Australia, including AusVaxSafety and the Therapeutic Goods Administration. The need for a comprehensive and transparent AEFI monitoring system can therefore be fulfilled through implementing SmartVax more broadly into pharmacy.[4,28] This is of particular importance in the deployment of new vaccines or vaccines that change, such as any COVID-19 vaccine or the seasonal influenza vaccine, in order to maintain public confidence in vaccine safety.[29] The extensive range of benefits associated with the SmartVax system makes a compelling case for its widespread implementation in pharmacies across the world.

Table 4. Factors influencing future access to SmartVax, as described by interview participants ($n = 15$).

Themes	Description	Key Illustrative Quotes
Immunisation volume	Participants noted that cost could be an issue depending on the volume of immunisations administered.	"We're a large vaccinating pharmacy so, for us, we can spread that cost.. across all of our vaccinations but if you're a smaller pharmacy that doesn't do as many... I think it would have to be like a tiered pricing." – P 5
Patient engagement	Participants noted that patient engagement would influence the utility of the system.	"...it depends on the response rate because we could subscribe [to SmartVax] but no one respond to our message or things like that, then it may not be effective to invest in the service." – P 10
Subsidisation	Participants noted the importance of subsidisation by organisations external to the pharmacy to ensure broad uptake of the SmartVax system.	"I think it should be subsidised by like you [the research team] or the government, because I think the program is essential. So then if you start putting a monetary value on it, then I guess a lot of business owners might not want to pay the extra fee just to participate in a program. So then if it is subsidised... I think more pharmacies will be willing to participate." – P 15 "...it needs to be at a price point... [that] is reasonable... you want to capture as many people as possible. And I don't know whether there is any subsidies or anything from the professional bodies, from the Guild, from PSA, from the state health department, any of them to keep that level down" – P 3

P: participant.

Participants also identified factors that influenced how they might access the system in the future, including their pharmacy's immunisation volume, the level of patient engagement with the system and subsidisation of the system's cost. At the time of writing, formal cost evaluation has not been conducted for the active surveillance system Vaxtracker.[30] As this is a concern among participants, we suggest further research be conducted into the economics of active surveillance following immunisation in Australia. There is no present transparent model for funding active surveillance systems in primary care in Australia, so it will be important to consider potential mechanisms to ensure pharmacists can access crucial surveillance options (such as SmartVax) as they perform their important public health role in providing extended and new access to vaccines.

It is also worth considering the cost–benefit ratio for pharmacies with a low immunisation volume and whether this system is eligible for subsidisation by the government. Despite the receptiveness of participants to the system, these improvements and factors influencing future access to SmartVax should be considered for future research and implementation of the system in pharmacies across Australia.

Evaluation of SmartVax end-user (pharmacist) satisfaction following implementation in pharmacies across Australia, appears to be the next logical step after refining communication methods and feedback mechanisms; this evaluation should include quantitative data collection to enable an understanding of the population's (Australian community pharmacists) level of satisfaction, as well as identifying predictors of poor satisfaction (e.g. demographic characteristics of pharmacists) to enable targeted strategies to improve satisfaction. Once established, international adoption of the automated, real-time active surveillance system across various locations could provide the opportunity for integration and collaboration, revolutionising vaccine safety surveillance on a global scale. Similarly, as SmartVax end-users also include patients, further studies should explore patients' perceptions and experiences with the SmartVax system; this is important given that, if SmartVax is to be implemented more broadly, patient satisfaction is vital to ensure they are willing to respond to SMS-based follow-ups.

Strengths and limitations

There were a number of strengths and limitations associated with our study. Pharmacists were interviewed partway through the trial, limiting recall bias and established approaches were utilised to ensure credibility and confirmability of the results. However, participants interviewed were limited to Western Australia, potentially limiting the transferability of our findings to the rest of Australia, and

internationally. However, despite this, and variations in state legislation, similarities in pharmacy software used across Australia (mainly MedAdvisor and GuildCare) provides us with confidence in seeing similar themes if the present study was to be conducted nationwide. Given that MedAdvisor was used to integrate SmartVax, and given MedAdvisor's global presence,[26,27] our findings could be transferable beyond Australia.

While interviewing of patients could have provided further insight into the experiences of SmartVax from another stakeholder perspective, we did not explore this in the present study, and thus our findings are limited to the perspectives of pharmacist end users. This is because we believe the priority of the study was to firstly capture pharmacist end-user experiences to enable insight that can inform broader rollout of the SmartVax system across Australian pharmacies (and thus expanding active surveillance); further studies can then focus on exploring and improving the patient experience once pharmacy-based active surveillance is more pervasive.

Conclusion

Until recently, there has not been any active monitoring of vaccine safety within the community pharmacy setting, despite the demonstrated benefits of active surveillance systems over traditional passive systems, and the significance of community pharmacies as sites for immunisation services globally. The present study demonstrated that when SmartVax (an SMS-based active surveillance system) was integrated within community pharmacies, pharmacist immunisers reported an extensive range of perceived benefits; these include the usability of SmartVax, the ease of patient follow-up facilitated by the system and enhancement of the patient–pharmacist relationship, which were apparent during semi-structured interviews with pharmacist-immunisers. Further optimisation of the system to provide more granularity and a faster response time in the report generated for pharmacies should be considered when considering further implementation across Australia and worldwide, along with future/ongoing access to SmartVax and cost concerns surrounding the system. Although well received, ultimately, end-user acceptability is crucial to the wider implementation of SmartVax, allowing pharmacists-immunisers to confidently provide quality care to their patients without negatively impacting their workload.

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