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**DEVELOPMENT OF ENVIRONMENTAL HEALTH ENGINEERING FACILITIES, EQUIPMENT, SENSORS AND PUBLIC HEALTH SYSTEMS FOR TACKLING COVID-19 PANDEMIC**

**SUBMITTED TO**

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**ABSTRACT**

Development of environmental engineering health facilities has to do with monitoring natural conditions as well the impact that humans have on these conditions. It also involves accessing possible hazards that may be present, from physical dangers such as the development of food plains and mountain faces, to contaminants that may be in the soil air or water. The demand for environmental healthcare engineering facilities equipment is growing large due to the outbreak of the most recent pandemic COVID-19. Sensors and public health systems for tackling the pandemic should be developed by the environmental health engineer. This could be small facilities such as pocket self-testing kits, movable breathing aids etc. as this will help tackle the basic care for infected patients or patients suspecting attack.

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**INTRODUCTION**

As engineers, it’s our duty to provide a faster and better way in which health facilities can work. When it comes to medical field the primary goal is to improve the health of people. Doctors have the knowledge of human body. They know what is good for a person and what not. But to build anything, you need engineers.

Software Engineers can write software that uses algorithms to analyze massive amount of health information and generate results that help people and doctors in making healthy decisions. Also, making health information readily available using cloud, will make work easier.

One of the main reasons the system lacks stability and infrastructure is that not enough people are aware that health insurance is even possible and affordable for them. Once more people start purchasing quality health insurance, more money will be entering the health care system, and better facilities and hospitals can be built. In the world, today most of the medical facilities depend on the engineering facilities built to carry out various operations. Example using the x-ray machine as a case study. A doctor wont treat a fractured or dislocated bone without having his patient go through series of test using the X-ray machine. Even after the treatment the doctor still follows up the recovery of the patient using the same results gotten off the test carried out by the x-ray machine. We can see that without an x-ray machine set up by an engineer it’s difficult to carry out that operation. It may even lead to errors in the treatment because the doctor can only imagine what is going on without having a proper image of what is going on. we can see that in the society today, especially in Nigeria the medical facilities even as low as the testing kit for the pandemic COVID-19 is not made readily available for all due to the scarcity. This will slow the whole process of combating the virus unlike in developed countries like china where they are readily available to all and is aiding the combating of the pandemic COVID-19.

**INTRODUCING MODERN EQUIPMENTS AND SENSORS**

Modern equipment’s should be brought in to test for the coronavirus. People shouldn’t have to wait for a long period before they know if they are positive or negative. New easy and mobile self-testing kits can be developed and released to the public as this will avoid the slow testing rate and stress of the medical workers. For example, they are simple testing kits for diabetic patients which can even be done from home. This has reduced the rate at which people go to the health centers to know the diabetes status. It will also reduce the amount of work for health care workers and allow the, turn focus to other pressing issues. So, if this can also be done for the COVID-19 pandemic it will help a long way in combating it

Below is an image of the ancient way of testing for diabetes and the modern way.

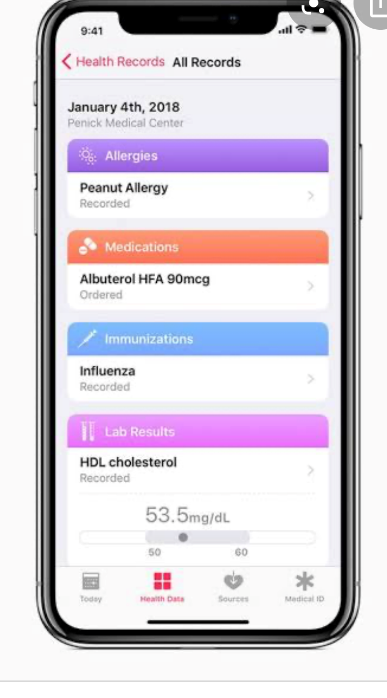


Development of new modern day temperature sensors. Instead of the usual temperature reading equipment where someone has to hold it and point it to your head to see your temperature while others wait in line, sensors should be put in places like airports and big organizations where a large number of people walk in every day. The sensor will be developed and placed in such a way that as you start to approach the entrance door the computer will be reading your temperature while you walk, so by the time you get to the door and your temperature is high when you get there the door won’t open and then you will be isolated and tested immediately. This will reduce the risk of spreading any pandemic such as this one. Imagine having to be a little close to someone to check his/her temperature rather than having an object check it. Below is the current thermometer we have.



Mobile apps can be built to measure blood, urine etc. using accessories for your phone, mail to labs instantly, get results immediately. Or get alerts when your BP fluctuates or your sugar fluctuates or when your heart behaves erratically.

Build better algorithms for insurance companies so they can provide better insurance for cheaper to a wider population. For example, they are smart watches with this features also smart phones which can also keep all these data and help one monitor all these. Even in some devices today they are emergency trigger buttons to immediately dial emergency units or numbers saved under the emergency lsit in the case of any casualty. Below are some images of a smart watch and a phones health record for a man.



**DEVELOPMENT OF PUBLIC HEALTH SYSTEMS FOR THE TACKLING OF COVID-19 PANDEMIC**

Healthcare Engineering professionals play key roles in creating and developing hardware and software to innovate, support, improve and optimize the operation processes and systems of patient care, and to improve patient outcomes through engineering approaches.

Protection of frontline staff- the protection and safety of the frontline staff (the doctors, nurses and all medical personnel attending to patients) should be the first move. If the medical personnel are not safe how can they keep their patients safe? So we need to ensure that after everyday treatment and checkup of the patients the medical personnel should also be tested.

Although hospitals are vital to the response, home care and outreach are also important. In an outbreak, you cannot focus only on hospital care; general practitioners and family doctors have a vital role to play as well. You have to take the wider community into account. People should be advised in their various homes on how to stay safe and avoid contacting and spreading the virus. They should also know the symptoms and what to do if the symptoms continue to appear

The people in retirement and nursing homes are at huge risk from covid-19, as the elderly are the most vulnerable and live in close contact in these facilities, so it’s important to reorganize the way they are run. Proper health measures should be taken.

**Challenges of development of environmental health engineering facilities, equipment, sensors and public health systems for tackling covid-19 pandemic.**

**(using Nigeria as a case study)**

1. Poor research institutes: The country lacks research institutes already before the pandemic COVID-19 hit. This is bad cause now that there’s an outbreak various researches are meant to carried out before any engineering building can take place. An example is an engineer trying to set up a testing kit. He needs to write an algorithm for it and before a device is set up to output a result, the algorithm will give it specifics or conditions to look out for. If researches are carried out properly this will aid the engineer.
2. Low funds/capital: A lot of engineers may have the idea of inventions to help combat the virus but not enough funds to actualize their ideas so it dies with them.
3. Bad governance: Involvement of bad governance will rather have them travelling out for the better medical care rather staying here and providing the best for them, and the masses.
4. Demand and supply: The few engineering facilities put in place are so expensive due to high demand and low supply. Because only a few engineers are providing so the masses can’t even afford it. This goes a long way to discourage other engineers as the feel if majority cant afford it they’ll run at risk of loss.

**Suggestions for the development of environmental health engineering facilities, equipment, sensors and public health systems for tackling covid-19 pandemic.**

**(using Nigeria as a case study)**

1. Improvement of research institutes: Making robust research institutes that can stand the test of time will help enable the easier development of sensors and engineering facilities to tackle pandemics such as COVID-19. Even if it hits the country without preparation it will aid the quick combating.
2. Institutions should be set up to receive good ideas of engineers in the society and help them bring it to reality. This will encourage others to even come up with better ideas knowing they’ll be actualized at long last it will aid combating of COVID-19.
3. Good governance: It is evident in developed countries where good governance is the other of the way what it is like. Development of the country facilities will enable it better and readily available to any pandemic of sort.
4. Government and health organization should try and subsidize all this equipment and facilities to make them easily affordable to the masses and will also encourage developers to involve in them as they know this can be a source of income.

**CONCLUSION**

There is no said cure to coronavirus disease, but there are ways as to which the virus can be contained. There are also ways to control the spread of the virus. So as caring humans we are to adhere to these measures.

And we must also note that everyone is important in fighting covid-19.

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