

Short communication

Perceptions of use of a case-based, integrated national electronic public health surveillance system in Jordan

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التصورات المتعلقة باستخدام نظام إلكتروني وطني متكامل قائم على الحالات لترصد الصحة العامة في الأردن

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الخلاصة: لا يزال جمع بيانات موحدة آنية يمثل تحدياً أمام نظم ترصد الصحة العامة. ويمكن أن ييسر استخدام تكنولوجيا المعلومات المتنقلة هذا الأمر. وقد استُحدث نظام وطني لترصد الصحة العامة قائم على الحالات في الأردن في عام 2015 باستخدام الأجهزة اللوحية المتنقلة وإطار إلكتروني قائم على الإنترنت. وأجري مسح لتصورات المستخدمين عن النظام بعد التدريب عليه. ومن بين المشاركين الذين حضروا التدريب والبالغ عددهم 596 مشاركاً، أكمل 580 مشاركاً (97.3%) استبياناً لمسح. وكان غالبية المستخدمين من العاملين في مجال التمريض (58.5%). وجاءت التصورات الكلية عن النظام إيجابية للغاية في 5 مجالات وظيفية (تعريفات الحالة الموحدة، والتوجيهات السريرية بشأن الظواهر والأعراض، وعوامل الخطر والتوجيهات المتعلقة بالمختبرات، والرسائل النصية، وخدمات الإخطار بالبريد الإلكتروني عن الأمراض التي يمكن الإخطار عنها، والإبلاغ بالمعلومات في غضون ساعة عبر إطار على الإنترنت). وفي جميع المجالات، أعرب 80% عن اعتقادهم بأن النظام من شأنه أن يساعد في أعمالهم ويوفر الوقت المستغرق في تحديد الأمراض التي يمكن الإخطار عنها وإبلاغ هذه المعلومات على أساس مركزي. ويُشجّع إجراء مزيد من العمل لتقييم النظام والنظر في تطبيق نماذج سحابية في سياقات أخرى.

ABSTRACT Collection of real-time, standardized data remains a challenge for public health surveillance systems. The use of mobile information technology may facilitate this. A national case-based public health surveillance system was introduced in Jordan in 2015 using mobile tablets and an online framework. After training on the system, users were surveyed about their perceptions of it. Of 596 participants attending the training, 580 (97.3%) completed the survey. The majority of users were nurses (58.5%). Overall perceptions of the system were highly positive across 5 areas of functionality (standardized case definitions, clinical guidance on signs and symptoms, risk factors and laboratory guidance, SMS and Email alerts for notifiable diseases, one-hour reporting of information via an online framework). In all areas, over 80% of participants thought the system would help their work and would save time in identifying notifiable diseases and reporting this information centrally. Further work is encouraged to evaluate the system and consider the application of cloud-based models in other settings.

Perceptions de l'utilisation d'un système national de surveillance de santé publique intégré et électronique fondé sur les cas en Jordanie

RÉSUMÉ La collecte, en temps réel, de données normalisées constitue un défi pour les systèmes de surveillance de santé publique. L'utilisation des technologies de l'information mobiles peut faciliter cette tâche. En 2015, un système national de surveillance de santé publique fondé sur les cas et utilisant des tablettes et une plate-forme en ligne a été introduit en Jordanie. Suite à une formation sur l'utilisation du système, un sondage a été effectué auprès des utilisateurs pour connaître leurs perceptions concernant ce système. Sur 596 participants à la formation, 580 (97,3 %) ont complété le sondage. La majorité des utilisateurs étaient des personnels infirmiers (58,5 %). Les perceptions globales du système avaient tendance à être très positives dans cinq domaines de fonctionnalité, qui sont les suivants : les définitions de cas normalisées, les directives cliniques sur les signes et les symptômes, les facteurs de risque et les directives concernant les laboratoires, les SMS et les alertes par courriel des maladies à déclaration obligatoire, et la notification des informations sur une plate-forme en ligne dans un délai d'une heure. Dans tous les domaines, plus de 80 % des participants considéraient que le système leur servirait dans leur travail et leur ferait gagner du temps dans l'identification des maladies à déclaration obligatoire et la notification de cette information au niveau central. Il conviendrait d'encourager davantage l'évaluation du système et d'envisager l'application de modèles basés sur un cloud dans d'autres établissements.

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Introduction

Public health surveillance is the ongoing, systematic assessment of the health of a community, based on the collection, interpretation and use of health data and information (1). Surveillance programmes often rely on multiple layers of reporting structure from the facility to central level, which can result in delays in data collection, analysis and reporting, particularly in insecure and inaccessible areas (2). Adoption of standardized case definitions and guidelines for accurate diagnosis also remains a challenge for public health surveillance systems (3,4).

Technological innovations within public health surveillance, including the use of mobile information technology, may help enable standardized data to be collected in real-time, and several advantages have been reported that could help to inform and improve decision-making for surveillance (5,6). Electronic data collection has been proposed as a solution to many challenges faced by paper-based surveillance and is increasingly being adopted in a number of public health programmes (7–9).

An innovative national programme of public health surveillance is being implemented across Jordan, in partnership with the Ministry of Health and the World Health Organization, to monitor the epidemiology of priority public health diseases, conditions and events (10). The programme utilizes mobile information technology to enable reporting of information in real-time from primary and secondary care facilities across the country. Mobile tablets are used by health workers during the consultation with the patient to provide case-based reporting of disease which is coded in a structured manner according to the International Classification of Diseases (ICD-10) (11).

The public health surveillance system was approved for use in Jordan by the Ministry of Health and adheres to

national surveillance standards and case definitions. It was built using free, open source software and builds on common platforms and previous work. The system uses a cloud-based model, meaning the server and data are hosted centrally by the Ministry of Health, which removes the need for local clinic infrastructure and enhances data access and sharing at different levels of the health system. A total of 55 communicable diseases, 7 noncommunicable diseases and 12 mental health conditions are currently included in the surveillance system (12).

National scale-up and implementation of the public health surveillance system in Jordan took place in a phased manner between April and September 2015, following pilot project implementation between May and December 2014 (13). A total of 297 primary and secondary care facilities are included in the system, using a total of 439 mobile tablets, across all 14 governorates of the country. All facilities received a half-day training on the use of mobile tablets and appropriate techniques for case-based reporting.

This paper reports on the perceptions of the users about the usefulness of various aspects of the system to help their work.

Methods

User survey

A survey of users of the public health surveillance system was completed immediately following each training to evaluate perceptions of use of the system by health care workers. A total of 596 participants attended training during the national scale-up and all were invited to participate in the survey. A total of 580 (97.3%) participants completed the survey.

Survey questions

Two domains of questions were chosen for inclusion within the survey following

working group discussion with users as well as with Ministry of Health directorates of communicable disease, non-communicable disease and information technology. The domains covered the principle utilities of the system, namely clinical decision support (providing a standardized case definition for each disease, clinical guidance on signs and symptoms, risk factors and laboratory guidance) and improved reporting and response (SMS and Email alerts for notifiable diseases, reporting of information within 1 hour via an online framework).

Data collection

The survey was available in Arabic and English, designed in extended markup language (XML) and uploaded to tablets. Each form was programmed for the Open Data Kit (ODK) (14) application and skip logic algorithms were used. The survey was self-administered by the user on the tablet following each training. Data were sent to a central server where they were subsequently downloaded for analysis.

Statistical analysis

Only anonymized survey data were used in the study analysis. All data were analysed using *STATA*, version 13.1.

Ethics statement

This was an emergency public health programme designed to increase monitoring in key public health diseases, conditions and events in Jordan, in line with goals set by the Ministry of Health in Jordan. It thus did not require institutional review board and ethical approvals. All data were anonymized prior to analysis. The study was approved by the Director of Primary Care and Public Health, Ministry of Health, Jordan.

Results

A total of 580 users of the public health surveillance system were surveyed

between 1 April 2015 and 30 April 2016. The majority of users surveyed were nurses and worked across all 14 governorates of the country (Table 1). The remaining users were doctors, data/medical records clerks or other categories (including laboratory technicians, administrative assistants and facility managers). The largest proportion of respondents worked in comprehensive care facilities (47.8%), followed by primary health care facilities (36.4%) and hospitals (9.5%). The remaining facilities (categorized as other) included influenza sentinel sites, correctional facilities and laboratories (Table 1).

The majority of users across all categories of health worker thought the system would help their work by providing: a standardized case definition for each disease (93.5%); clinical guidance on signs and symptoms, risk factors and laboratory guidance (89.7%); SMS and Email alerts for notifiable diseases (80.7%); and reporting of information within 1 hour via an online framework (90.2%). The majority of users thought the system would save time in identifying notifiable diseases (92.6%) and in reporting this information centrally (92.9%) (Table 2).

Discussion

A cloud-based public health surveillance system was implemented in Jordan using mobile information technology and an online framework. User perceptions of the system were very positive in regard to providing: a standardized case definition for each disease; clinical guidance on signs and symptoms, risk factors and laboratory guidance; SMS and Email alerts for notifiable diseases; and reporting of information within 1 hour via an online framework. Users also thought that the system would save time in identifying notifiable diseases and in reporting this information centrally.

Table 1 Position and location of users surveyed for the public health surveillance system in Jordan

Position and location of users	No. (n = 580)	%
Position		
Data clerk	36	6.2
Doctor	97	16.7
Nurse	339	58.5
Laboratory technician	72	12.4
Other ¹	36	6.2
Facility		
Primary health facility	211	36.4
Comprehensive care centre	277	47.8
Hospital	55	9.5
Other ²	37	6.3
Governorate		
Ajloun	35	6.0
Amman	95	16.4
Aqaba	18	3.1
Balqa	28	4.8
Irbid	124	21.4
Jerash	24	4.1
Karak	47	8.1
Ma'an	21	3.6
Madaba	11	1.9
Mafraq	54	9.3
Petra	3	0.5
Ramtha	31	5.3
Tafeileh	34	5.9
Zarqa	55	9.5

¹Administrative assistants and facility managers.

²Influenza sentinel sites, correctional facilities and laboratories.

No significant differences in user perceptions were recorded according to user type or facility type (data not reported; available on request). It was noted in comments at the end of the survey that some questions were not relevant for particular users, for example those working in noncommunicable diseases and mental health did not use SMS or email alerts (these alerts are generated only for certain notifiable communicable diseases and so are not relevant for noncommunicable disease and mental health focal points). A lower proportion of these respondents therefore reported this domain was relevant to their area of work. More

specific questions are recommended for individual user groups in future surveys.

Several methodological limitations of the study are acknowledged. The analyses presented may be subject to respondent bias, which may overestimate the positive user perceptions of the public health surveillance system. In addition, the sample size was not sufficiently powered to provide statistically significant results for individual user groups (doctors, nurses, data clerks).

Further surveys will be conducted after 1 and 2 years to determine if highly positive perceptions of the usefulness of the system are sustained. Further data collection and analysis will also facilitate

Table 2 Perceptions of use of the public health surveillance system in Jordan

Question	Data clerk No. (%)	Doctor No. (%)	Nurse No. (%)	Public health No. (%)	Total No. (%)
Total surveyed	36 (100)	97 (100)	339 (95.3)	72 (100)	580 (100)
Do you think the system will help your work by providing:					
<i>A standard case definition for each disease?</i>					
No	1 (2.8)	9 (9.3)	16 (4.7)	7 (9.7)	38 (6.6)
Yes	35 (97.2)	88 (90.7)	323 (95.3)	65 (90.3)	542 (93.4)
<i>Clinical guidance on signs and symptoms, risk factors and laboratory guidance?</i>					
No	3 (8.3)	8 (8.2)	34 (10.0)	8 (11.1)	60 (10.3)
Yes	33 (91.7)	89 (91.8)	305 (90.0)	64 (89.9)	520 (89.7)
<i>SMS and Email alerts for notifiable diseases?</i>					
No	7 (19.4)	17 (17.5)	62 (18.3)	12 (16.7)	112 (19.3)
Yes	29 (80.6)	80 (82.5)	277 (81.7)	60 (83.3)	468 (80.7)
<i>Information online within 1 hour?</i>					
No	0 (0)	8 (8.3)	29 (8.6)	7 (9.7)	57 (9.8)
Yes	100 (100)	89 (91.8)	310 (91.5)	65 (90.3)	523 (90.2)
<i>Do you think the system will save you time in:</i>					
<i>Identifying notifiable diseases?</i>					
No	1 (2.8)	11 (11.3)	18 (5.3)	4 (5.6)	43 (7.4)
Yes	35 (97.2)	86 (88.7)	321 (94.7)	68 (94.4)	537 (92.6)
<i>Reporting notifiable diseases?</i>					
No	1 (2.8)	11 (11.3)	17 (5.0)	3 (4.2)	41 (7.1)
Yes	35 (97.2)	86 (88.7)	322 (95.0)	69 (95.8)	539 (92.9)

a more detailed understanding of the burden of disease among host communities and displaced populations in Jordan. Further work is encouraged to compare the cloud-based public health surveillance model with traditional public health surveillance systems and to consider the application of cloud-based models in other settings. Further studies are also encouraged to consider the implications of case-based

reporting within the consultation, including the application of clinical decision support to improve the quality of diagnosis and clinical care. Adoption of mobile technology for public health surveillance in other countries and settings would need to take into account the mobile data network infrastructure as well as local guidelines on data management and security.

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