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An Analysis of the Initial Response to the MERS-CoV Epidemic from Leadership and
Management Perspectives: A Case Study Covering the Period from April 2012 to July 2017

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Table of Contents

Chapter I:	Introduction.....	4
Chapter II:	The Key Players: Organizations and People.....	7
Chapter III:	The Events in a Chronological Order	12
Chapter IV:	Conclusion (issues, problems highlighted, and solutions).....	18
Chapter V:	Recommendations.....	24
References	25

Chapter I: Introduction

Prior to September 2012, one Jordanian and one Qatari patient had died due to a mysterious disease. The Jordanian patient died in Jordan. The Qatari patient was transported to Britain and died in April 2012, according to the Centers for Disease Control and Prevention.

In September 2012, the first case of the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) was reported in Jeddah, Saudi Arabia. According to the World Health Organization (WHO), the patient had typical symptoms of shortness of breath, fever, and cough. Those symptoms are similar to the symptoms developed by the Severe Acute Respiratory Syndrome (SARS) that spread worldwide in 2003 and claimed 774 lives in China. The MERS-CoV and SARS both belong to the Corona Virus family, all of its members produce similar symptoms. Following the discovery of MERS-CoV in 2012 an epidemic ensued that has killed over 673 victims to date.

The MERS-CoV patient arrived at a hospital in Jeddah where the doctor admitted him to the intensive care unit due to pneumonia. A sputum sample was sent to the microbiology laboratory in the hospital in an effort to identify the type of virus the patient had. There were three versions of the story about what happened next. The first version of the story is, according to the expatriate microbiologist from Egypt, Dr. Ali Mohammed Zaki, he was unable to find a matching DNA sequence after many attempts in the course of at least one week. Thus, he sent a sample to the Saudi Ministry of Health (SMH,) which was tested for H1N1 only but did not identify which virus it was. At the same time, he send another sample to Erasmus MC University's laboratory in the Netherlands requesting assistance to identify what viruses it was. Meanwhile, Dr. Zaki continued to test the sample in his lab again while waiting for the response from the Erasmus MC University lab and actually found a match: it was a newly discovered type

of Coronavirus. He also confirmed this finding with the Erasmus MC University's lab later. The second version of the story, from Erasmus MC University's was that Dr. Zaki sent them the sample because he was initially unable to identify what virus it was. Their lab identified what virus it was and send him back a report. Therefore, the virus discovery was their discovery not Dr. Zaki's discovery. Then their lab patented the virus. The third version of the story was the Saudi Ministry of Health's version. It claimed that Dr. Zaki talked to the Erasmus MC University lab's expert over the phone on July 15 and the latter advised Dr. Zaki to test the sample for Coronavirus. Therefore, technically, Dr. Zaki was not the first person to discover the virus. This paper is an attempt to better understand the three versions of the initial discovery of the MERS-CoV virus, each will be analyzed and tested against statements made by those parties in interviews, reports, announcements. *The purpose of this research paper* was to learn who discovered the virus first, and determine if this conflict somehow affected the efforts to contain this epidemic.

When the Saudi Ministry of Health heard about the virus from the international community, an investigation was opened and found that Dr. Zaki's violated the Ministry's policies and procedure as well as put people's lives at risk. The Former Saudi Deputy Health Minister and spokesperson Dr. Ziad Memish claimed that Dr. Zaki, not only violated the policies and procedures, but put people' lives at risk by not informing the Ministry about this new virus until he posted his warning to microbiologists in ProMed. ProMed is a website "dedicated to the dissemination of information on outbreaks of infectious diseases" (ProMed). Moreover, Dr. Zaki's action led to the Ministry losing its right to patent the new virus. Furthermore, Dr. Memish claimed that the Erasmus MC University's lab patented the virus, which made it difficult for researchers and scientists to conduct additional research because of the complex and

lengthy procedures they required. Researchers and scientists needed to obtain samples to study the virus and develop vaccines or medications, but the samples were legally controlled by the Erasmus MC University.

The Saudi Ministry of Health has received a worldwide criticism, specifically directed at Dr. Memish, for being uncooperative and not being serious about containing the virus. Some organizations claimed that the Saudi Ministry of Health denied offers to assist it with the efforts to contain the virus when the Saudi Ministry of Health obviously needed the help. This criticism came from international healthcare organizations, scientists especially in Europe, and some college professors. However, some of the top officials in the Saudi Ministry of Health denied such claims and responded by saying that the ministry followed the proper methods of containing the pandemic and the ministry was very cooperative.

Simultaneously, both the Saudi Ministry of Health and those who criticized it criticized the Erasmus MC University for patenting the virus claiming that patenting the virus slowed down the process of containing the virus.

In regard to the current pandemic status, the virus is still a problem in Saudi. Almost every week, there are new cases of infections. As of June 15, 2017, 43 cases are under treatment, 948 cases have recovered, and 673 patients have passed away.

Purpose of the Study

This paper is a case study, from publically available documents, of the initial response to the MERS-CoV epidemic from leadership and management perspectives. Recommendations are made at the end which would allow healthcare institutions and individuals to learn from this experience and avoid making mistakes when they find themselves in similar situations. It aims to:

1. Understand if there were leadership problems such as an ineffective bureaucracy, lack of communication and transparency, inflexibility, arrogance and attitude, lack of knowledge and experience, or incompetence in general. Suggestions will be made accordingly.
2. Analyze the first response to the virus's emergence to pinpoint where the problem(s) occurred.
3. Determine if Dr. Zaki, the Saudi Ministry of Health's Central Lab, and the Erasmus MC Medical University lab followed the World Health Organization's rules and guidelines. Those guidelines include the "International Health Regulations" and the "Early Warning and Response System." Both Saudi Arabia and the Netherlands are members of WHO and have agreed to its constitution.

The following data will be analyzed: academic literature and studies, comments and reports made by legitimate health organization, announcements made by the Saudi Ministry of Health, the WHO's reports, the Saudi Center for Control and Command's reports, newspaper articles, and news and interviews made by media channels such as Aljazeera.

Limitations and Delimitations

A limitation to this study could be that some individuals who were involved in the efforts to counter the virus may not be willing to share information due to fear of legal issues, or fear of being held accountable for something they never said or did. Some individuals may not be able to participate because they were not authorized to speak on behalf of their organizations.

Vocabulary

Pandemic – a disease spread through the human population across a large region.

ProMed – a program developed to monitor emerging diseases.

Aljazeera – a Qatari news channel.

Levels of medical society: local, intermediate, and international – (these will be explained in chapters 2, 3, and 4)

Summary

Chapter two will introduce the key players whether they were organizations or individuals. Chapter three will discuss the pandemic events and list them in a chronological order. Chapters four and five will discuss conclusions of the study and the author's recommendations, respectively.

Chapter II: The Key Players: Organizations and People

In order for readers to understand this case study, readers needed to know how the Saudi Ministry of Health (MOH) works, its laboratories' policies and procedures, what the World Health Organization (WHO) is and its role, the world-wide protocols that every country has to follow when they encounter new pandemics or diseases, patenting in healthcare and roles protecting discoveries, Dr. Ali Mohammed Zaki's role in this case study, and the former Saudi Deputy Health Minister Dr. Ziad Memish's role in this case study.

The Saudi Ministry of Health

A department named the Public Health Department was established in 1925 and grew up to become the Ministry of Health in 1950. Its mission has been to train healthcare professionals and provide healthcare for the Saudi citizens nationwide. The MOH is divided into directorates, healthcare centers, hospitals, poison control centers, and the recently established Command and Control Center (CCC) in 2014.

The CCC was established in response to the MERS-CoV epidemic in 2012. According to its website, it “provides the Ministry of Health the ability and capacity to monitor developing health concerns across the Kingdom in real time and ensures that health challenges are managed with a systematic, holistic, and comprehensive approach.” It publishes guidelines to citizens and healthcare professionals on how to deal with the MERS-CoV and H1N1 as well as an everyday report of current status. This center also coordinates with the Saudi central laboratories located across the nation.

The Ministry's Central Lab: Policies and Procedures

I reviewed the Saudi Ministry of Health's portal in an effort to find the policies and procedures pertaining to the private laboratories in Saudi. However, I could not find any

document that explains their policies and procedures. I think there is a lack of communication between the Saudi Ministry of Health and its divisions from one side, and the ministry and private hospitals from another side. The confusion which happened at the beginning of the MERS-CoV virus emergence could have been the result of the lack of communication between the parties above, specifically between the Ministry and the private hospitals. Leaders need to communicate effectively and designate roles clearly.

The WHO and its Role

The World Health Organization, as the name implies, is an international organization specialized in healthcare related issues. It was founded in April 1948. Its headquarters are in Geneva, Switzerland. It connects with public health institutions in every country in order to monitor and contain epidemics as they arise. It also publishes articles about current healthcare issues and how to improve the quality of healthcare. Experts from all over the world work for WHO and many others participate in the efforts to improve the healthcare sector.

The World-wide protocols to encounter pandemics/epidemics.

The WHO developed guidelines known as the “International Health Regulations” and “Early Warning & Response System.” They were written for healthcare institutions and governments to guide them on how to respond to evolving infection diseases. They also show those governments and institutions how to report, and share information and expertise in order to control infectious diseases. It collects information and rumors from ministries of health, WHO’s regional offices, laboratories, academic institutions, and nongovernmental organizations.

Article Six of the International Health Regulation guideline requires all members to report suspicions of new viruses within 24 hours. It states that:

Each State Party shall assess events occurring within its territory by using the decision instrument in Annex 2. Each State Party shall notify WHO, by the most efficient means of communication available, by way of the National IHR Focal Point, and within 24 hours of assessment of public health information, of all events which may constitute a public health emergency of international concern within its territory in accordance with the decision instrument, as well as any health measure implemented in response to those events. If the notification received by WHO involves the competency of the International Atomic Energy Agency (IAEA), WHO shall immediately notify the IAEA. (The World Health Organization, 2005)

In addition to the time requirements of Article Six, it also emphasizes that Central Labs should pay attention to unusual events and suspicions of contagious diseases. It states that:

[Members] to assess reported events immediately and, if found urgent, to report all essential information to the national level. For the purposes of this Annex, the criteria for urgent events include serious public health impact and/or unusual or unexpected nature with high potential for spread. (The World Health Organization, 2005)

Saudi Arabia and Netherlands are state parties to the International Health Regulations before and during the MERS-CoV virus breakdown.

Microbiologist Dr. Ali Mohammed Zaki

According to his Facebook profile, Dr. Zaki is an Egyptian Microbiologist who completed his doctoral degree in 1978. He moved to Saudi Arabia to work for Dr. Suliman Alfakeeh Hospital in Jeddah in 1993. He claimed to discover the first case of Dengue fever in Saudi in 1994. He claimed to discover the Yellow Fever in Saudi 1996. In 2005, he claimed to discover Alkhurma Fever in Saudi.

In 2012, he was dismissed from the hospital and deported to Egypt due to, according to the Saudi Ministry of Health, his violation of its policies and procedures as well as putting peoples' lives at risk (Alhayder, 2013).

Dr. Zaki currently works as a professor at Ain Shams University Medical College in Cairo.

The Former Saudi Deputy Health Minister Dr. Ziad Memish

According to his profile at the WHO, Professor Memish worked as the Deputy Ministry of Health for the Public Health in Saudi Arabia. He recently was designated as the Director of the WHO Collaborating Centre for Mass Gathering Medicine. He earned his medical degree from Canada in 1987 then passed three different American boards. In 1991 and 1992, he received a Fellowship from the Royal College of Physicians and Surgeons in Internal Medicine and Infectious Diseases. He is also a Fellow of four American healthcare organizations. He published more than 250 peer reviewed papers and participated in many journals and medical societies.

The reason why Dr. Memish was being mentioned here is because he was the spokesperson of the Saudi Ministry of Health. He was involved from the beginning of the discovery of the virus until the Saudi Ministry of Health decided to replace him sometime in April or June 2014.

Erasmus MC University Lab

The lab is a branch of the Erasmus University Medical Center. It is based in Rotterdam, Netherlands. Microbiologists around the world send samples to the lab to help them identify viruses.

Chapter III: The Events in a Chronological Order

I analyzed the following materials:

April 11, 2013, and May 11, 2013: The First and Second Interviews with Dr. Zaki (ONtv, 2014)

After Dr. Zaki's termination, an Egyptian TV channel known as ONtv, and a Saudi TV channel known as Rotana both interviewed Dr. Zaki. These interviews were then made available to the public on YouTube. In those interviews, Dr. Zaki put the events of the virus's discovery in a chronological order as follows (Table 1):

Table 1

Dr. Zaki's Understanding of the Chronology of Events

Days in Numbers	Events	Dates
Day 1	Patient admitted to the emergency room due to pneumonia.	June 13, 2012
Day 3	Patient suffered from renal failure.	June 15
From day 4 to day 31	<ul style="list-style-type: none"> - Dr. Zaki received a sputum sample from the patient's primary doctor and, at the same time, sent another sample to the Saudi Ministry of Health's laboratory along with a report explaining the patient's case. - He tested his sample several times for Paramyxovirus and other viruses affecting the respiratory system. All results were negative. He continued his experiments though. - The sample sent to the Saudi Ministry of Health's Central lab came back within two days. It was tested for Swine Flu only. The result was negative. - On day 11 (June 24th), the patient died. 	June 16 to July 14
Day 32	Dr. Zaki contacted and sent a sample to the Erasmus MC University's lab in Netherland. Dr. Zaki discussed the case with the lab top scientist, but the lab technicians were on vacation until August 1 st .	July 15
From day 33 to day 48	Dr. Zaki continued testing the sample. He spent the next 16 days testing the sample until he found that it was a virus that belonged to the Coronavirus family. He suspected that it was a new type of	From July 15 to July 31 st

	Coronavirus. Immediately, he sent an email to the Netherland lab updating it with his new findings.	
From day 49 to day 55	The Netherland lab sent part of the virus sequence to Dr. Zaki. Together, they constructed a virus family tree, which led the lab to conclude that the virus was in fact a new Coronavirus.	From August 1 st to August 7 th
Day 96	Dr. Zaki sent to ProMED a request to alert all microbiologists around the world of the new virus.	September 15
Day 101	Dr. Zaki's request was approved and therefore the alert was published.	September 20 th

Based on Table 1, it is clear there were three mistakes made, one by microbiologist Dr. Zaki, the second by the microbiologists at the Saudi Ministry of Health's Central Lab, and the third by Erasmus MC University lab. First, on the local community level (the hospital Dr. Zaki worked at,) Dr. Zaki failed to report the suspicion of the new deadly virus to the MOH or to the WHO within 24 hours, as the rules required. In fact, after he and the Erasmus MC University Lab successfully identified the virus, he waited for 45 days to inform them (from August 7th to September 20th). Second, on the intermediate community level (Microbiologist in Saudi,) the microbiologists at Saudi Arabia's Ministry of Health's Central lab were supposed to seek help from the international experts to assist them in the process of identifying the virus, as the rules required. Unfortunately, this never happened. They should have reported the case to the international community because of its "unusual or unexpected nature." Instead of following the rules, the microbiologists at the Saudi Arabia's Ministry of Health's Central Lab tested the sample for H1N1 only and sent a report to Dr. Zaki with their finding. The third mistake was made by the Erasmus MC University lab. After identifying the virus, it kept the information secret from the international community. From August 7th until September 15th when Dr. Zaki published his alert in ProMED, the Erasmus MC University lab had kept this information secret in a move that was considered by the international community as unethical and immoral. Adding

insult to the injury, it moved to patent the virus. Scientists are now required to sign a legal agreement with the lab in order to work on the virus. This process costs time, effort, and money as well as a delay in the process of developing a cure. The Erasmus MC University lab claimed that it was bind by the agreement with Dr. Zaki. The agreement mandated that the lab never disclose information about the sample unless Dr. Zaki's allowed it to do so (Inside Story, 2013).

This incident showed a lack of communication, which in turn led to confusion in the healthcare community as well as a patenting conflict between the Saudi Ministry of Health and the Erasmus Medical Center. The confusion can be seen in many statements made by Dr. Zaki, the Saudi Ministry of Health, the Erasmus Medical Center, and the WHO.

In the first interview, Dr. Zaki made a statement that contradicted another statement made in another interview. The statement was about the reason for his termination. Dr. Zaki stated that “[He] named the virus: Human Coronavirus KSA 1... and of course there was a problem with that.. because the [the Saudi officials] said that they didn't want to have any relation[ship] with the virus.. or their name to be associated with it” (ONTb, 2013). Using “KSA” in the name of the virus is a reference to the Kingdom of Saudi Arabia.

Contrary to what Dr. Zaki stated in his first interview, in the second interview he stated that “he sent [the new findings] to ProMed and of course that annoyed the Saudi Ministry of Health.. this of course annoyed some individuals whom always had personal interests in this subject” (Yahalashow, 2013). Again, in the first statement, he claimed that the Saudi officials were not interested in the virus. In the second statement, he claimed they were interested. However, announcements from the Ministry of Health showed that the Ministry was interested. In fact, the top management was outraged when Dr. Zaki handed the virus to the Erasmus MC University Lab (Alhayder, 2013).

To conclude this part of the analysis, Dr. Zaki failed to inform the Saudi Ministry of Health or the WHO as soon as he knew about this new Coronavirus. The microbiologists at the Saudi Central Lab failed to seek help from the international community. The Erasmus MC University lab failed to inform the international community about the virus as soon as it knew. All of these mistakes may have contributed to the increase in the infection cases from that moment and after.

It worth to mention that, for the microbiologists' failure to seek help from the international community, there is no evidence that Dr. Zaki sent a sample to the Saudi Central Lab because the Saudi officials never made a statement about this particular incident. Here we just assume he did.

(May 22, 2013): The Saudi Ministry of Health's Response to Dr. Zaki's Claims

The Saudi Ministry of Health responded to Dr. Zaki's TV claims and accusations by claiming that he violated several of its policies and regulations including sending "sensitive laboratory samples" to an outside institution without obtaining approval from the Ministry (Alhayder, 2013). The Ministry claimed that Dr. Zaki was aware of those policies and regulations. In addition, the Ministry claimed that Dr. Zaki violated the medical code of ethics. Moreover, it claimed that:

[Dr. Zaki] hid information for two months and put the society in danger for the sake of his personal interests... he isolated the virus in a way that was not permitted... in a lab that did not meet the safety and standards for such tests...; [this also] put employees and patients' lives in danger. (Reuters, 2014)

It is worth mentioning here that Dr. Zaki indeed mentioned that his lab was small, basic, and was not equipped with advanced technologies (Yahalashow, 2013).

In regards to who owns the virus, the Ministry claimed that “Dr. Zaki handed the discovery to the Erasmus MC University Lab..[therefore].. the Ministry too lost its patenting right and was prevented from taking advantage of this opportunity to conduct research on the virus” (Alhayder, 2013)

Concerning who discovered the virus first, the Ministry claimed that the Erasmus MC University lab recommended that Dr. Zaki run the Coronavirus test when he called the lab in July 15th (Alhayder, 2013). Therefore, the Erasmus MC University Lab was the one who actually discovered the virus, not Dr. Zaki.

A finding of this report is, Dr. Zaki violated at least one of the Ministry’s policy and procedures, and/or the code of medical practice.

(May 2, 2014): Dr. Zaki’s Third Interview with the Egyptian Channel AlHayah

In a third interview, Dr. Zaki was interviewed by the Egyptian TV channel called ‘AlHayah’ (AlHayah, 2014). In this interview, the host asked Dr. Zaki to justify his move to inform the international community about this new discovery before the Saudi Ministry of Health. Dr. Zaki’s response was that he had already informed the Saudi Ministry of Health. That was reflected in the fact that he sent a sputum sample to the Saudi Ministry of Health as soon as he received one from the patient’s primary doctor (June 16 to July 14.) It is then assumed that Dr. Zaki considered sending a sample to the Ministry and receiving a report back from it as sufficient and no further communication was necessary. This is another miscommunication from Dr. Zaki. He should not confuse sending the sample with reporting the new virus. They are totally different things.

(June 3, 2014) Reuters’ report: Saudi Arabia sacks minister criticized over handling of MERS

In the Reuters report, a form of journalistic reporting, the writers referenced comments made by international scientists in their attempt to expose the story behind the initial reporting of the MERS virus (Reuters, 2014). The international scientists contacted, criticized Dr. Memish by name. He was a key figure in the efforts to contain the spread of the virus and he was known for “[his] reluctance to collaborate with some specialist laboratories around the world offering help investigate the possible source of MERS and explore how it spreads” (Reuters, 2014). WHO and the U.S. Centers for Disease Control and Prevention, University of Columbia and Ecohealth Alliance described the Saudi’s performance as a “lack of urgency.” The criticism continued by claiming that

....the rising number of infections and death could have been stopped well within the two years since MERS first emerged — and would have been if Saudi authorities had been more open to outside help offered by specialist teams around the world with the technology, know-how and will to conduct scientific studies. (Reuters, 2014)

Dr. Memish responded to the above allegation in his statement to Reuter on May 22. He claimed that his Ministry was very cooperative with scientists and experts around the world.

Chapter IV: Conclusion

My advice to the Erasmus MC University lab

Viruses are, like any other creatures, exist in nature. Owning these creatures, or preventing or restricting other peoples' ability to work on/with these creatures is an improper practice. The Erasmus MC University lab claimed that patenting the virus did not prevent or restrict others' ability to work on the virus; and this was a false claim. Its agreement includes safety and rules for any potential monetary gains that might come out as a result of scientists developing vaccines. After it patented the virus, scientist now are required to sign an agreement with the Erasmus MC University lab (Inside Story, 2014). Scientists now, to protect themselves from law suits, have to consult with lawyers before signing the agreement. This by itself is a preventions and restriction. I recommend to the scientific community to take legal actions against the Erasmus MC University lab in order to deter it from preventing or restricting others' ability to work with things that exist in nature.

In addition, I recommend that the Erasmus MC University lab to re-review the medical ethics. There shall be no agreement between the lab and customers which will keep information secret if these information are at a potential risk to living being. In addition to the medical ethics, legally, the Netherland is a state party at WHO and agreed to report information about new viruses within 24 hours. Therefore, I recommend that the WHO takes steps to ensure that the Erasmus MC University lab understands the content of the agreement.

My advice to Dr. Zaki

Dr. Zaki needs to review and comply with the safety rules the WHO published. Putting other coworkers and patients' lives at risk for the sake of taking credit for a discovery is unacceptable and unethical.

My advice to the Saudi Ministry of Health

It is clear that there are both procedures and leadership practices that need to be changed for the Saudi Ministry of Health to function well during crisis. I believe the Saudi Ministry of Health needs to develop an emergency response plan for the reporting and communication of new viruses. In addition, it needs to be more transparent regarding its policies and procedures. The important challenge for this emergency response plan is for microbiologists at local hospitals and the Central Lab need to communicate properly and follow the MOH and the WHO rules. I highly recommend that the MOH train all microbiologists at local hospitals and the Central Lab on how to communicate properly. These microbiologists should also be made aware of the rules pertaining to reporting suspicions of new viruses to the MOH and the WHO in a timely manner. For this purpose, I have developed a “Strategic Communication Plan.” This communication plan has goals, objectives, a targeted audience, key messages, strategies and tactics, and accountability measures.

Communication Plan for the Saudi Ministry of Health

Goals.

- 1- All microbiologists at Saudi hospitals and the Central Lab are to follow the virus reporting rules of the Saudi Ministry of Health and the World Health Organization.
- 2- To make the virus reporting rules accessible through the Saudi Ministry of Health’s and the Control and Command Center’s websites.

Objectives.

1. Form a taskforce that will assume responsibility for this project. The taskforce should include members from the Saudi Ministry of Health, Central Lab, Command and Control Center, and the World Health Organization.

2. Train all microbiologists at Saudi hospitals and the MOH Central Lab on how to communicate properly and understand the virus reporting rules.
3. Make the virus reporting rules accessible through the Saudi Ministry of Health's and the Control and Command Center's websites.

Targeted audience.

Primary audience.

All microbiologists in the Saudi healthcare system.

Additional stakeholders.

WHO, lab technicians, and IT staff at the Saudi Ministry of Health and local hospitals.

Key messages.

To microbiologist at local hospitals.

You are the frontline of the fight against new viruses. Therefore, you need to be aware of and follow the virus reporting rules recommended by the Ministry of Health and the World Health Organization. You should be able to recognize new viruses quickly. If you are unable to identify which virus your patients have, you need to report that to the MOH Central Lab immediately.

You need to follow up your request for help if the Central Lab does not respond to your request for help. For instance, if you send a sample to the Central lab requesting help with identifying which virus your patient has but the Central Lab test fails to identify it or takes time longer than 48 hours, you need to make it clear to the microbiologist at the Central Lab that requesting help from the WHO is the proper next step to make. Communication should be clear, direct, and conducted in a timely fashion.

To microbiologist at the Central lab:

As the MOH and WHO rules state, it is your responsibility to communicate with the international community (WHO and ProMed) if you are unable to identify a virus sent to you for identification. It is your responsibility to do so because you are in the intermediate community level. The intermediate community level is responsible to assist local hospitals identify unknown viruses and communicate with the international community if it suspects new viruses.

To officials at the Saudi Ministry of Health.

You need to ensure that the virus reporting rules are followed by every microbiologist at local hospitals and the Central Lab. Your website needs to designate a section for these rules; explaining the rules and how to follow them in detail. In addition, you need to ensure that microbiologists at local hospitals and the Central Lab coordinate and communicate with each other properly. Furthermore, you need to ensure that every party knows its responsibility and how to seek help if they are unsure what to do.

Strategies and tactics.

To achieve Objective #1, each member of the taskforce needs to be familiar with the virus reporting rules, have the knowledge of the Saudi healthcare system, and be experts of communication skills. In addition, the members need to be given permission from the highest authority to use the Saudi Ministry of Health's assets and resources to accomplish their goals of training all Saudi microbiologists, ensuring they follow the rules, and update the Ministry's website.

To achieve Objective #2, microbiologists need to be open for change and learn about the proper method to encounter and officially report possible epidemics. They need to cooperate with the taskforce. It is highly recommended that the taskforce conduct their meetings at the

hospital level and at the Central Lab level to discuss why it is important to follow the virus reporting rules.

To achieve Objective #3, the IT department at the Saudi Ministry of Health needs to be involved in every process of making the rules available and accessible online.

Chart 1

Taskforce Timeline

Objective (why)	Task (what & how)	Responsibility (who)	Timeline (when)
1. Form a taskforce for this project. The taskforce should include members from the Saudi Ministry of Health, Central Lab, Command and Control Center, and the World Health Organization.	a. The Minister of Health needs to discuss with his consultants who should be in the taskforce. The taskforce should include 2 virologists, 2 microbiologists, 1 communication expert, 1 IT staff, and 1 representative from the WHO. Total of 7 members.	a. The Minister of Health	1/1/2018
	b. The consultants and the taskforce need to know what its mission is, know how to measure the taskforce progress, and document every event in details.	b. Taskforce, the MOH's consultant team, and executive assistants	1/2/2018
2. Train all microbiologists at Saudi hospitals and Central lab on how to follow the virus reporting rules.	a. Send a telegraph to all local hospitals and the central lab informing them of the taskforce mission, the schedule of the conference, and that it is mandatory for every microbiologist to attend the conference.	a. The Minister of Health's executive assistants.	1/3/2018
	b. the taskforce will go to every region in Saudi. The taskforce should ensure the attendance of every microbiologist.	b. Taskforce members	1/10/2018
3. Make the virus reporting rules accessible through the Saudi HOH's and the Control and Command Center's websites.	a. The Minister of Health should conduct a meeting with the IT department to make the virus reporting rules available online.	a. The Minister of Health, IT Director, and IT experts.	1/4/2018
	b. The taskforce should hand in to the IT specialists what info needs to be put online.	b. Taskforce members and IT specialists.	1/5/2018

Measurement.

The achievement of Objective #1 will be determined by selection published notice of the taskforce members, sending the telegram to all local hospitals and the Central Lab, and providing the budget required to accomplish its mission.

The achievement of Objective #2 will be determined by the attendance of all microbiologist from local hospitals and the Central Lab at the conference and their awareness of the virus reporting rules.

*The achievement of Objective #3 will be determined-*when the virus reporting rules are available online for every person to see. In addition, the rules should be clear and in sufficient detail. Moreover, there should be a phone number to call or email address to use if microbiologists need further information

Chapter V: Recommendations

Doing this research paper taught me new things about communication, leadership, the rules pertaining to new viruses, the WHO, the Saudi Ministry of Health, and the Central Lab. I learned that communication is very important in the healthcare sector. Healthcare professionals need to know how to communicate, and constantly improve their communication skills.

I learned that the Saudi healthcare system needed to improve its leadership skills and create a plan for future crises before they occur. I learned about how the Saudi Ministry of Health is bureaucratically structured, and how it responded to the MERS crisis. I learned about the rules pertaining to the determination of a new virus and how healthcare organizations should respond. I learned about the World Health Organization and its role in fighting emerging diseases. I learned about the Saudi Central Lab and how it communicates with healthcare organizations both within the country and internationally. I learned about the MERS virus itself and how diseases spread.

In regard to how healthcare organizations should respond to new viruses, more research is needed to improve responses.

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