ORIGINAL ARTICLE

# UNRWA's innovative e-Health for 5 million Palestine refugees in the Near East

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## ABSTRACT

The United Nations Relief and Works Agency for Palestine Refugees (UNRWA) provides primary healthcare (PHC) for some 5 million Palestine refugees in five operational fields (Jordan, Syria, Lebanon, West Bank and Gaza) through its 143 health centres (HCs). UNRWA started, in 2009, developing an electronic health records (e-Health) system. The primary aim was to improve the quality of services and to respond to the increasing workload and the rise in the prevalence of non-communicable diseases (NCDs). The system was developed in-house based on the Family Health Team approach as a web-based, patient-centred application to support UNRWA's health services for common illnesses, maternal and child health, NCDs, laboratory and pharmacy. It has a built-in appointment system, uses the International Statistical Classification of Diseases, 10th Edition classification and generates 29 reports. By October 2017, the system was rolled out in 121 HCs, of which 100 are paperless, covering almost 3 million refugee population, and managing some 9 million visits a year. The number of physician's daily consultations was reduced from 104 to 85. It enabled the introduction of an innovative cohort analysis to monitor patients with NCD efficiently. 89% of doctors expressed their satisfaction concerning timesaving and efficiency of e-Health. Long-standing effective PHC services, detailed clinical guidelines, well-trained staff and in-house development made that roll-out possible. Interoperability enabled operation in five different fields. However, the main challenges include HCs' infrastructure and connectivity. UNRWA is working to address such challenges to complete the roll-out, except for HCs in Syria, by the end of 2017. UNRWA's experience indicates that implementing such an innovation is possible and can improve efficiency, effectiveness and control the duplication of PHC services. Mobile technologies (m-Health) and integration with host countries' e-Health systems are planned to achieve best value for low cost.

## INTRODUCTION

The United Nations Relief and Works Agency for Palestine Refugees (UNRWA) was established by the United Nations General Assembly in 1949 following the 1948 Arab–Israeli War, and became operational in 1950. It is mandated to provide assistance and protection to a population of some 5 million registered Palestine refugees (PRs) living in its five fields of operations including Jordan, Lebanon, Syria, West Bank and Gaza. Its mission is to help PRs achieve their full potential in human development, pending a just solution to their plight. UNRWA's services encompass education, healthcare, relief and social services, camp infrastructure and improvement, microfinance and emergency assistance.

For the seventh decade, UNRWA Health Programme (HP) continues to deliver comprehensive preventive and curative primary healthcare (PHC) services to PRs through a network of 143 health centres (HCs) and supports patients to access secondary and tertiary healthcare services. Currently, some 3 million PRs receive healthcare at UNRWA HCs.[1]

In 2009, as a response to the change in the health needs of PR population, UNRWA's HP started a comprehensive reform. The first component of this reform was the development of computer-based electronic health records or e-Health system. The e-Health system was gradually developed and was introduced in 2010 aiming to improve the

quality and efficiency of UNRWA healthcare services. Its aims included the reduction of staff workload, cost of service delivery, medical errors and paperwork, while improving data quality and daily operations, in addition to improving the quality of statistical reports to support evidence-based planning and management, subsequently improving the effectiveness and efficiency of services at the HCs.

The system was developed in-house in collaboration with other UNRWA departments, in particular the Information Systems Department (ISD) and the five fields of UNRWA operations, through financial support by several donors.

In 2011, UNRWA HP launched its Family Health Team (FHT) approach, which compromised the other component of the reform. Through this model, UNRWA health services were organised to provide comprehensive and holistic PHC package for the entire family, emphasising long-term provider/patient/family relationships and responding to the rise in the prevalence of non-communicable diseases (NCDs).

Currently, the FHT approach is implemented in almost all the health centres in the five fields of operations. The other reform pillar, the e-Health system, is currently functional in 121 (out of 143) HCs in the five fields.

UNRWA, being under constant pressure in terms of budget and staffing, has to consider options that ensure cost-containment and reduction, better efficiency and higher quality of services. Timely and precise reporting to the UN and its partners is one area that was of concern to UNRWA.[2]

In similar contexts, Haskew and colleagues found that a total of 17 refugee operations in Africa, Asia and the Middle East were reporting into a standardised health information system via the use of common tools and guidelines. Under surveillance, there were approximately 1.5 million refugees in 85 refugee camps across 24 different partners.[3]

The objective of this paper is to report on the rationale for the development of UNRWA's e-Health system, including the phases of the project, the development of an m-Health programme for maternal and child health (MCH) using the experience of WHO/International Telecommunication Union (ITU) initiative, the approach used, the functionality of the system, the challenges faced, lessons learnt and future directions.

## EVIDENCE AND RATIONALE FOR E-HEALTH

There has been a global interest in benefiting from the potentials of information and communication technologies (ICTs) for health, often referred to as e-Health, to enhance the quality, safety and cost of healthcare.

Development of such systems was guided by the World Health Assembly (WHA) resolution passed in 2005 describing e-Health as 'the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including healthcare services, health surveillance, health literature, and health education, knowledge and research,' and urged member states to develop and implement e-Health technologies.[4]

Globally, implementing e-Health has become a main priority for many countries as demonstrated by the results of the WHO Global Observatory for e-Health (GOe).[5] At the regional level, the e-Health status in the five countries where UNRWA is operational fits with the general profile of e-Health in the Eastern Mediterranean Region, which includes different levels of maturity and readiness to use e-Health as a key enabler in the delivery of healthcare services.[6]

Studies reported advantages of e-Health that include improving efficiency, decision support, data collection, retrieval and analysis, privacy, security, safety, cost reduction, office efficiencies, centralised access to patient information, and ability to communicate with patients and fellow providers leading to better quality of care.[7–15]

UNRWA health services are influenced by the surrounding countries, and e-Health development is no exception. Evidence of e-Health implementation in countries in the region shows progress, diversity of ICT applications for health and reported challenges.[16]

In the context of poor and limited resources settings and areas with conflict, such as the case in countries where UNRWA operates, technological innovations hold potentials for health systems to improve access, quality and cost-effectiveness of healthcare provision. The shortages in human resources for health are most acute in post-conflict settings. A study by Woodward and others in 2014 which included a sample from West Bank and Gaza showed that ICT-based e-Health innovations can relieve information and communication needs of health workers in postconflict settings.[17–19]

Another study by Hassan and others in 2017 described the implementation of a registration tool for obstetric interventions and childbirth events using e-Health in a prospective birth cohort study in six Palestinian governmental hospitals. Their study indicated that e-Health provides opportunities for quality improvement of healthcare, although its implementation in low-income and middle-income countries is still limited.[18]

Strong evidence exists regarding the use of standards and the system's interoperability as ways to reduce cost, improve safety, enhance confidentiality and enable data exchange between systems.[19] The WHO Forum emphasised the importance of using standards and the need for their implementation.[20] UNRWA is in most need to adapt international standards and to ensure interoperability with e-Health systems in the five countries of its operations.

After the development and deployment of the e-Health system and the diffusion of m-Health globally, interest in the use of mobile phones for improving healthcare service delivery among PRs has emerged.

GOe 2016 indicated that a large number of countries reported at least one m-Health initiative. M-Health continues to be a dynamic area; the number of established programmes reaching maturity has increased since 2010.[21]

The initiative 'Be Healthy, Be Mobile' by WHO and the ITU is a great example of the buy-in by people and governments of the use of mobile phones for health. The initiative uses mobile phone technology to deliver disease prevention and management information directly to mobile phone users, and strengthen health systems by providing training to healthcare workers.[22]

## UNRWA E-HEALTH SYSTEM

The vision of UNRWA HP for the e-Health system stated that "Upon its completion, e-Health will provide quality improvement in the healthcare provided to Palestine refugees and will reduce the cost of the service". Replacing the paper-based system, increasing efficiency, reducing cost, improving services and mitigating all the risks have been the guiding principles in the in-house development of the system.

### Challenges and constraints

Based on a SWOT (strengths, weaknesses, opportunities and threats) analysis concerning the development of the e-Health system, the following challenges were identified:

1. Financial challenges. There was a limited budget distributed over a 2-year cycle allocated for health. Financing of UNRWA activities is mainly provided from donors for limited durations.
2. Technological challenges. Due to different ICT policies, infrastructure, skills and maturity levels in the five fields of operations, UNRWA had to consider the minimum requirements that will satisfy the needed deployment system.
3. Policy and legislative challenges. Five different countries have different legislative frameworks, ICT policies, health policies, health insurance and economies. Privacy, confidentiality, data ownership and ethics are only a few of the factors to be taken into consideration.
4. Stakeholder challenges. Stakeholders concerned with UNRWA e-Health include mainly healthcare providers in the five host countries and PRs themselves, in addition to many others. The main challenges were the diversity of health systems, political atmosphere and security, human resources and ICT infrastructure.
5. Organisational barriers. These included the typical return on investment issue and the need to coordinate work between the UNRWA HP and ISD.
6. Human and cultural barriers. Resistance by health staff, management and patients was one of the potential challenges. Engagement of each category at the early stages of e-Health introduction was important to ensure their buy-in and support.
7. Unstable political situation. Countries where UNRWA operates faced conflicts and instability, which posed serious challenges to the deployment of the system.
8. Quality of data in the system. Data in the system have been imported from multiple stand-alone and disintegrated systems, which affected the quality of data.

### Phases of the project

The project was divided into three phases:

- Phase 1 aimed to complete the upgrading and the modernisation of the IT infrastructure of HCs in Lebanon;
- Phase 2 aimed to entail the development of the e-Health application, piloting it at one HC in Jordansince UNRWA headquarters is located there. Staff were trained on its use;
- Phase 3 aimed to primarily rollout the application to all HCs starting with Lebanon. This roll-out was interrupted due to the development of a new version of e-Health to fully support the FHT.

### Project management approach

A project management approach was followed that targeted three components:

1. The e-Health system development component: it included the development of processes; requirements analysis, system design, system development, testing and troubleshooting. A modular system was envisaged.
2. The capacity building package: the readiness for implementation of the system was assessed, and necessary ICT and connectivity infrastructure were put in place.
3. The e-Health project adoption component: it included rolling out processes currently resulting in 121 HCs, out of a total of 143, fully using the system.

### Key features of UNRWA e-Health system

These include the following:

- In-house development ensuring that all components and source codes are owned by UNRWA;
- Web-based requiring only a web browser on the workstation supported by a centralised ICT team and data storage;
- Use of Structured Query Language relational database;
- Deployment of health information standards such as International Statistical Classification of Diseases, 10th Edition coding;
- Use of unique identifier (ID) extracted through the main registration system of PRs in UNRWA;
- Ability to search for the patient's file, using different identifiers (name, registration number, ID number, medical file number, etc)
- Built-in data validation for most values of patients' data in the system;
- It is modular for the healthcare of patients with NCD, child healthcare, maternal healthcare, general outpatient healthcare, pharmacy, laboratory, specialist care and oral health;
- Full and flexible workflow between various stations and different service providers at the HC (clerk, nurse, doctor, pharmacy, laboratory, midwife, etc);
- Built-in appointment system;
- Categorised and alphabetical medicines' lists with easy medicine selection mechanism based on UNRWA's essential list of medicines;

- Auto-fill for doses, pharmaceutical forms and quantities of prescribed medicines according to special clinical guidelines, which can be overwritten by the doctor as needed;
- The system has a medicines analysis tool, which has been used for policy and decision-making and research;
- It generates 29 main reports to monitor services effectively and support the management in informed decision-making.

### UNRWA m-Health application

Based on the evidence available and the assessment made by UNRWA team and experts, the e-Health system was expanded to support and include a mobile health (m-Health) application. Early in 2017, UNRWA released its electronic Maternal and Child Health (e-MCH) mobile application in Jordan. It constitutes a complete digitalised version of the Mother and Child Health Handbook that has been distributed to all PR mothers attending UNRWA HCs since 2008. It has an Arabic-language interface that enables mothers to read their medical files and the medical files of their children. The application has also a built-in notification system to alert mothers about several important issues such as their appointments. The application can work offline and update the data it displays immediately when connected to the internet. It includes health education content that the mother can go through, and push notifications can be forwarded to the mother based on the stage of her pregnancy and the ages of her children. Lastly, the application can interface with other similar applications, if needed.

### Tangible results and achievements

- A full implementation in 121 HCs out of 143 (84.6%). Figure 1 shows the details.
- In-house development allowed for close interaction between UNRWA HP and ISD staff to address users' requirements and speed-up software development;

**Table 1** Average time of patient's registration at the clerk's station (in minutes)

| System used | Waiting time in queue before registration | Registration time |
|---|---|---|
| e-Health | 12 | 1.5 |
| Paper | 25 | 6 |

- A smooth transition from earlier distributed systems to a new centralised system without any interruptions in service operations;
- The development of the system started with a proof of concept to do 80% of the work with 20% of the effort. It resulted in the reduction of the waiting time of patients with NCD to refill their medicines, and the reduction of the doctor's time they needed before to hand-write the periodical prescriptions for controlled patients with NCD.
- Gradual roll-out in UNRWA HCs based on the availability of funds. HCs were gradually equipped with the needed infrastructure;
- Users' buy-in was translated in a high level of satisfaction as expressed by physicians and patients;
- The system supported evidence-based decision-making and enabled the measurement of quality improvements. For example, there was a reduction in the waiting time by patients at each station in the HC after the implementation of e-Health as shown in table 1.[23]

Among many other quality indicators measured, there was a reduction in both the antibiotic prescription rate and the number of consultations per doctor per day as in figures 2 and 3. Both were monitored through e-Health over 6 years (2011–2016).[24] The drop in both instances was primarily due to the use of e-Health, which enabled the reduction of duplicate services, leading to less numbers of patients seen by each healthcare provider, more time available for seeing each patient and therefore having more healthcare provider–patient contact time. In addition, the accurate follow-up of the medicines for each patient

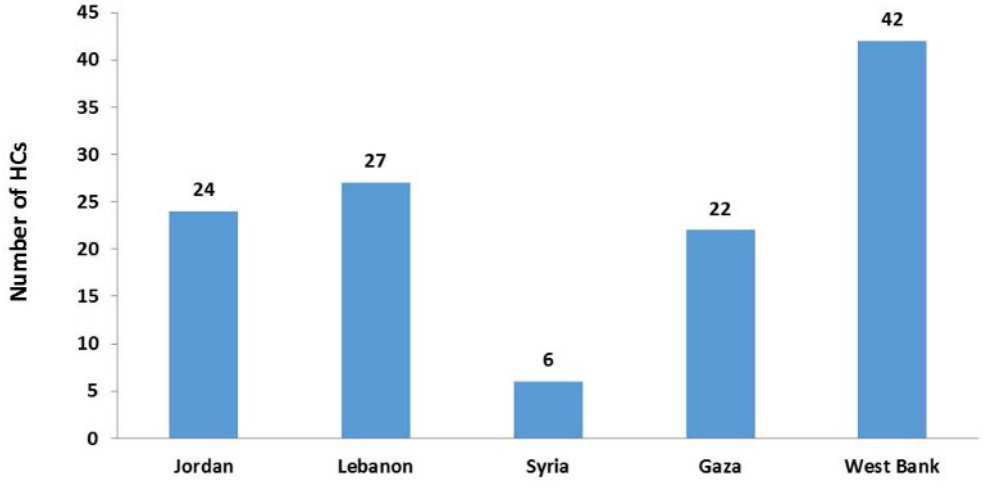


**Figure 1** Number of health centres (HCs) with e-Health by field of operations.

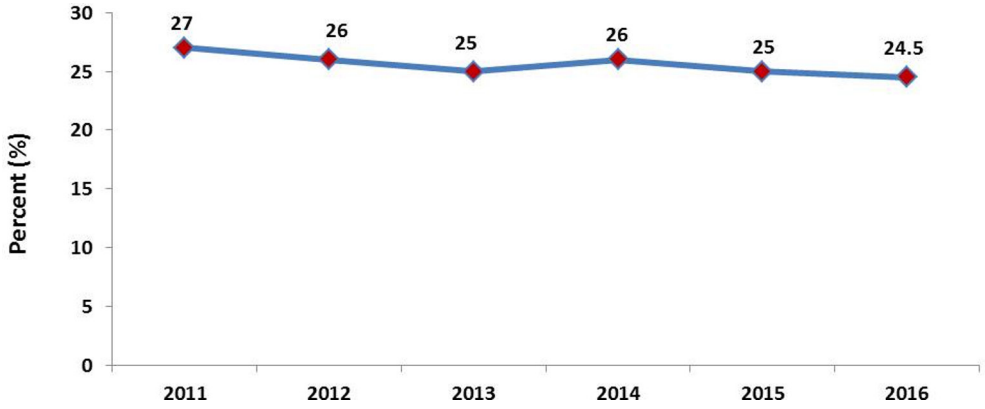


**Figure 2** Average antibiotic prescription rate at all health centres in the five fields of the United Nations Relief and Works Agency for Palestine Refugees operations, 2011–2016.

by the same healthcare provider made the prescription of antibiotics more rationale.

- Based on preliminary data, it was found that the e-MCH application had an immediate impact on mothers' engagement, education and use of the services provided to them by the HCs.

## DISCUSSION

The 2016 report of the UNRWA Department of Internal Oversight Services on the evaluation of the e-Health concluded that "there seems to be enough evidence that the e-Health system had positive impact both, on health centre team dynamics and on the patients' perception about UNRWA, among a general feeling of fairness brought by the e-Health equity factor".[23] Moreover, 92.9% of health staff consider e-Health as a main tool for quality assurance. The report stated that 71.1% of staff were satisfied with work organisation, saving and searching data in the system, and that 69.5% of the staff were satisfied with training provided on the system. Moreover, the report showed that 91.6% of the staff were satisfied with their ability to use the system, which might indicate that the system is easy to use without extensive training. A low percentage (34.9%) of staff was satisfied with the technical support provided to the system. Concerning patients' satisfaction, 57.4% were satisfied with the reduction in the waiting time and 78.1% were generally satisfied with the services provided after the introduction of the e-Health system. In addition, 78.1% of the patients were satisfied with quality and duration of their consultations. Contrary to many claims that e-Health systems take away time from health education during the visit, it was found that 69.6% of patients were happy with the health education provided to them.[23]

The results of the evaluation and the assessment of the outcomes of the UNRWA e-Health system are consistent to a great extent with the findings from the literature. The system has proven to be cost-effective and secure, supporting healthcare services and research conducted by UNRWA HP. This findings ares fully compliant with the WHA resolution of 2005.[4] In addition, these results are also in line with the reported evidence about improving efficiency, decision support, data collection, retrieval and analysis, privacy, security, safety, cost reduction, office efficiencies, centralised

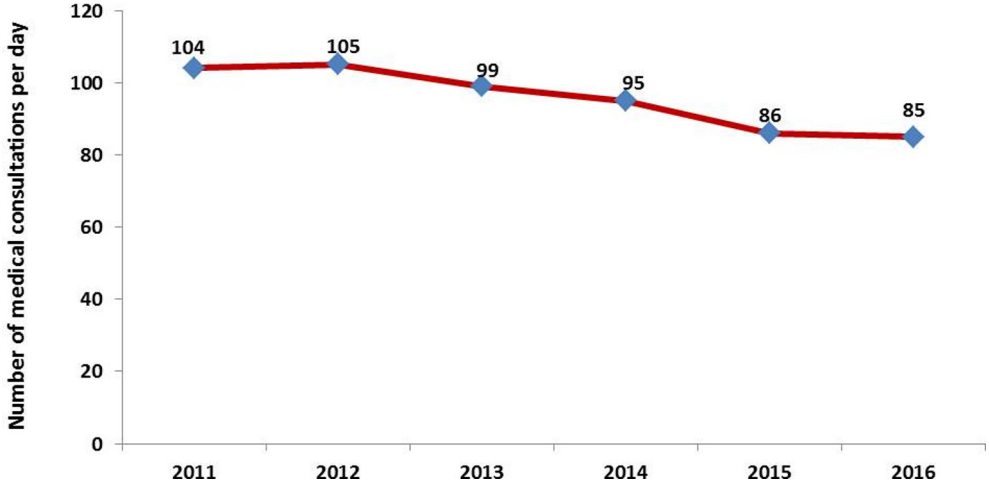


**Figure 3** Average number of medical consultations per doctor per day at all health centres in the five fields of the United Nations Relief and Works Agency for Palestine Refugees operations, 2011–2016.

access to patient information, and ability to communicate with patients and fellow providers leading to quality improvement of healthcare.[7–15]

The use of data extracted from UNRWA e-Health system was important to support the secondary use of the system in cohort analysis, as documented in several studies published by UNRWA HP.[25–28]

## CONCLUSIONS AND WAY FORWARD

The e-Health system developed and deployed by UNRWA at its PHC facilities has proven to be an essential tool for a cost-effective, patient-centred, better healthcare quality, in addition to equitable, fair and sustainable healthcare services via such an ICT health application.

The way forward can be summarised as follows:

1. Complete the deployment of the system to include all HCs in the five fields;
2. Enhance the technical support provided to healthcare workers in all fields of UNRWA operations;
3. Improve the quality of data stored and data that will be captured in the system to enable evidence-based planning and decision-making;
4. Release the new version (V.6.0) of the system after the compilation of requirements and development of the software;
5. Collaborate with national health authorities in each of the five fields of UNRWA operations to exchange data on PR patients in a secure manner.

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