Switching to a Coronavirus disease 2019 (COVID-19) center: Lessons from Ariana Hospital experience

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Abstract:

After the translating of the worldwide pandemic COVID-19 disease from South East Asia to Europe, north African countries accelerate their steps to follow WHO guidelines to prepare the outbreak response.

In March 2020, Tunisian ministry of health switched Abderrahmen Mami Hospital as a COVID-19 center. Main objectives were management of patients but also setting-up new rules to permit enough safety for the staff members and harmony between medical, non medical and administrative departments within the facility. Organization and communication during the accelerating rate preparation process were crucial to get enough qualified human resources, material resources and clear procedural texts just in time before cases arrival in huge numbers. A group of medical and administrative experts within a central crisis unit brought this challenge into reality.

Key words: COVID-19, Crisis units, Communication, Health care worker
Introduction

After the spread of the worldwide pandemic of SARS-CoV-2 and COVID-19 disease from South East Asia to Europe, North African countries accelerated their steps to follow WHO guidelines to prepare the outbreak response. Goals to achieve at a national scale were:

- Identification, tracking and isolation of imported cases entering Tunisian territory
- Prevention or put back the occurrence of contagion among Tunisian citizen
- Preparing health care centers to stage 3 epidemic state.

In March 2\textsuperscript{nd} 2020, the first imported COVID-19 case in Tunisia was declared. In March 23\textsuperscript{rd} 2020, Abderrahmen Mami Hospital in the city of Ariana, was dedicated to COVID-19 patients management (1). The emergency department in Mahmoud El Matri Hospital, was designated to ensure the targeted screening for COVID-19 in suspected patients, the severity assessment and the guidance of patients towards other departments if necessary.

Methodology

Previously containing pulmonology, cardiology, chest surgery and intensive care departments, the guidance rules to fulfill in the hospital after its nomination as a COVID-19 center were defined and written. During epidemics, a coordinated and multidisciplinary management between specialists in infectious diseases, intensive care units, and infection prevention and control, but also the hospital management, is of paramount importance to provide an optimal care.

In this manuscript, we describe by details all preparative measures and the new organization set up in this medical center to enable the switch to an uncommon health care regimen. This paper provides rich description of phenomena and enhances understanding of the context of events as well as the events themselves during the first COVID-19 wave.

To report faithfully all the previous, authors examined all procedural texts and notes provided by the medical council, all administrative assignments recorded as ordinary, exceptional or temporary during the first quarter of 2020.

Set up of a steering crisis unit and derivative sub-units with clear missions

In the beginning, an important concern voiced by staff was a lack of preparedness for COVID-19. Once the National Body for Health Assessment and Accreditation posted its main
manual for COVID-19 management (2), steering crisis unit members had to provide their professional expertise and up-to-date all written guidance on procedures for management of suspected and confirmed cases of COVID-19 within the hospital, considered as a third line teaching center.

Clinical pathways for screening of incoming symptomatic patients in the hospital entrance were established by a reflection sub-unit. Experts ensure in their plan an avoidance of intersections with COVID-19 free people, a reduction of contagion risk and a safety distance from suspicious cases always respected. Clinical examination boxes, waiting spaces and protective measurements and equipments were precisely described according to WHO guidelines (3,4).

Daily meetings of national and regional head managers were held each morning to learn about the epidemiological situation in the country, isolated patients in airports or advanced medical posts near borders, to organize patients dispatching towards specialized centers, to organize donations and to include more volunteers onto existing operational teams. Scientific sub-units discussed regularly problems encountered by doctors, proposed drafting or updating consensus and tracked feedback from doctors.

An administrative and legal arm was created to watch and review achievements and predictions. Then, real and predicted shortage of supplies were treated efficiently. Donation enhancing, counting and resource distribution is ensured by a specific sub-unit directly connected to the communication and announcement representative members, in order to highlight the real actual needs of the hospital. This inventory management cell managed any shortage-wise in personal protective equipments, Chloroquine or other. Pharmacists could involve purchasing department easily if necessary.

Training-qualification units transmitted regularly up-to-dates (reminding of theoretical knowledge, description of the occupational risk, transmission of skills, description or immersion into the new working pathways, application of the distance keeping concept) and surveyed real progress and handling of the procedures among health care workers (HCW).

Exchange between all sub-units is made easier through some common members. Prediction was essential to avoid mistakes in the decision making process (5). Predictions were gathered from the previous experience of H1N1 outbreak in 2009, from previous knowledge about severe acute respiratory infections and from reviewing China and Europe experience against novel coronavirus (nCOV) spread in January and February.
Protecting health care workers

The fact that HCWs are at risk of infection in the epidemic chain is a critical issue and a real burden in many countries (6). Therefore, all possible actions must be taken to control the spread of the infection among HCWs, first by identifying the risk factors for infection and then by taking appropriate measures to reduce these risks.

It was well established that transmission of any viral disease among HCWs is associated with overcrowding, absence of isolation room facilities, environmental contamination and inadequate awareness of infection prevention practices among both patients and HCWs (6). Knowledge of a disease can influence HCWs’ attitudes and practices. Incorrect attitudes and practices directly increase the risk of any infection (7). Therefore, COVID-19 training sub-units managed to select well trained members in every department who facilitated the transmission of new guidelines and rules concerning work in a contaminated isolation area. These sub-units, also, transmitted a feedback to the central crisis unit concerning work shift length in every department, team set up and sharing responsibilities within all members of the staff. Crisis unit consider these recommendations as much as possible.

From the perspective of scientific prevention and control, HCWs should place a high value on correct removal of the protective equipment (4). When removing contaminated equipment such as gowns, gloves, medical masks, and eye protection worn in contaminated or high-risk environments, it is necessary to prevent self or surface contamination.

Understanding HCWs’ knowledge, attitudes and practices towards possible risk factors helps to predict “at risk staff members” or “higher risk situations”.

There was considerable variation in the use of barrier precautions and personal protective equipment. There was also wide variation in perceptions of security with use of personal protective equipments. HCW usually avoided receiving various templates, models or sizes of protective equipments. Key message in these situations was to focus on showing effectiveness of every outfit to wear during a specific medical procedure.

However, inadequate knowledge is not the only risk factor for care. A previous study showed that the causes of higher risk of infection are related to HCW daily practice, the duration and the frequency of their occupational exposure. We defended the concept of front line personnel while setting clinical and in-patient pathways. They were more exposed during patient intake, screening, inspection, testing, transport, treatment, nursing, specimen collection or pathogen...
Therefore, to minimize the contact time with the patient, we applied distance surveillance through a closed circuit television (CCTV) network linking the infected zone to the staff zone. Nurses considered it a good and safe way to monitor a patient and suggested to make also, regular phone calls to patients to minimize the psychological impact of the isolation rules (8,9). Greater risk of contagion was observed among maids, perhaps related to the complexity of the procedure for transporting patient’s waste and laundry.

Before the outbreak, the pace of work at the hospital was as follows: One heterogeneous team of seniors and trainees ensures the morning session (6 hours) and a second team ensures the afternoon session (6 hours). The evening session (12 hours) is provided by three teams who pass the evenings in turn at a rhythm of one day out of three.

Shifts during the outbreak was as follows: Medical staff finish one week of field work on a rhythm of 12 hours shifts, followed by one week of confining. Two RT-PCR nasopharyngeal staining are done two days apart during confining period, before they could go back home for one week of rest.

During confining period, health care workers were in periodically decontaminated individual hotel rooms. These dedicated hotels had no other guests otherwise. Lockdown measures were set: special agents and bus for transport, daily provided face masks, presence check and phone-call check. Meals delivery, laundry and rubbish collecting were directed and done by ministry of health teams. During Ramadan (fasting month for muslims), work shifts were slightly modified to fit the time of fast-breaking, to avoid overwork or non-conscious errors. Meals and water delivery was easier, twice a day.

**Digitalization**

Trying to fulfill a safe “paper free” medical activity, there was a real need for more and better documentation as well as digitalization of healthcare systems in no time. That entailed shifts in requested competencies and roles of HCW. During COVID-19 outbreak, as a result of this data-centric digitalized daily practice and the risk of including medical scribes, this supplementary workload was taken in equal parts by doctors and nurses.

The boundaries between professions as well as their skills, expertise, and task repertoire continuously change in healthcare due to multiple reasons. In times of shortage of staff, physicians and nurses may hand over routine tasks to other occupational groups, whereas in
times of surplus or “imperative need” they may try to incorporate additional tasks and specialties into their work domain (10).

During COVID-19 outbreak, trainees and nurses extended and restored their skills in digital compilation. They were able to enter information into the electronic medical record (EMR) or chart at the direction of a physician or practitioner. In practice, a nurse does not and might not act independently but could document the previously determined physician's or practitioner's dictation and/or activities. Skilled nurses also assisted the practitioners in navigating through or entering information into the electronic medical record (EMR), locating information such as test results and lab results. They could support work flow and supervise documentation, coding process and storage of medical or administrative records. The ultimate goal was to allow the physician or practitioner to spend more time with the patient, to prevent him from clerical work, and to avoid his physical displacement from a room to another excessively.

Computed requests for laboratory analyses were activated for the first time during the COVID-19 outbreak. Blood samples were identified by serial numbers or codes corresponding to specific requests made previously by the physician. X rays explorations requests were computed as well. Human intervention to respond one by one to the incoming requests meant to avoid the crowds and facilitate the sterilization of the close areas.

Psychological support:

Citizens reaction were classically described after H1N1 spread, large scale experiences like tsunami, hurricanes. In addition, according to earlier Chinese and European publications, HCW reported feeling unsafe while working during the actual outbreak, and expressed incertitude about the effectiveness of personal protective equipments (11,12). So, dealing with psychological impact of the outbreak on isolated or hospitalized patients, HCW, large population was an important issue to predict (13–16).

Using a free telephone line, a group of psychologists and psychiatrists ensured the listening and the support of HCW in our hospital during or after finishing their anti COVID-19 “duty”. Several cases of infected nurses had to be admitted in their same departments. After discharge, they needed a supportive psychotherapy and a special care from their doctors.

A psychological support was offered to patients on request, by a group of psychologists using another special free telephone line. Physicians and medical trainees made phone calls to their
patients, two weeks after discharge to seek of their news and answer questions if they had any.

**Post epidemic strategy:**

In May 10\textsuperscript{th} 2020, Tunisia scored zero new case of COVID-19 infection. Twenty days after that, epidemiologists declared a total control of the epidemic status: No more new cases, screening in the entourage of the remaining patients already done and borders still close for casual travelling and tourism.

Emergency department then all other departments of cardiology, pulmonology and imaging returned progressively back to normal activity with strict distancing procedures.

Online platform or Facebook pages were set to provide appointments to patients. All departments came back to work with 70\% of full capacity. Patients came on schedule in small groups every one hour all over the morning. Waiting areas were re-arranged with fewer chairs. Priority was given to chronic diseases careers which missed their regular controls. Experts within the reflection sub-unit did not miss to evaluate the whole experience and write procedures predicting a second wave of COVID-19 infection in Tunisia

**Discussion:**

Ariana hospital was the only third-line medical center entirely dedicated to COVID-19 management in Tunisia. The other hospitals in Tunisia followed the classic plan used worldwide (6,17,18). They developed triage at their entry gates leading to COVID-19 or COVID-free circuits with no intersections. They built, also, isolated waiting zones and small COVID-19 admission pavilions. Ariana hospital, instead, included the largest intensive care department entirely dedicated to severe cases of COVID-19 patients in Tunisia. There was also seven pulmonology departments for mild cases, a cardiology department containing an angioplasty unit, an imaging department with three access plan to facilitate decontamination after every exploration and a surgery department dealing with all types of surgical or gynecological emergencies in COVID-19 patients. In Ariana hospital, it was not need to set up a COVID-19 versus COVID-free physical separation. Triage is performed in another hospital in the nearby, allowing medical units to receive infected patients already diagnosed, with severity assessment quite done. Nevertheless, the transport of the patients from a center to another was found to be a critical point to anticipate. Patient movement circuits to avoid
infectious spread had to be organized by the infection prevention and control (IPC) team and forwarded to involved HCWs. The inventory department had to adapt to a rapidly growing demand and provide the personnel with the necessary equipment for treatment.

Infection among personnel of the hospital during the first COVID-19 wave was sporadic. We registered 4 cases with mild symptoms and 4 asymptomatic cases of COVID-19 infection. Taking into consideration the facility size (1400 employees in a third line teaching hospital), infection rate would be near Zero.

On the other hand, international data and experience exchange was entrusted to a group of seniors. This quality control sub-unit made daily debriefing sessions in small groups or via web-conferences to make sure of the unfolding of all processes: pre-triage, targeted screening, nasopharyngeal swab performing, buffering and waiting zone management, exchanging between various implicated departments in and out of the hospital (19).

Centralization of management decisions was an administrative choice coming from the ministry of health. National crisis unit was connecting to sectorial units, which are themselves bringing data from hospital crisis units. Resources managing and consumption was directly under their control to avoid any standstill and to predict shortage. Public sector had a full priority to get supplies of reactant products for chemical testing, hydroxychloroquine pills for oral route and individual protective equipments. This schema had proven an efficiency in previous similar experiences (20–22).

Such experience have succeeded to ensure the management of all directed patients with need to be hospitalized. The hospital had reached his maximum capacity of ICU reserved places, but never reached his limits to receive mild cases.

Worldwide, we found no great difference between high or low income countries strategies during outbreak face-off. After closing borders, it all depends on rapidity to set up all measurements and the real size of the pandemic state in a national scale. A major work has been conducted to improve the resilience of infrastructure in terms of building new facilities, ensuring supplies while decision-makers were trying to limit the monetary expenditure. Main strategic decisions were congruent to abilities of a middle income country (17,20,23).

In Tunisia, the maximum number was 58 per day in April 4th 2020, and then dropped quickly. Situation was always described as under control. During the first wave of nCov spread, the so-
called big Tunis governorates (about 25% of the entire population) has recorded a mortality rate of 0.66% within 150 officially recorded cases. Sfax is the city with the second highest population density hosting almost 9% of the entire population in the country. In this city, fourteen Covid-19 cases were officially registered on March 29th with 3 lethal outcomes.

However, the tests have been performed only for persons with severe disease symptoms and after evident contact to infected patients. Indeed, the maximum recorded tests made in Tunisia are 724 daily. The official statistics revealed that only 10% of tested people were Covid-19 positive. Taking this number in consideration, more than 45,000 tests have to be performed in order to limit the virus propagation before stopping containment. In May 10th, Tunisia had zero new infection registered. Total number of patients officially declared was 1032. Active contagious cases were 327 patients. Management of the first wave of the outbreak was based on predictions from the European experience (24–26). The central directorate of health got scenarios of the next 2-3 weeks and tried to apply measurements of stage 3 pandemic state whereas Tunisia was still in stage 2. Getting one step forward permitted to Tunisia to stop the first wave of Coronavirus spread. Therefore, assuming that the real number of infected persons is four to ten times higher, authors and decision-makers waited wisely at least to get beyond 150,000 tests performed prior to decide on stopping containment. Ministry of health focused then, to plan perfect modalities of re-opening borders, re-activate safely the touristic activity, manufacturing and normal administrative activities.

Conclusions:

All health structures in Tunisia were prepared to face an increasing number of patients with COVID-19 and had to anticipate the consequences, including the need for more beds, more intensive care units, ventilators and trained HCWs. In order to face the outbreak, hospitals have to anticipate the consequences of COVID-19 on all the departments, including indirect impact on non-infected patients. Ariana Hospital switched entirely to a COVID-19 dedicated center and prepared for a fight against COVID-19 that would last for months. A full commitment of health authorities and hospital management staff led to an organized communication with the wider public.
In developing low-income countries, a better response to COVID-19 outbreak was noticed in countries which already made progress in several socio-economic fields = digitalization, continuous recycling process, popular awareness, welfare recipient assistance and enhancing the civil society role. The balance between material resources preservation, security of field effectors and providing of medical care was the subject of daily discussion by health system experts.

Managing a crisis throughout the hospital generally rely on the existence of an updated “crisis plan”, a dynamic revision process led by doctors and a skilled IPC team. This makes it possible to translate and personalize, in the field, ministerial decisions efficiently.
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