Original article

Translating and piloting a cardiovascular risk assessment and management online tool using mobile technology

Monica Zolezzi [a,*], Athar Elhakim [b], Taimaa Hejazi [a], Lana Kattan [a], Dana Mustafa [a], Shimaa Aboelbaha [a], Shorouk Homs [a], Yazid N. Al Hamarneh [c]

[a] College of Pharmacy, QU Health, Qatar University, Doha, Qatar
[b] College of Health Sciences, University of Doha for Science and Technology, Doha, Qatar
[c] University of Alberta, Edmonton, Alberta, Canada

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ABSTRACT

Background: Cardiovascular disease (CVD) risk assessment and management (RAM) services face many challenges and barriers in the community. Mobile technology offers the opportunity to empower patients and improve access to health prevention strategies to overcome these barriers. However, there is limited information on the availability and use of CVDRAM-related mobile technology in the Arabic language.
Objectives: To pilot test an Arabic version of a CVDRAM application among potential end-users accessing community pharmacy services in Qatar.
Methodology: Translation of an established cardiovascular risk calculator (*EPI·RxISK*™) into the Arabic language was conducted. The English/Arabic version of the calculator was tested by potential end-users, consisting of a sample of community pharmacists (CRxs) and members of the public (MOP) accessing community pharmacy services. Semi-structured interviews were conducted based on the quality attributes of the Mobile Application Rating Scale (MARS). Data were analyzed using deductive content analysis.
Results: A total of 10 CRxs and 5 MOP were interviewed. Five themes emerged to describe the *EPI·RxISK*™ calculator: Engagement, Functionality, Attractiveness, Education, and Responsiveness. For the most part, positive subthemes were associated with each of these themes. The functionality and educational themes had some negative subthemes.
Conclusion: End-users of the *EPI·RxISK*™ calculator had mostly positive descriptors that were aligned with all five quality attributes of the web and mobile applications.
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1. Introduction

Cardiovascular disease (CVD) is the leading cause of death worldwide, accounting for around one third of the total global deaths, which represents more than 17 million people annually (Global Burden of Disease Study, 2017). The majority of these deaths are caused by modifiable risk factors, such as tobacco use, a sedentary lifestyle and an unhealthy diet (Yusuf et al., 2020). Local studies and regional reports from the World Health Organization (WHO) have highlighted high rates of diabetes, hypertension, smoking, and obesity in Qatar (Christos et al., 2013; Zainel et al., 2020; Imam et al., 2020; Lopez et al. 2006). It has also been predicted that Qatar will have the largest number of CVD-related deaths in the WHO Eastern Mediterranean Region in the next 10 years (Lopez et al., 2006; Roth et al., 2015). To help address this major public health issue, the Qatar National Health Strategy 2018–2022 emphasizes on the importance of enhancing health promotion and disease prevention efforts in the country (Ministry of Public Health, 2023). This includes managing patients with multiple chronic conditions and enabling self-care. This strategy is further emphasized in the Qatar National Vision 2030, which

* Corresponding author at: Clinical Pharmacy and Practice, College of Pharmacy, QU Health, Qatar University, Doha, Qatar.
E-mail addresses: mzolezzi@qu.edu.qa (M. Zolezzi), athar.elhakim@udst.edu.qa (A. Elhakim), th1802698@qu.edu.qa (T. Hejazi), lk1802709@qu.edu.qa (L. Kattan), dm1805518@qu.edu.qa (D. Mustafa), sa1401981@qu.edu.qa (S. Aboelbaha), sh1302908@qu.edu.qa (S. Homs), yazid.alhamarneh@ualberta.ca (Y.N. Al Hamarneh).

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aims to have a comprehensive healthcare system that is accessible to all, with coverage of preventive and curative health care needs (Qatar General Secretariat for Development Planning, 2016). This includes adopting a systematic risk assessment and management approach years before CVD manifests. Cardiovascular (CV) risk assessment consists of estimating a person's probability of experiencing a CV event over time based on their modifiable and non-modifiable risk factors (World Health Organization, 2020). Such an approach considers all the risk factors, rather than addressing them in isolation. The WHO recommends the use of CV risk assessment (CVRA) equations to guide CVD prevention and management strategies (World Health Organization, 2020). However, this approach has been challenging for clinicians to implement in their daily practice. Indeed, it has been reported that CV risk was not assessed for the majority of people attending routine primary care consultations (Anand et al., 2018; Grover and Lowensteyn, 2011; Salem et al., 2015). Insufficient resources, lack of awareness, and limited manpower have been cited as barriers for the routine implementation of CVRA (World Health Organization, 2020). Digital health technologies can be used to overcome some of these barriers. They have been shown to facilitate and support CVD prevention strategies, promoting awareness, improving accessibility for CVRA and management, and empowering patients to achieve better CV health (Marchibroda, 2008; Wells et al., 2010; US FDA, 2018). Community pharmacists (CRxs) are easily accessible frontline primary care providers who see patients with chronic conditions frequently. As such, they are in an ideal position to identify and assess people who are at risk for CVD. The efficacy of pharmacists' interventions to improve CV risk factors is well documented in the literature (Santschi et al., 2011; Tsuyuki et al., 2002, 2016). In the largest randomized controlled trial in a community pharmacy setting, Tsuyuki and colleagues reported that pharmacist-led case finding, prescribing and care was associated with a 21% reduction in the estimated CV risk when compared to usual care (Tsuyuki et al., 2016). Individualized CVRA and education was a major component of the CRxs' intervention. Risk assessment was facilitated by an interactive CV risk calculator (*EPI*·RxISK™), which was also used to educate patients on the impact of risk factor management on their estimated CV risk (Tsuyuki et al., 2016). Patients reported that the interactive calculator helped them better understand the importance of controlling their CV risk and related risk factors (Al Hamarneh YN et al., 2018)

There is limited information on the implementation of digital health technology for the purpose of CVRA in the Middle East, possibly due to their scarce availability in the Arabic language. Most of the work that was done in the region compared risk levels using different CV risk assessment instruments in their original languages (mostly English) and intended to be used primarily by health care professionals and not patients or members of the public (Hasabullah et al., 2020; Elsayed et al., 2017). The study described in this article aimed at addressing this gap: translating the *EPI*·RxISK™ calculator into Arabic, and pilot testing the Arabic and English version of its web and mobile applications in Qatar.

2. Methodology

This study used the *EPI*·RxISK™ CV risk calculator, developed by a group of researchers from the Epidemiology Coordinating and Research (EPICORE) Centre at the University of Alberta in Canada (Epidemiology Coordinating and Research Centre, 2023). The risk calculation framework used by *EPI*·RxISK™ is based on three validated risk assessment equations: Framingham (D'Agostino et al., 2008), UKPDS (UKPDS Group, 2001) and SMART (Dorresteijn et al., 2013), and was evaluated in the largest randomized controlled trial in a community pharmacy setting (Tsuyuki et al.,

2016). As illustrated in Fig. 1, *EPI*·RxISK™ uses the age, sex, ethnicity, medical history, family history, blood pressure, tobacco use status and laboratory parameters (e.g., lipid panel) to estimate a person's CV risk.

Arabic Translation: Translation of the English version of the *EPI*·RxISK™ calculator into the Arabic language was conducted based on guidelines developed by the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) for adaptation, validation, and translation of questionnaires related to measurement of patient-reported outcomes (Wild et al., 2005). The Arabic translation process is illustrated in Fig. 2. Input and output items (data points) for translation were identified by the research team. Data points include items that are to be read by Arabic-speaking users, including healthcare professionals and patients. Risk assessment equations and calculations (not used as input or output items) were not translated. Forward translation of the data points was completed by a professional Arabic translator and two members of the research team who are native Arabic speakers and fluent in English (YH and SA). The Arabic versions were reconciled into one version by another research team member (AE), fluent in both English and Arabic, and discrepancies were addressed during a meeting with the team members who independently translated the original data points (YH and SA). Back translation was conducted by an independent translator (FM), fluent in both English and Arabic, and blinded to the original English version of the data points. A meeting consisting of the research team members (AE, YH and SA) was then held to compare the original and back-translated English versions of the data points. Any discrepancies were discussed, and a final reconciled Arabic version was agreed upon. The final reconciled Arabic version was piloted by a group of individuals from the target population. A cognitive debriefing session was held to finalize the translated data points to be used in the Arabic version of the mobile application. Fig. 3 provides a screenshot of the home page of the mobile application of the *EPI*·RxISK™ calculator, both in Arabic and in English.

Pilot testing: Community pharmacies which are official training sites for the undergraduate experiential education program at the College of Pharmacy, Qatar University (CPH-QU) were purposely selected for the usability testing of the *EPI*·RXISK™ calculator. At each study site, CRxs invited members of the public (MOP) to participate in the usability testing of the mobile application of the *EPI*·RXISK™ calculator. Both CRxs and MOP were requested to try its various functions. Semi-structured interviews were then conducted using a guide (***Appendix 1***) which consisted of open-ended questions, based on the constructs of the Mobile Application Rating Scale (MARS), which explores five quality attributes: engagement, functionality, aesthetics, information and subjective quality (Stoyanov et al., 2015). The interviews were recorded, transcribed verbatim and analyzed deductively by two independent reviewers and then reviewed by the research team to achieve consensus. Data were analyzed using deductive content analysis, with initial broad categories based on each of the constructs of the MARS. An initial structured analysis matrix was developed from these frameworks. To ensure data saturation, data was collected until no new information was elicited. The results of the analysis informed the edits of the final version of the English and Arabic versions of the web and mobile applications of the *EPI*·RXISK™ calculator.

3. Results

Participants' demographics: As outlined in Table 1, a total of 10 CRxs participated (6 males and 4 females) and 5 MOP (2 males and 3 females). The majority (46.7 %) of participants were between 25 and 39 years of age. CRxs tested the web application of the
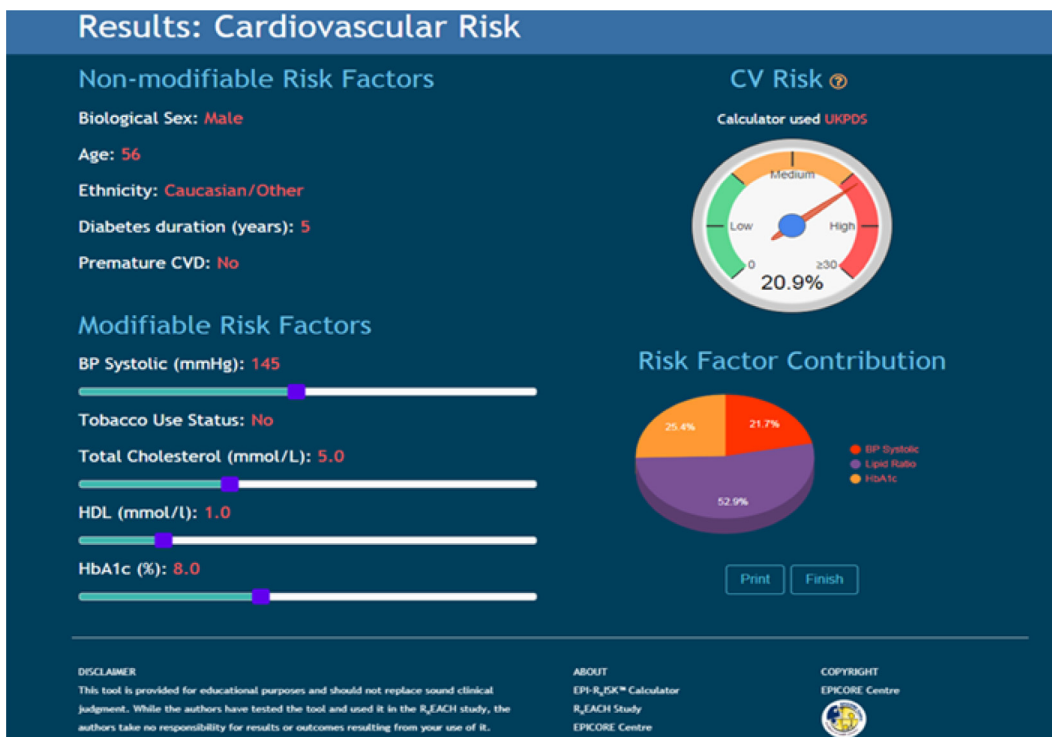
Fig. 1. Screenshot of a cardiovascular risk assessment using the *EPI·*RxISK™ calculator.
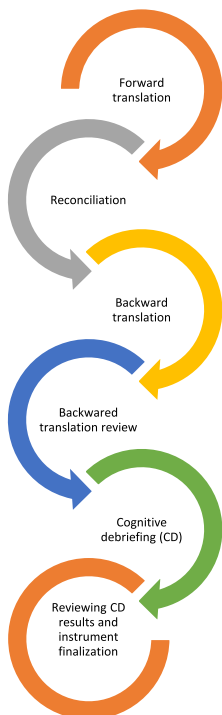

Fig. 2. Translation Process.

*EPI·*RXISK™ calculator whereas the mobile application was tested by the MOP.

Emerging themes: As illustrated in Fig. 4, five themes and fourteen subthemes emerged from the interviews which explored the quality attributes of the *EPI·*RxISK™ calculator: Engagement, Functionality, Attractiveness, Education, and Responsiveness. These themes were in line with the five quality attributes outlined in the MARS tool, and are described below:

Engagement: This theme derived subthemes that highlighted quality indicators of the *EPI·*RxISK™ calculator that facilitate end-users' interaction with the application and motivation to sustain usage, such as convenience in accessing personal information and tracking risk factors. All emerging subthemes under this theme indicated positive engagement attributes of the *EPI·*RxISK™ calculator.

"It was really very good, and you can enter all the patient history like BP and diabetes and all, we can record and finally we are able to see the assessment and risk factors." (CRx 4)

"I think it was interesting because the information that the application ask was very easy to know and I don't have to collect them from somewhere else I already know them." (MOP 3)

Functionality: This theme derived subthemes related to attributes of the *EPI·*RxISK™ calculator when navigating through the application, the complexity of the steps suitable to cater a range of end-users, the time required to enter personal information to estimate risk, and the speed for retrieving information once data was entered. All emerging subthemes under this theme indicated positive functionality attributes of the *EPI·*RxISK™ calculator, except for being initially time consuming as reported by a CRx when entering information about patients in order to estimate their CV risk.

"It is easy only. By easy means anyone can handle. No tricky vocabulary so… the patient himself can also use this app." (CRx 6)

"No, it was very easy, it is step by step and the questions were really clear." (MOP 5)

"The content from the beginning is hard, but when you started get into the question about the patients you want to [assess] then there is no problem." (CRx 5)
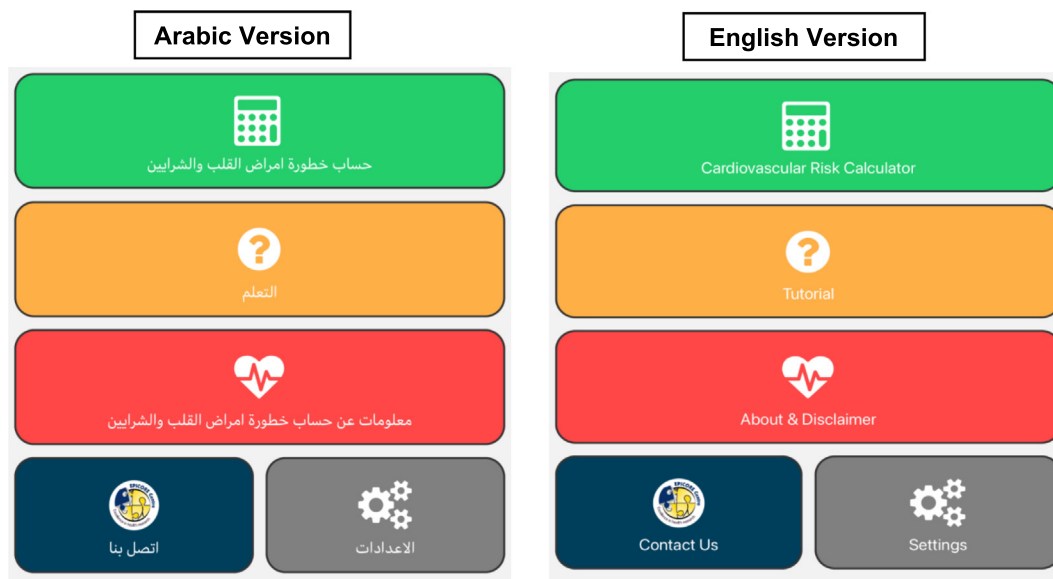
Arabic Version **English Version**

Fig. 3. Screenshot of the EPI•RxISK™ mobile application home page.

Table 1
Demographic characteristics of the participants (n = 15).

		CRxs n	MOP n	Total n (%)
Gender	Male	6	2	8 (56.1)
	Female	4	3	7 (46.7)
Age Range	18–24	0	2	2 (13.3)
	25–39	6	1	7 (46.7)
	40–60	4	2	6 (40.0)

Legend: CRxs = Community pharmacists; MOP = Members of the public; n = Number of participants; %=Percentage.
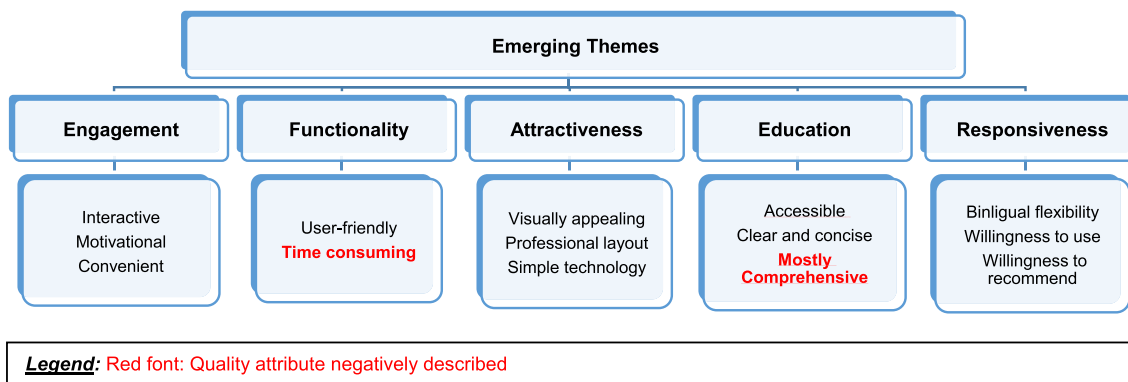

Fig. 4. Emerging themes.

Attractiveness: This theme derived subthemes related to the overall visual appeal and layout of the EPI·RXISK™ calculator, including the designs and technology. Participants found the application visually appealing, with a professional layout and utilizing simple technology. With the exception of one MOP who suggested enlarging the font size to help those with visual impairment, all emerging subthemes under this theme indicated positive aesthetics attributes of the EPI·RXISK™ calculator.

"Yes, it is easy to find each icons and menus and content of screen, it is simple to find everything." (CRx 1)

"You might put an option for like if you want to use a bigger font or something like that, especially if older people will use it. They need bigger fonts." (MOP 5)

Education: This theme derived subthemes in relation to the ability of the EPI·RXISK™ calculator to provide CV risk information for the purpose of education and increasing public awareness on strategies to improve CV health. This theme describes the overall quantity and quality of the information included in the application and on its accessibility, that is, the ability to provide information which end-users would not have otherwise, or to fill the end-

users' knowledge gaps. For the most part, all emerging subthemes under this theme indicated positive educational attributes of the *EPI·*RXISK™ calculator, particularly in regard to the accessibility, and the clear and concise format in which it is presented. Available information was regarded as having significant importance for CV risk management, and was viewed as being comprehensive, despite the fact that one CRx recommended adding more options for types of tobacco, as well as including a unit conversion calculator. Considering that patient data can only be saved in the web application, a MOP recommended having this feature also in the mobile application so they can view and compare their CV risk assessed at different times.

> "*The information is in format to gather the information so it will give you a quick review. So when we generated a report in the first visit when we moved to the next visit there was a concise information about the patient, no need to re-enter and re-calculate the risk score*" (CRx 8)

> "*I think it was fine,… but the information I got its helpful, … my results were thankfully it was good, but I would appreciate it if more information could be added, like hmm… ideas to keep it that way, for me to keep myself healthy and lowering the risk of CV events*" (MOP 5)

Responsiveness: This theme included subthemes in relation to end users' overall practical acceptability and satisfaction with the features of the *EPI·*RXISK™ calculator. Subthemes under these themes described quality indicators in regards to its social acceptability, considering its bilingual flexibility (availability in Arabic and English) and the participants' willingness to use and recommend it to others. All emerging subthemes under this theme indicated positive responsiveness attributes of the *EPI·*RxISK™ calculator.

> "*I will recommend it to other people. It should be beneficial*" (CRx 3)

> "*Yes I can think of some people I can recommend this app to.*" (MOP 5)

4. Discussion

Community pharmacy practice in the State of Qatar is undergoing transformation, moving from being mostly product-oriented to the provision of more patient-focused services (Kheir and Fahey, 2011). One of the strongest drivers of this change is Qatar's National Health Strategy, which is transitioning the country's health care services toward a primary health care model (Ministry of Public Health, 2023). Studies that investigated the readiness of Qatar's community pharmacists for the provision of CVRA report on their willingness of adopting this role, but also recognize the lack of supportive resources (Zolezzi et al., 2019, 2020). To our knowledge, this is the first study to explore the opinions and views of CRxs and MOP regarding the applicability and functionality of a bilingual (English/Arabic) CV risk assessment application which can be used in a community pharmacy setting.

Although the American College of Cardiology has developed an online, multilingual, atherosclerotic CVD (ASCVD) risk estimator that provides clinicians with the option to use their application in different languages (Arabic, German, Indonesian, Portuguese, Spanish or English), a mobile version is not currently available (American College of Cardiology, 2023). In addition, no studies on the translation process or on its usability by multilingual populations have been published to date. In this study, MOP who participated in the pilot testing of the mobile application of the *EPI·*RXISK™ calculator did not report any problems understanding the translated and culturally adapted terminology used. This find-

ing reflects that the *EPI·*RXISK™ calculator translation process from English into the Arabic language was based on the principles of good practice for translation and cultural adaptation (Wild et al., 2005). Our findings add evidence to the understudied area of user experience and perspectives on health applications in the Middle East region.

For the most part, subthemes outlined positive descriptors of the *EPI·*RXISK™ calculator, particularly for the engagement, attractiveness, and responsiveness quality attributes, which are indicative of strong practical acceptability and usefulness of the web and mobile applications of the *EPI·*RXISK™ calculator. These findings are in line with those derived from studies that demonstrated the way technology can assist health care professionals in managing chronic diseases and promoting shared decision-making by engaging patients in self-management (Marchibroda, 2008; Wells et al., 2010; Al Harmarneh et al., 2018; Lemay et al., 2017; Santo and Redfern, 2020; Vaidya et al., 2012; Nolan et al., 2015; Mortara et al., 2020). However, the functionality of the mobile application as assessed by CRxs derived an important subtheme that could represent a barrier for use: having to manually input patient data in the application was described as time-consuming. This would represent an important challenge and may negatively affect the usability of the application, particularly in a busy pharmacy. In fact, some studies have highlighted that using risk scoring tools can increase the workload (Muthee et al., 2020; Al-Ruwaili et al., 2019). On the other hand, other studies reported that incorporating these tools into existing clinical management systems as software or web-based applications facilitates the implementation of CVRA in routine patient care (Wells et al., 2010; Vaidya et al., 2012; Muthee et al.,2020). It is important to recognize that information gathering is an important assessment process that reflects best practice, the more thorough, the more accurate the CV risk score estimation will be. As such, although it emerged as a negative descriptor, it may actually be a positive attribute of the *EPI·*RXISK™ calculator, as such accurate estimation will turn into more meaningful engagement and discussion with the patient.

The emerging subthemes under the education theme were mostly positive descriptors of the *EPI·*RXISK™ calculator, although the comprehensiveness of the retrievable information was viewed as needing additional supportive information (e.g., including a unit conversion calculator in the web application, as suggested by a CRx participant, or saving previously recorded CV risk estimates for comparison purposes in the mobile application, as suggested by a MOP participant). Implementation of these changes may also improve the functionality and responsiveness attributes of the *EPI·*RXISK™ calculator web and mobile applications.

5. Strengths and limitations

By engaging two different types of end-users in this study, this evaluation provided rich insights into the *EPI·*RxISK™ CV risk calculator from the perspectives of MOP and CRxs. It has been recommended that in order to ensure mobile health tools have an impact and add value, patients should be involved in the application development (Mortara et al., 2020). Similarly, it is also important to couple health technology with health care provider oversight (Nolan et al., 2015). By pilot testing the application among individuals who access community pharmacy services, we involved MOP that may benefit from gaining insight into CV health and the factors that they consider beneficial in a mobile application developed to facilitate self-assessment and management of CV risk factors. The literature also suggests incorporating strategies that involve task-sharing with health care professionals other than doctors (Muthee et al., 2020; Schwalm et al., 2016). Having CRxs use mobile applications for assessing CV risk and for engaging MOP in

their care by regularly using these tools, may contribute to reducing the burden that CVD risk assessment has on the primary care sector (Schwalm et al., 2016).

This study had some limitations. There were difficulties recruiting MOP participants during the COVID-19 pandemic, and because the mobile application of the *EPI·RXISK™* calculator is not available for Android users, limited recruiting additional MOP participants. Some pharmacists also pointed out that some patients were not comfortable with sharing personal information in the absence of a private space in most community pharmacy settings, which may limit the overall usability of the calculator. We did not perform a separate analysis of the data to determine if there was a difference in the participants' assessment of the *EPI·RXISK™* calculator or if their demographic characteristics influenced the emerging themes. Although it has been reported that end-users' age may influence the usability of mobile applications, in our study almost all participants were above 25 years of age (roughly half in the age range 25–29 and the other half in the 30–60 years old) thus we assumed that the emerging quality descriptors were not significantly influenced by the age of the participants. In addition, self-reported data is subject to social desirability bias, and thus participants may have exaggerated their positive reactions to the *EPI·RXISK™* calculator. Furthermore, as CRxs were recruited from the list of training sites for the undergraduate experiential education program at the CPH-QU, they are considered well prepared, reducing the generalizability of the findings to other non-training sites, and the representativeness of the sample. Finally, the MARS tool, which was used as the framework to build the semi-structured interviews guide, does not include constructs for data management, such as "Privacy" and "Security". As such, these attributes were not assessed.

6. Conclusion

The overall positive descriptors associated with the bilingual (English and Arabic) web and mobile applications of the *EPI·RxISK™* calculator found in this study may facilitate a wider adoption of CVD prevention strategies in the country and support a more active role of community pharmacists in CVRA.

The insights provided by the CRxs and MOP will allow us to incorporate changes and innovations into the application to address challenges related to functionality, resource information, and data management. Optimizing the use of mobile applications by MOP, guided by easily accessible health care professionals such as CRxs, may alleviate barriers to timely and effective CVRA and management in the primary care sector.

The research team is currently testing the application in primary health care centers and community pharmacies in Qatar to determine feasibility. After the study is completed, we are aiming to make the Arabic version of the application available for MOP and healthcare providers across Qatar to facilitate its use on a national scale.

7. Ethics approval and informed consent

This research received ethical approval from Qatar University Institutional Review Board with reference number: QU-IRB 1298-EA/20. Informed written consents were taken from all participants prior to the commencement of the study.

8. Data availability

Data supporting findings of this manuscript is available upon request from the co responding author.

9. Authors' contributions

MZ, AE and YH led the conception and design of this article. All authors took part in the execution of the study, interpretation of the data, drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jsps.2023.02.001.

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