

Breaking Silos to Streamline Covid-19 Management with the Help of Electronic Medical Record: Case Report from Ministry of Health and Prevention, UAE

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Abstract

Following onset of the COVID-19 pandemic, United Arab Emirates (UAE) was vigilant in their response. The Ministry of Health and Prevention UAE devised an end-to-end program for disease surveillance and management by utilizing their Electronic Medical Record System (Wareed) as the bridge to ensure a smooth workflow.

The objective of this project was to enhance the healthcare delivery process by developing a well-synchronized and integrated workflow model and design supportive tools to integrate all different health departments engaged in COVID-19 response. We highlight the situational requirements and their solutions within Electronic Medical Record System.

We designed a workflow utilizing the Hub and Spoke Model. Our smart solutions to the challenges of pandemic are pre-defined identifier, contactless screening, dashboards, etc.

Through our design, we exhibit an Electronic Medical Record System playing a pivotal role in bridging the different departments of a health system

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Introduction

Health care systems around the world are being loaded with suspected COVID cases, reaching out to different providers in varied settings. Some are being identified at entry points, some presenting to outpatient clinics with symptoms while some are opportunistically being captured while visiting a health provider for other complains. Can these cases be unified on one platform and the management plan is synchronized rather than working in silos?

This is a real case scenario the global health care system is facing today. World history took an unforeseen turn when China reported 41 cases of “mysterious pneumonia” on 31st December, 2019 [1]. Unexpectedly, the mysterious viral illness- now

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referred to as COVID 19, became an epidemic and took on the form of a global Pandemic within a few weeks [2,3]. The Number of confirmed cases reported by World Health organization on the 16th of June 2020 were 7,890,687 with 433,404 reported deaths so far [4]. This is an ongoing situation where research is evolving every day to understand the epidemiology, pathology, management and other dynamics of this virus. Today, there is an immediate response expected from all sectors of health to collectively combat this pandemic. Disaster mitigation and management systems are activated to bring all required resources under a unified plan to better manage this health crisis.

While the situation approaches a system in an aggressive yet phased manner, a piece meal response from different health sectors exposed areas of “information dark spots” and siloed workflows. Health care system can be broadly segregated into preventive medicine/ public health, primary, secondary and tertiary care. While all different departments within the health sector play a different role, there is a need of integration between all departments for smooth flow of patient information. Patient information is the real currency for the modern health systems and it plays a pivotal role in defining system strategy. There is evidence that breaks in this Interdepartmental flow of information can cause undesirable delays in the care giving process [5]. The Health Information system or the Electronic Medical Record (EMR) system is a prime tool that can prepare the system better. It can harmonize the workflow by integrating all departments through one platform and ensuring timely release of information to minimize delays in care giving process [6,7].

United Arab Emirates (UAE) were vigilant in their response to COVID-19. The Ministry of Health and Prevention (MOHAP) UAE, governs an organization that ranges from preventive medicine to tertiary care services. Catering mostly to the northern emirates of the country, MOHAP devised an end-to-end program for disease surveillance and management by utilizing their EMR (Wareed) serving as the bridge to ensure a smooth workflow.

In our case report, we discuss the process of developing a highly synchronized and integrated workflow between all different health departments at MOHAP that are engaged in COVID-19 response. We highlight the situational requirements and their solutions within EMR.

Objectives

To design a smart workflow model and design that will enhance the healthcare delivery process by streamlining the interdepartmental and intradepartmental COVID-19 Information capture, flow and analytics. This will help to improve the health outcomes of COVID-19 cases within our health organization.

Methods

This project was initiated on urgent basis as an immediate requirement by MOHAP-UAE. Every department had to devise their own plan on how they will contribute in fighting the emergent situation, as well as how they will be working in sync with other departments in receiving and transferring patients.

This is a unique scenario that rarely occurs in decades. It was an opportunity for the health informatics to prove its mettle. The clinical information system would be the bridge between different individual departments and teams facilitating smooth processing of patient information back and forth.

The COVID-19 integrated workflow team comprises of MOHAP subject matter experts, Health Informatics professionals, process engineers and analytics experts who worked cohesively with policy makers and end users to design an end to end workflow solution for the situation. We conducted a detailed needs assessment and workflow gap analysis to design a comprehensive workflow from surveillance point till patient discharge and follow up. This workflow incorporates all different departments for the health system and drills down to specific customized solutions for supporting every step in the workflow.

We considered the fact that the COVID-19 workflow should be flexible enough to accommodate all different stake holders, ensuring their requirements are met by providing them documentation and clinical decision support as well as giving them insights from other data hubs within the system. Another reason to keep it flexible and modifiable is that guidelines are subject to updates given the evolving situation. Our focus remains to keep the documentation simple, easy to interpret and the system efficient.

Results

Along with creating a smooth workflow (Figure 1), we envisaged even a bigger role for our clinical information system than one limited to capturing documentation and transfer of information between providers/facilities/departments. It was transformed into a tool for streamlining and standardizing workflow, automating repetitive steps, joining otherwise disparate processes, feeding a data lake with a defined data structure and providing high, medium and low-level view of patient flow through the entire health system. Clinical decision support elements were derived from clinical guidelines in the form of alerts, reminders, care plans and clinical rules (Figure 2) (Table 1).

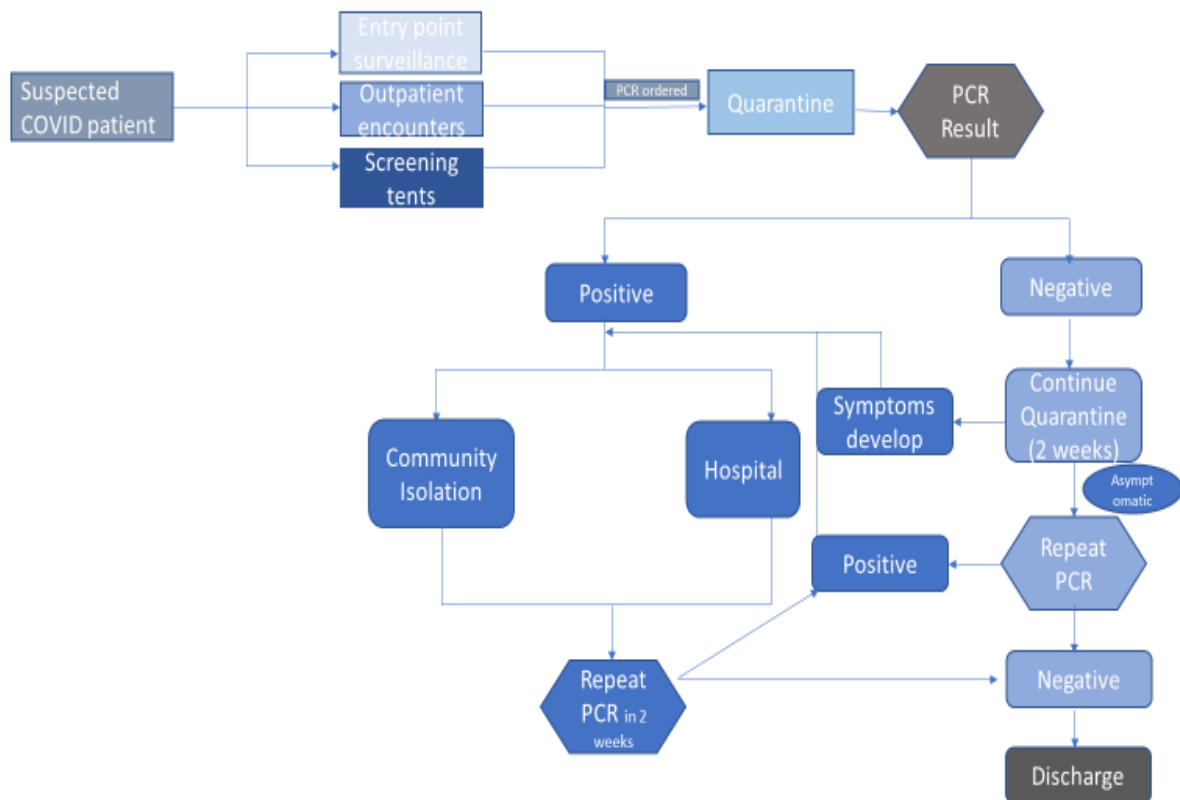


Figure 1: Workflow diagram explaining the flow of patients from entry points till discharge.

Challenge	Solution
Mass Screening	Surveillance workflow (registration, documentation, registry)
No ID at screening points	Registration in central registry using preassigned unique ID number
Flow of patients from surveillance point to care facility	Tracing and identification using unique ID, detailed documentation to complete patient ID and demographics
Bidirectional data flow	Automatic assignment to central registry as soon as a PCR order is placed on the system through any facility
Precise and standardized documentation	Development of precise documentation tools, pre-defined order sites, risk stratification tools, auto filled standard documentation templates to keep documentation precise and accurate
Minimizing physical exposure at health facilities	Conversion of outpatient encounters into E-visits using remote assessment workflow
Clinical decision support and alerts	System enabled risk stratification, care plans and alerts to support management of existing patients and alerts to notify new /suspected cases utilizing PCR order as the flag
Data insights	Data visualization and creating insights through smart dashboards that assist in situation analysis, resource allocation and care planning

Table 1: Challenges and their solutions to establish a streamlines workflow utilizing EMR.

An Effective Pandemic Defense Through EMR

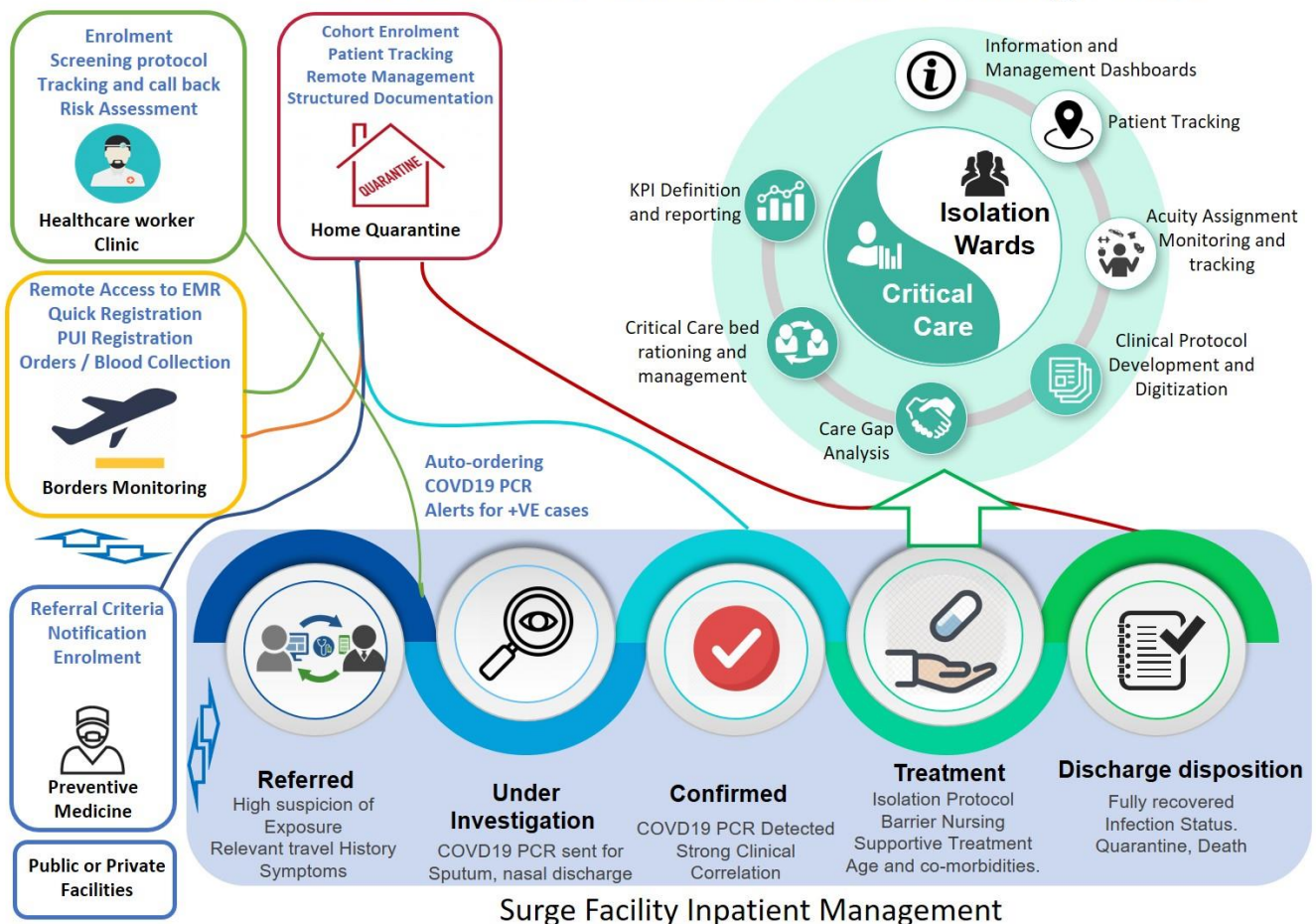


Figure 2: Health system wide HCIT strategy.

Workflow design utilizing the hub and spoke model

The most important and challenging part was to identify and establish a central Patient Register that would serve as the central repository for all patients that were screened, found to be at risk, to be positive, recovered or died unfortunately. The workflow has three defined streams of enrolling patients in the COVID 19 system. They can either be captured from the national entry points (airport, seaport, etc.), from the outpatient encounters or the (Ambulatory or Emergency Department), and purpose-built screening tents in population dense areas. We were challenged to create a model where information would flow easily between different departments and their various workflows. Creation of a one to one relationship was initially considered and attempted due complexity of maintaining $(N \times (N-1)/2)$ relationships. We then opted for Hub and Spoke model [8] where all departments (and their sub-departments) are connected through a centralized patient register. This register displays extensive information with multiple views created, to suit the need of corresponding workflow. This allows the clinical information system to keep everyone one the same page (Figure 3).

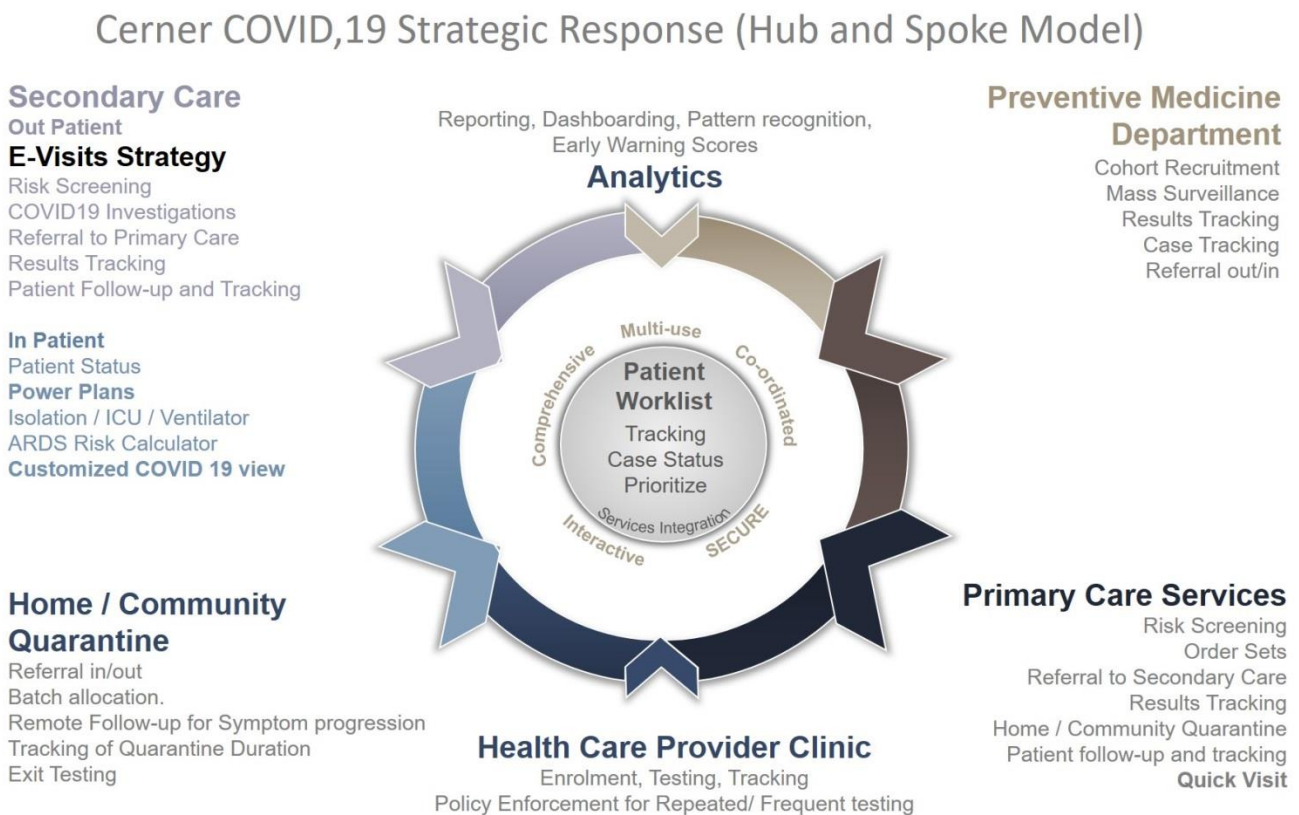


Figure 3: Covid-19 strategic response (using hub and spoke model).

Predefined patient identifiers

The challenge at surveillance points was to capture the patients with a unique identity while many of them did not have a valid National ID (especially for the patients entering from ports or jail inmates). The frontline staff had an overwhelming workload and couldn't spare time for detailed identifier documentation. So, the solution had to be precise, accurate and traceable. We came up with the solution of a predefined Unique COVID Surveillance Medical record number, that was assigned to all unique

patients and would serve as their ID throughout the process and linked to any other IDs later added to the system (National IDs or Unique patient identifiers).

Contactless tracing

In parallel to this requirement, the physical interaction of suspected patients with the health care centers was to be minimized. To tackle this situation, e-visits were designed over-night that would capture all relevant COVID information in EMR while avoiding physical interaction. Once a patient was screened to be eligible for PCR testing through this evaluation, this patient would receive an appointment for PCR to a center nearest to their place of residence. All patients identified as suspected cases (based on travel, contact or clinical history) were admitted to quarantine list by the system till a PCR result was recorded back.

Unique quarantine/Isolation workflows

The next bifurcation occurred once the system captured the patients COVID 19 PCR results. If they were positive, they were recommended isolation based on the severity of clinical picture. The system developed documentation and decision support making it easier for the providers to transfer them out of primary care to their next destination at this point. These workflows encompass very objective initial and follow up assessments, risk stratification as well as clinical decision support. Having a risk stratification within the system enables the physicians in classifying them, assigning them to correct facilities for management and treatment protocols.

Discharge workflow

To end the patient journey, this COVID-19 management system is supported by an appropriate discharge workflow for continuity of care after the patient exits the facility in given time. It incorporates all mandatory and relevant orders, educational support and suggestions for the care giver to complete the encounter successfully.

Smart dashboards

Our system supports the health system by creating insights with the help of smart dashboards. These dashboards derive operational as well as clinical information and continue to support the decision-making process.

Teleconsultation

To minimize patient and healthcare providers exposure, we designed teleconsultation system for routine, non-urgent encounters that do not require physical interaction. These encounters were further categorized as E-visit encounters over telephone for visit types where telephonic interviews would suffice the need and second category was video consultation.

Preventive Medicine Centers	10
Surge Facilities	19
Primary Health centers	60+
Hospitals	16

Table 2: Number of facilities integrated through COVID workflow.

As a final outcome of the above mentioned processes, we were able to integrate all health departments (10 preventive medicine centers, 60+ primary health care centers, 13 surge facilities and all 16 hospitals in the network). These processes were supported by insights created through 10 smart dashboards displaying day to day figures to track and record current situation (Table 2).

Discussion

Our in-depth situation analysis leads to designing a smooth flowing workflow that would enable exchange of documentation within and between different departments of the healthcare system. The system would support timely decision making by making the data available as soon as it is entered in the system. This is essential for managing patients referred from one service to the other. Studies from the past have proven how disaster situations impact different sectors within and outside health sector and how a unified response is the most efficient way to cater [9]. Collaboration, cooperation and partnerships are identified as few of the most important pillars of a prompt and appropriate response from a health system [10,11].

Creating a central repository is the central piece to our workflow design. This repository is fed by all gateways to the health system and has some data stewardship designated to maintain and update the repository. It highlights hot clusters and creates a clear picture to assign resources on need basis. The importance of a central data collection process is well-established in supporting the function of the entire response mechanism [12].

Developing Risk stratification following standard guidelines has many advantages to the caregiving process-most importantly, it empowers nonspecialized health care providers to follow the same management protocol as infection control specialists. This becomes essential in crisis situations where resources are limited, and the health system requires a standardized response from all levels of care givers.

Dashboards are one of the major outcomes of our COVID management system. The significance of dashboards for clinical decision making is well established. These data driven insights are the backbone of any mature healthcare management system [13-15].

Teleconsultation is being proposed as a very helpful mode of continuing healthcare process with minimizing exposure. It enables physicians to conduct many encounters every day despite lockdown and assures continuity of care without violating social distancing [16,17]. We successfully utilized it in our system and we were able to use it as two types: telephone E-visit and video consultation.

We propose a well-connected workflow enabled by the EMR that creates partnerships across the different responders and is able to bring all stakeholders on the same table when followed effectively. We have highlighted the challenges and share effective solutions that were implemented in our system to support COVID-19 management strategy (Table 1). This design will not only help in fighting the COVID-19 outbreak today but it can be modified and replicated effectively in future.

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Conflict of Interest:

None

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