

COVID radiology preparedness in Nigeria: How ready are we?

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Abstract

The novel human coronavirus (COVID-19) began in Wuhan China as an interstitial pneumonia of unidentifiable origin in December 2019 and thereafter spread its tentacles all over the world.

There is a need for radiology departments in both government and private facilities to be prepared to meet this crisis. Their efforts should be geared not only toward diagnosis, but also to preventing patient-to-patient, staff-to-patient, and staff-to-staff transmission of infection by utilizing social distancing measures and personal protective equipment (PPE).

Aim: To evaluate the preparedness of radiologic departments of government hospitals and private centers, by assessing the outlay of the facility and likelihood to attend to COVID patients, type of equipment in the centers, and plans in place for protection of staff and the public.

Materials and Methods: The radiology departments of government and private facilities in each geopolitical zone of the country were randomly selected to discuss radiology preparedness in Nigeria using preset guidelines which were sent to radiologists at the facilities. Written informed consent was obtained from the radiologists at the participating centers. Ethical approval was also obtained from the Lagos University Teaching Hospital Health Research Ethics Committee.

Results: A total of twelve centers were included in the study, comprising eight government and four private centers. All had plans in place to attend to COVID patients; majority were in the process of developing standard operating procedures (SOPs). Majority of the government facilities lacked mobile equipment and adequate PPEs, with only one computed tomography machine and no holding area in some of the facilities for symptomatic patients unlike the private facilities. They, however, had infection control teams in place.

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Conclusion: Private radiological centers appear better prepared and more equipped to cope with the crisis than government hospitals. Adequate PPEs, mobile equipment, and isolation rooms need to be provided for the government facilities. Radiology information systems should be installed for remote viewing. Training and retraining on COVID management and decontamination should be conducted periodically. SOPs should be drafted universally and modified for each facility.

Keywords: Challenges, COVID, Nigeria, personal protective equipment, radiology preparedness, standard operating procedures

BACKGROUND

The novel human coronavirus (COVID-19) infection began in Wuhan China as an interstitial pneumonia of unidentifiable origin in December 2019 and thereafter spread its tentacles all over the world.^[1] The outbreak became a public health emergency in January 30, 2020, and a pandemic in March 11, 2020. As at May 22, 2020, the WHO records show that approximately 5 million (4,962,707) people have been confirmed infected with 326,459 deaths.^[2]

The first case of COVID-19 in Nigeria was confirmed in February 27, 2020, in an Italian man who arrived in Lagos from Europe. This led to the activation of the country's National Emergency Operation Response Centre.^[3] As at April 23, 2020, the number of cases had risen to 981.

The COVID-19 is a novel coronavirus causing severe acute respiratory distress, which spreads via droplets from coughing and sneezing. Clinical features include diverse symptoms of respiratory and gastrointestinal origin such as fever, cough, chest pain, difficulty in breathing, chills, sore throat, muscle pains, headache, and loss of taste or smell from 2 days – weeks after being infected by the virus.^[4]

Patients with these symptoms are often sent to the radiology department with requests for a chest X-ray or computed tomography (CT) scan or both, depending on the severity of their symptoms.

There is a need for radiology departments, imaging or diagnostic centers to be prepared to meet this crisis, with their efforts geared not only toward diagnosis, but prevention of transmission to other patients and staff by utilizing social distancing and use of personal protective equipment (PPE).^[5]

Radiology preparedness is defined as “a set of policies and procedures directly applicable to imaging departments designed (a) to achieve enough capacity for continued operation during a health care emergency of unprecedented proportions, (b) to support the care of COVID-19 patients,

and (c) to sustain radiologic diagnostic and interventional support for the entire hospital and health system.”^[5]

Infection control policies (both nationally and regionally) however vary, and so steps for radiology preparedness for COVID-19 will vary between institutions and clinics.^[5]

This paper aims to assess the preparedness of radiologic departments and centers in Nigeria, by assessing the equipment available, the outlay of the facilities, and the plans in place for protection of personnel.

MATERIALS AND METHODS

The radiology departments of government hospitals and private diagnostic centers in each geopolitical zone of the country were selected using simple random sampling to discuss radiology preparedness in Nigeria using preset guidelines. The guidelines were sent to radiologists at the selected centers via their E-mails. The guidelines had questions on type of centers and likelihood to attend to COVID patients, type of equipment in the centers, and plans in place for protection of staff and the public.

All responses were sent back via E-mail, collated, and analyzed for content and inclusion.

Accident & Emergency, LUTH Checklist for Assessing Risk of COVID-19 among Patients Presenting at A&E LUTH				
Patient Name:		Date:		
	Questions	Yes	No	Sum
1	Cough of recent onset, within the last 14 days	+1	0	
2	Catarrh/Running nose of recent onset, within the last 14 days	+1	0	
3	Sore throat	+1	0	
4	Diarrhea	+1	0	
5	Body pains	+1	0	
6	Headaches	+1	0	
7	Fever	+1	0	
8	Difficulty breathing of recent onset, within the last 14 days	+2	0	
9	Easy fatigability	+2	0	
10	Any travel during the past 14 days	+3	0	
11	Contact with an individual who tested positive for COVID-19	+3	0	
12	Symptoms explainable by an alternative diagnosis	-3	0	
		Total		

Interpretation	Score	Action
	0 – 2	No action required. Admit patient into A&E
	3 – 5	No specific action required. Admit patient into A&E. Consider Chest CT Scan
	6 – 17	Invite IDU to review

Figure 1: Risk assessment at Lagos University Teaching Hospital

Ethical approval

Informed consent was obtained from the radiologists at the participating centers and approval for the study was obtained from the Lagos University Teaching Hospital's Health Research Ethics Committee.

RESULTS

The radiology departments from eight government hospitals and four private centers were included in the study. All were certified to attend to COVID-19 patients.

Availability of equipment

Regarding equipment, majority of the government hospitals were ill-equipped to handle COVID patients, with most having only one CT machine. Only one government hospital had two CT machines. Mobile X-rays were available in all the government hospitals, but these were either nonfunctional or dedicated to some other purposes in most centers. Only 1 (12.5%) of the government hospitals had a mobile X-ray machine dedicated to COVID patients and decontaminated after every use. Most of the private centers, 3 (75%), had dedicated mobile X-ray equipment for these patients [Table 1].

All the private centers had the picture archiving communications system (PACS) which enabled remote viewing unlike government hospitals where only 1 (12.5%) center had PACS.

Patient triaging

Both the government and private centers prioritized identifying patients at risk and they all had questionnaires based on the Nigeria Centre for Disease Control (NCDC) criteria for this purpose [Figure 1]. They all insisted on face masks, sanitizers, and temperature checks for the patients and workers before entering the facility.

All the centers deliberately reduced patient traffic by scaling down operations to emergency and ward services, especially during the lockdown. The centers also utilized some form of social distancing by ensuring patients sat at some distance from each other [Figures 2-4].

Ventilation of departments

Majority of the government centers, 1 (12.5%), had poorly aerated rooms, relying mainly on air-conditioning systems. All the private centers were well aerated. Only 2 (25%) of the government centers had a holding area for suspected COVID patients for onward transfer to an isolation center which may be located in the hospital or an external facility, whereas 3 (75%) of the private centers had holding facilities [Table 1].

Staff strength

Regarding personnel, only 3 (37.5%) of government facilities had adequate staff strength and so most of



Figure 2: A resident radiologist, with facemask and gown, preparing for the day's work

Table 1: Tabulation on the preparedness for coronavirus-19 in radiology department in government and private centers

Criteria for assessing preparedness	Government facilities 8 (100%)	Private facilities 4 (100%)
Availability of equipment (%)		
CT machines	8 (100)	3 (75)
Dedicated functional mobile X-rays	1 (12.5)	3 (75)
Remote viewing equipment (PACS)	2 (25)	4 (100)
Decontamination plan	8 (100)	4 (100)
Department preparedness (%)		
Triaging documentation	8 (100)	4 (100)
Adequate aeration	1 (12.5)	4 (100)
Dedicated holding/isolation area for suspected patients		
Social distancing practice	2 (25)	3 (75)
Hand washing and sanitizer facilities	8 (100)	4 (100)
Personnel (%)		
Adequate staff strength	3 (37.5)	4 (100)
Training on handling COVID 19 patients	8 (100)	4 (100)
Adequate personal protective equipment	2 (25)	4 (100)
Infection control team	8 (100)	3 (100)

COVID – Coronavirus; PACS – Picture archiving communications system; CT – Computed tomography



Figure 3: Photos at crestview radiology. Up: Signage at entrance of facility. Down: Social distancing method of creating sitting space

the government facilities could not run shifts which would limit exposure of staff. The private facilities reported adequate staff strength to meet the needs of the facility.

Training on COVID-19 management

There was training and retraining of staff of both government and private centers on the symptoms, management of the disease, donning and doffing of protective equipment, and equipment decontamination.

Personal protective equipment availability

Only 2 (25%) of the government hospitals reported having adequate PPEs, whereas all the private centers had sufficient PPEs [Figure 2].

Infection control teams

All the government hospitals had infection control teams (8; 100%), while only 3 of the private centers had such teams. As at the time of this report, the government hospitals were in the process of developing standard operating procedures (SOPs).

DISCUSSION

The novel COVID-19 infection came unexpectedly and will remain for a while.^[6] There is re-emergence in China and other countries^[7] with resurgence in the United States.^[8] A myriad of signs and symptoms have been described with asymptomatic people even transmitting the virus.^[4] Multiple drug trials, including antivirals, immunotherapy, and vaccine trials, are currently underway in the advanced nations.^[9]

Radiology departments are at the frontline, being the hub of referrals for chest X-ray and CT scans for respiratory symptoms.^[10] They, however, cannot function optimally without some prerequisites. The outlay of the department, with regard to ventilation, is very important, as one of the decontamination processes of an exposed room includes

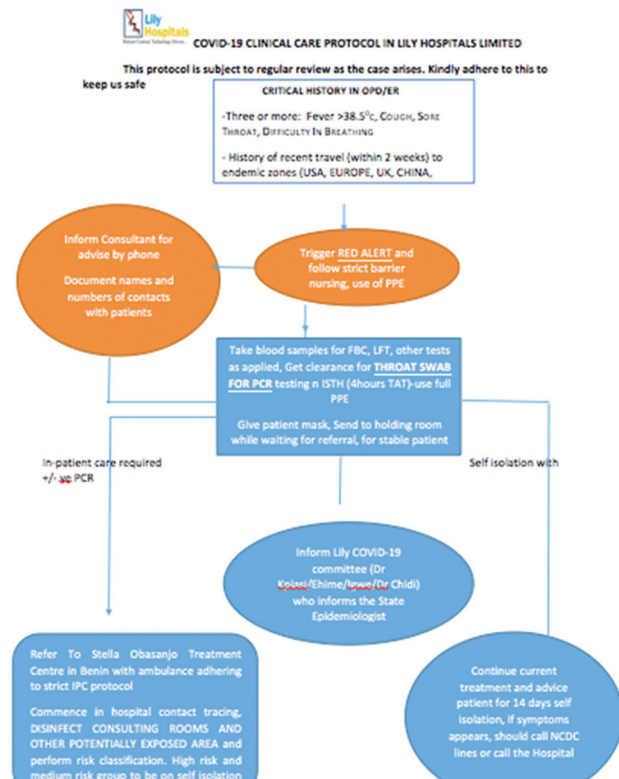


Figure 4: COVID-19 clinical care protocol at Lily Hospitals, Warri

passive air exchange.^[5,10] Majority of the government departments were a closed system with air conditioning, limiting the process of passive air exchange. Furthermore, as most government centers had only one CT/X-ray machine, the possibility of a downtime of 30 min to 1 h between patients would severely limit the number of patients that could be attended to in 1 day. The private centers fared better in this regard, likely because private centers tend to have more equipment and could easily dedicate one solely for use on suspected or confirmed COVID cases.

Portable imaging equipment is essential in the management of COVID patients, using a dedicated room for this purpose thereby limiting hallway contamination.^[10] Patients who present with features suggestive of COVID may be kept in the holding area where the mobile X-ray machine could be utilized for him/her, and subsequently, the room and X-ray machine could be decontaminated. Most of the government hospitals had no functioning mobile X-ray machine, those that did had them for other purposes – one center *“had them stationed at the intensive care unit and neonatal intensive care.”* Most of the private centers had mobile equipment and rooms dedicated for symptomatic patients.

Technology permits remote use of people and procedures, especially with digital imaging advances in radiology.^[11]

PACS and enterprise imaging are essential tools for storage and convenient access to images acquired using multiple imaging modalities. They are convenient in that they also allow for remote viewing and reporting of images. Patients could come to the facility for procedures and radiologists could stay at home and report images generated from the procedures without visiting the facility. Very few of the government centers had this system in place, unlike private facilities. Provision of the technology would help to limit the frequency of contact with patients and surfaces and encourage social distancing.

Lack of PPE was an issue at most of the government facilities unlike the private facilities; the authors postulate that this may be due to a paucity of allocation of funds from government and also that private facilities are not bugged down by bureaucracy of procurement. The acute shortage of PPE was a worldwide issue^[12] with most governments encouraging manufacturers of other items to begin manufacturing protective equipment.

Both government and private facilities had similar processes in place for staff and public protection, which included restricting the number of patients to ward and emergency cases, using a COVID questionnaire to assess risk of infection, temperature checks, provision of hand sanitizers, soap, and water, and facemasks for all patients and visitors. These are essential to prevent person to person transmission.^[10]

CONCLUSION

Private facilities appear better prepared than government-owned facilities, in terms of dedicated mobile equipment and holding areas, well-ventilated buildings, and adequate PPE. This implies that individuals who could afford private hospital bills would have more time and attention. Those who cannot afford private bills would be attended to at the government hospitals within the limits of the hospital provision. Public hospitals are not well-equipped to handle COVID patients and so indigent people may not receive adequate care. The government hospitals do not have enough equipment, so none can be dedicated to COVID patients. Radiology information systems are not in place at most government institutions obstructing remote viewing and limiting social distancing between the workers, which may further increase transmission of the virus. Government needs to fund the public hospitals to make them at par with the private ones. Donations from private organizations and people can also help alleviate the shortfall. This would ensure that adequate PPEs, mobile equipment, and

isolation rooms are provided for the government facilities. Radiology information systems should be installed for remote viewing. Training and retraining on COVID management and decontamination should be conducted periodically. SOPs should be drafted universally and modified for each facility.

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Conflicts of interest

There are no conflicts of interest.

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