A Cross-Sectional Study on Mobile Medical Applications and the Effectiveness of the Strategies Adopted to Promote them

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ABSTRACT

Introduction: Increase in the number of mobile medical applications (Apps) along with an increased sophistication of mobile technology resulted in an altered way of patient awareness and care. It is always challenging for an App developer to ensure the success of an App, hence the present study aims to identify and study the utilization promotional strategies for mobile medical Apps. **Materials and Methods:** A cross-sectional study was conducted on 150 mobile medical Apps. These were then comparatively evaluated for App information, technical parameters, and privacy permissions. The utilization of promotional strategies, user ratings, and number of downloads were presented descriptively. **Results:** App store listing and App store optimization, social sharing from inside networks, and keep App freemium were the top three strategies used for the promotion of the mobile medical Apps. Country-wise App ratings indicate that the UK Apps have considerably higher median value for high ratings followed by Australia and the USA. Higher percentage of downloads were seen among the mobile medical Apps developed by Australia, the USA, and the UK developers. **Conclusion:** Previous studies purely focused on the adherence of medical Apps, benefits of smartphones, and benefits of medical Apps, the effectiveness of promotional strategies on the acceptability of medical App is not available but the need of promoting the Apps was not available in this area. Present study was able to clearly indicate the promotional strategy utilization and was also demonstrated disparities in user rating and number of downloads across countries.

Key words: Application downloads, mobile applications, mobile health, promotional strategy, review ratings

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Access this article online
Website: www.jbclinpharm.org
Quick Response Code:

INTRODUCTION

The medical applications (Apps) commonly abbreviated as medical Apps are a type of software enabled via a digital platform boosted by an interface to facilitate effective patient care. Today, medical Apps are an integral part of health-care information access and utilization by patients and health-care providers. The health-care information access and utilization is popularly termed as mobile health (mhealth). Due to the advent of information technology through user friendly mobile phones, mhealth has seen phenomenal growth in the span of a decade and a half. The continuous increase in the complexity and sophistication of mobile technology combined with the development of newer Apps has fundamentally changed the traditional style of patient handling.

Smartphones are not just gadgets anymore, but an individual's best friend. They put up an exhaustive list of medical and health-care Apps that prod and provoke the user to exercise, monitor blood glucose, review and identify the symptoms. The recent shift toward mobile medical Apps is due to the enhancement of the overall consumer involvement in health care and this is attributed to factors such as reduced visits to the physicians, patient adherence, better decisions, and satisfaction with the overall experience of health-care utilization.

Currently, the mhealth industry is approximately valued in range of $180-$200 billion.[1] By the end of year 2016, there would be approximately 10 billion mobile devices in the world.[2] Another statistics state that number of mobile device users who downloaded at least one mhealth App onto their smartphone doubled between 2011 and 2012.[3] Some of the factors contributing to the growth of medical Apps include the user friendly format and seamless integration and availability with just an click. Medical Apps are in tremendous demand in third world countries and specifically in the Asia Pacific. Countries such as India are also significantly contributing to the medical App due to the robustness of Indian App developers' expertise. In general, medical Apps are classified as "suggestive," "awareness," "symptom identifier," and "general medical Apps." As the number of medical Apps increases, it is always challenging for App developers to ensure that App reaches more intended users and garner maximum downloads. Hence, the present study aims to identify and study the utilization of promotional strategies adopted for mobile medical Apps.

MATERIALS AND METHODS

Literature survey was done to identify promotional strategies adopted by App developers. A cross-sectional study was done on 150 Apps which were identified [Table 1] from different countries. As the android operating system is available with a wide variety of mobile brands, more people using them it was decided to consider medical Apps developed for android'. The selected Apps were from android operating system and available only in English.[4] Apps which were not having their own website and an E-mail Id were excluded from the study.

Data collection form was designed to record data relating to number of downloads, review ratings, and updates. The App-related information such as number of tabs displayed, introduction, specificity of the disease such as general App, or disease-specific App along with suggestive or awareness App were also recorded. Technical aspects of App such as usage of high quality images, provision of separate web page, and compatibility with all kinds of android platforms were recorded in addition to the privacy permissions and permissions such as Touch Id,

Table 1: Medical application in different countries

Country	Number of App developers	Number of Apps (*n*=150)
USA	37	80
UK	12	21
India	11	20
Australia	4	8
Pakistan	2	6
Germany	1	1
Switzerland	1	4
Russia	1	3
France	2	2
Poland	1	2
Spain	1	1

Sensors.

Data recorded in the data collection sheet were coded and entered into Statistical Package for Social Sciences, version 15.0. (SPSS Inc. Released 2006. SPSS for Windows, Version 15.0. Chicago, SPSS Inc.). Descriptive statistic was used to present the data and to draw the conclusions.

RESULTS

Different promotional strategies were identified by review of literature from various sites related to App promotion and marketing and top strategies are summarized in Table 2.[5-7]

Apps from various countries were chosen randomly and special focus was laid on developed countries and empirically on developing countries and 150 Apps were selected for the studies which are summarized in Table 1.

APPLICATION PARAMETERS

The comparative evaluation of parameters from the countries yielded results in which Australian App developers developed (75%) of their Apps for the general disease conditions and the USA developed (68%) of their Apps in the disease-specific category and variations with the other countries were minimal. Australian Apps do not have an introduction for the App with percentage of (100%). Countries such as Pakistan and France have least or no tabs on their front page (90.5%) while the USA and India have the majority share in presenting tabs on their front page with a cumulative percentage of 5%. The UK tops the list in developing awareness Apps (71.4%) while the USA has a marginal foothold in developing suggestive Apps (66.2%). Wonderful usage of high-definition (HD) images can be seen by Australian App developers (100%). Countries such as Pakistan and Russia failed to provide a separate webpage or an E-mail to the consumers who are the potential users of the App (100%). All App developers of the specific countries were excellent in providing portability to the App where the percentages were differing with meager differences (85%, 95%) which are reviewed in Table 3.

Application permission parameters

App developers of all the countries have higher network access and Australia tops the chart with 100% and the UK is the only country with lower network connections up to (23.8%). Australia App developers have been consistent enough to provide services such as the App working under conditions, wherein the battery has been drained or in conditions of device sleeping (100%) while other App developers are lagging far behind such as India (30%). The Apps from the USA have been profound to track the location of the device (65%). Specific permissions such as numbers in call and USB storage had a minimal percentage without any difference between the various countries (52.3% and 47.6%). Many countries were not providing any access or a framework for the protection or storage of the data (9.5%). UK-based

Apps were in forefront for providing camera microphone (39.1%) and data net (52.4%) which are summarized in Table 4. The remaining App permissions such as run setup, sensor touch, and low battery were accounted in all the Apps.

Promotional strategies

App store listing and App store optimization, social sharing from inside networks, and keep App freemium were the top three strategies used for the promotion of the mobile medical Apps. The promotion by other Apps and websites, create a YouTube channel and speak at events were the least preferred strategies. The details of the strategy utilization are provided in Table 5.

USER RATINGS AND DOWNLOADS

Ratings are the user opinions expressed on 5-point scale, 1 being lowest and 5 being highest for the user satisfaction and preference. For the

Table 2: List of promotional strategies

Promotional strategies
App store listing and ASO
Public relations
Social sharing from inside networks
Social sharing from inside Apps
Website promotion (teaser, blogs)
Other Apps and websites
Paying for advertising
Email marketing
Speak at events
Create an YouTube channel
Keep App freemium
Google search of the App
Review ratings of the App

ASO: App store optimization, Apps: Applications

Table 3: Application parameters

Parameter	Country (%)				
	India	USA	UK	Australia	Others
Disease area					
General	35	32.5	42.9	75	61.9
Disease specific	65	67.5	57.2	25	38.1
Introduction					
Yes	15	30	19	-	9.5
No	85	70	81	100	90.5
Tabs on front page					
0	80	56.2	71.4	87.5	90.5
4	5	23.7	23.8	12.5	4.5
5	5	3.8	11.6	-	-
7	5	11.3	1.6	-	-
9	5	5	1.6	-	-
App type					
Suggestive	30	66.2	28.6	62.5	47.6
Awareness	70	33.8	71.4	37.5	52.4
HD images					
Yes	15	42.5	23.8	-	38.1
No	85	57.5	76.2	100	61.9
Separate webpage					
Yes	20	16.2	23.8	37.5	-
No	80	83.2	76.2	62.5	100
App portability					
Yes	85	95	76.2	87.5	90.5
No	15	5	23.8	12.5	9.5

HD: High definition, Apps: Applications

Table 4: Application permissions by application developer

Parameter	Country (%)				
	India	USA	UK	Australia	Others
Network access					
Yes	95	96.2	81	100	95.2
No	5	3.8	19	-	4.8
Network connections					
Yes	80	98.8	76.2	100	90.5
No	20	1.2	23.8	-	9.5
Device sleep					
Yes	30	67.5	61.9	100	52.4
No	70	32.5	38.1	-	47.6
Location track					
Yes	35	65	52.4	62.5	33.3
No	65	35	47.6	37.5	66.7
Call numbers					
Yes	30	47.5	47.6	62.5	23.8
No	70	52.5	52.3	37.5	76.2
USB storage					
Yes	30	61.2	52.4	62.5	28.6
No	70	38.8	47.6	37.5	71.4
Protection storage					
Yes	20	58.8	47.6	37.5	9.5
No	80	41.2	52.4	62.5	90.5
WiFi connection					
Yes	15	31.2	33.3	25	14.3
No	85	68.8	66.7	75	85.7
Camera microphone					
Yes	10	30	39.1	-	4.8
No	90	70	61.9	100	95.2
Account devices					
Yes	15	40	43	12.5	9.5
No	85	60	57	87.5	90.5
Data net					
Yes	-	33.8	52.4	12.5	14.3
No	100	66.2	47.6	87.5	85.7
Run setup					
Yes	-	33.8	38.1	-	9.5
No	100	66.2	61.9	100	90.5
Sensor touch					
Yes	5	21.2	28.6	12,5	4.8
No	95	78.8	71.4	87.5	95.2
Low battery					
Yes	10	25	38.1	12.5	9.5
No	90	75	61.9	87.5	90.5
Device ID					
Yes	60	47.5	61.9	62.5	33.7
No	40	52.5	38.1	37.5	66.7
Photos/media/files					
Yes	55	58.8	60	62.5	23.8
No	45	41.2	40	37.5	76.2

Apps: Applications, ID: Identification

convenience of evaluation, ratings are expressed as "low" (rating from 1 to 3) and high (rating of 4 and 5). The country-wise results are shown in Table 6.

Country-wise App ratings indicate that the UK Apps have considerably higher median value for high ratings followed by Australia and the USA. Number of downloads are expressed in to two categories such as "high" (more than 100 thousand downloads) and "low" (<100 thousand downloads). The results are shown in Table 7.

Table 5: Promotional strategies utilization by the mobile medical applications

Promotional strategies	Utilization (%)	
	Yes	No
App store listing and ASO	98.7	1.3
Public relations	48.7	51.3
Social sharing from inside networks	84.7	15.3
Social sharing from inside Apps	26	74
Website promotion (teaser, blogs)	63.3	36.7
Other Apps and websites	8.7	91.3
Paying for advertising	22.7	77.3
Email marketing	58.7	41.3
Speak at events	14.7	85.3
Create an YouTube channel	12	88
Keep App freemium	67.3	32.6
Google search of the App	60.7	39.3
Review ratings of the App	42.7	57.3

Apps: Applications, ASO: App store optimization

Table 6: Country wise mobile medical applications ratings

Country	*n*	Median (IQR)	
		High rating	Low rating
India	20	751 (58.5–5997.25)	173 (18.5–2056)
USA	80	1246 (258–10744)	351 (74.75–3012.5)
UK	21	5861 (531.5–19911)	1314 (295–4591)
Australia	8	1413.5 (376.25–18582.75)	549 (164.25–1781)
Others	21	563 (25–7309)	164 (14–2386.5)

IQR: Inter quartile range

Table 7: Mobile medical application downloads

Country	*n*	High downloads (%)	Low downloads (%)
India	20	15	85
USA	80	51.2	48.8
UK	21	47.6	52.4
Australia	8	75	25
Others	21	28.6	71.4

DISCUSSION

The USA is the country which tops the list in possessing the most number of Apps developed followed by the UK and India while other nations such as Australia, France, and Russia are trying to set up the foothold in this sector. Previous studies have purely focused on the adherence of medical Apps,[8-11] benefits of smartphones,[12,13] and benefits of medical Apps,[14,15] the effectiveness of promotional strategies on the acceptability of medical App is not available but the need of promoting the Apps was not available in this area.

To unfold the knowledge gap existing in this area, an extensive study was done and we found that App developers mainly categorized their Apps into general and disease specific, i.e., general Apps are those which mainly focus on fitness, jogging, running, calculation of body mass index, and tracking the calorie intake, etc., while disease-specific Apps are those which adhere to identification of disease symptoms, prior medication, dose and dosage combinations including recent advancements such as fixing an appointment or schedule with an doctor or pharmacist.

Australian App developers focus more upon the general Apps without any introduction on the front tab and provision of website because the App developers from Australia are not specifically the medical App developers but are the general App developers who develop Apps by an third party client. The USA develops the highest number of Apps

for the disease conditions. The USA developers have dedicated team of App developers purely based on medical and health-care sector which are subsequently reviewed and rated by external agencies[16] also including the physician reviews of medical and health Apps.

Various countries excluding India and the USA do not have any tabs on their front page. Tabs are presented in the App which is the sequential arrangement of the contents in the App. App developers design tabs purely upon their convenience for adjusting to the interface when developing Apps by the design teams.

Australian App developers have a high penchant for including HD images in their Apps[17] as according to mobile statistics because the penetration rate of the android market in Australia has crossed the 50% mark. App developers from the United States are producing Apps which are suggestive while the UK App developers are producing awareness Apps. Countries such as Russia, Pakistan failed to provide the details of separate introduction for the App in the intended webpage as they were in the nascent stages of the App development and are not contenders in the big league.

Australian App developers have excellent network access. The United States App developers possess location-based tracking which includes Global Positioning System access and precise location, access extra location provider commands.[18]

Device sleeping is an additional permission which was thoroughly implemented by Australian developers. Majority of the countries do not provide access for storage of the data. The UK-based Apps were providing facilities such as camera and microphone for ability to record audio and video. Various countries do not possess a device id as the App developers are not forefront in accessing the device to read the phone status and identity if any connected to a call. The various countries were also having a majority in access to photos/media/files to modify or delete the contents of USB storage.

CONCLUSION

Mobile medical Apps today play a very important role in health-care provision and awareness creation. Present study was aimed to understand the utilization of promotional strategies has provided insight in to the mobile medical Apps not only with regard to promotional strategies but also providing some useful comparative results across countries for downloads and user ratings. This is one of the first studies to demonstrate the utilization of the various promotional strategies based on the preference which gives a clear picture to App developers, App entrepreneurs, and App startups. As the effectiveness of promotion strategies is usually expressed in terms of number of downloads and user ratings, the Apps developed by Indian developers found to be having low downloads and user ratings as compared to the medical Apps developed by the UK, USA, and Australian developers.

LIMITATION

The study was carried out among the Apps developed for Android operating system. There is a scope for future studies to include the Apps developed for iOS operating system.

Financial support and sponsorship

None.

Conflicts of interest

There are no conflicts of interest.

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