Emergency Department Waiting Times (EDWaT): A Patient Flow Management and Quality of Care Rating mHealth Application

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Abstract. Saudi hospital emergency departments (ED) have suffered from long waiting times, which have led to a delay in emergency patient care. The increase in the population of Saudi Arabia is likely to further stretch the healthcare services due to overcrowding leading to decreased healthcare quality, long patient waits, patient dissatisfaction, ambulance diversions, decreased physician productivity, and increased frustration among medical staff. This all will ultimately put patients at risk for poor health outcomes. Time is of the essence in emergencies and to get to an ED that has the shortest waiting time can mean life or death for a patient, especially in cases of stroke and myocardial infarction. In this paper, we present our work on the development of a mHealth Application – EDWaT - that will: provide patient flow information to the emergency medical services staff, help in quick routing of patients to the nearest hospital, and provide an opportunity for patients to review and rate the quality of care received at an ED, which will then be forwarded to ED services administrators. The quality ratings will help patients to choose between two EDs with the same waiting time and distance from their location. We anticipate that the use of EDWaT will help improve ED wait times and the quality of care provision in Saudi hospitals EDs.

Keywords. Emergency Department, Wait Times, mHealth, Quality of Care, Patient Ratings, Emergency Medical Services

1. Introduction

For the past decade, waiting times at Saudi hospital emergency departments (ED) have increased leading to a delay in provision of patient care. With the projected population growth, it is anticipated that healthcare services in Saudi Arabia will be further stretched leading to decreased healthcare quality, long patient waits, patient dissatisfaction, ambulance diversions, decreased physician productivity, and increased frustration among medical staff [1]. This all will ultimately put patients at risk for poor health outcomes.

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health outcomes. A study in Saudi Arabia recorded an increase of 30% ED visits within a year, between 2006 and 2007, to a total of 45,483 visits at one ED [2].

In this paper, we present our work related to the development of an innovative mobile health application (mHealth App) – EDWaT - that will provide patient flow information to emergency medical services (EMS) staff, quick routing of the patients to the nearest hospital, live updates on ED waiting times, and provision of quality of care feedback for the ED services administrators. In addition, this App will provide an opportunity for patients to review and rate the quality of care received in terms of their overall satisfaction, staff co-operation, dignity and respect, involvement in decisions. These ratings will help patients to choose between two EDs with the same waiting times and distance from their location. There are no applications currently available within Saudi Arabia or the Middle East and North Africa (MENA) region that address these issues.

According to West (2012), in the future doctors and patients will use mobile devices to manage numerous health issues and for that reason, the healthcare services will heavily depend on mHealth all over the world including the developing world [3]. In Saudi Arabia, smartphone market share is around 12% of the total markets in the Arab world [4]. The smartphone penetration rate is expected to increase from 25% to around 49% by 2016. Hence, this expansion will make the App accessible and possibly used by a larger segment of the Saudi population, especially youths that are under 35 years old and make up the largest part of the Saudi population.

2. Goals and Features of EDWaT

The specific goals of EDWaT are to:

1. Provide live updates on waiting times in minutes in the preceding hour for a patient to be seen by a physician on arrival to the ED.
2. Calculate the travel distance time (drive time) and the shortest route (using Google Maps) to the nearest ED with the least waiting time.
3. Provide directions through Google Maps for the EMS teams to the nearest hospital with the shortest waiting times.
4. Provide data for hospital EDs on their waiting times and quality of services. This will help hospitals improve their services.
5. Provide a map view showing patient’s current location and the waiting times of nearby facilities.

Once developed and tested, the EDWaT App will have the following features:

1. **Innovative mHealth Tool:** It will help in taking a patient in emergency to the right hospital facility within the shortest possible time.
2. **Economical:** Will provide a cost effective solution to deal with the issue of ED overcrowding.
3. **Patient-centered:** It will, by virtue of taking patients to the right facilities in the shortest possible time, help in improving clinical effectiveness of treatment especially that require administration within a short window of opportunity thus leading to timely treatment, saving of lives, and prevention of long term disabilities.

4. **Clinical Relevance:** Quality ED treatment and wait times are important issues. Thus, an App like EDWaT that helps in dealing with these issues will have a high clinical value.

5. **Achievable:** This innovative App can be up and running within a very short period and can easily be expanded to include other relevant features due to its flexible model.

6. **Potential Health Value:** This App can lead to immediate cost savings, life savings, and improved quality of patient care.

### 3. Conceptual Framework of EDWaT

The innovative tool that supports the EDWaT App is its statistical algorithm that will use multiple data sources to predict the optimal hospital for patients given their condition. The algorithm will make use of three main sources: patients’ provided quality of care ratings, hospital waiting times, and shortest distance to the ED. Figure 1 provides an overview of the linkages between various data sources that will be assessed together within EDWaT’s mHealth central database. The assessment will be based on the underlying statistical predictive algorithm, which is currently under development.

![Figure 1. EDWaT Conceptual Framework](image.png)
4. EDWaT Screen Shot

EDWaT will provide patients with an interface to choose the optimal ED with the shortest time travel, shortest waiting times, and highest quality of care. Figure 2 provides a screen shot of the EDWaT mHealth application. On the top of the screen is the hospital name. Below that is the estimated travel time to the hospital from the patient’s location at that point in time, and estimated waiting time in the ED. We plan to provide voice activated map directions for patients, which is in the middle of Figure 2. Below the map, is the patients’ provided quality ratings for the hospital of interest. The patients can click on the icon to read the reviews left by other patients and can also provide their own ratings after their episode of management at that ED. The ratings range from one star to five stars, with one indicating inadequate services and five highlighting exemplary services. Below the quality of rating screen is a social media component, which allows the patients and the hospital to communicate with each other. For example, if there is a discrepancy in the algorithm concerning wait times, the hospital or the patient can comment on this and all patients using the EDWaT application will be able to view that communication. Furthermore, if there is an emergency, the hospital can inform patients to avoid that particular ED through this social media functionality. The last feature at the bottom, the alternative hospital button, allows the patients to choose another hospital if they are not satisfied with the information on that hospital and decide to avoid that hospital based on the algorithm’s results.

Figure 2. EDWaT Screen Shot
5. Discussion

EDWaT is a mHealth tool that will provide improved ED services within Saudi Arabia and the wider MENA region. Currently, the application is under development. There are a few issues that have slowed down the development and implementation of this App. First, there is some resistance from the hospitals in sharing their waiting times data with our EDWaT research team. For the application to be successful, multiple hospitals need to participate in this work providing live and up-to-date waiting times data. Second, it has been challenging to develop the algorithm that can ultimately provide the optimal information on a range of matters outlined above. One of the difficulties in the development of this algorithm is the lack of reliable baseline data on waiting times, which in turn is not that easily available as mentioned in the first point. Third, reliability and validity of the patients’ provided quality of care ratings and whether these subjective patient ratings are a true reflection of the quality of care provided by the EDs. Fourth, the development of the application requires time, resources, and multiple testing to ensure it provides accurate information to the EMS staff, the patients, and the hospital administrators.

As a result of these impediments, we are currently working on the development of an EDWaT GPS service where the application will provide the shortest travel time to the ED, with the provision of the patients and hospital to interact via social networking function within the App. Patients will still be able to rate the quality of the care at the hospital and leave their comments as even though these ratings are subjective, but they still provide adequate overview of the issues that matter most to the patients. The modification will remove the ED waiting times, as these data have been difficult to obtain from the various hospitals, but will likely be included in the future versions of EDWaT.

References