

# Sensing, ArtiFicial intelligence, and Edge networking towards Rural Health monitoring (SAFE-RH)



## D1.2

### **The skill priorities and requirements of Remote Monitoring**

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## Abstract

The Government of Pakistan intends to accelerate the use of digital technologies to provide health care facilities to distant rural communities, in particular in case of emergencies. The vision also includes the development of various online platforms through which remote living populations can have an access to qualified doctors and paramedical staff. Carrying the same vision forward SAFE-RH also intends to facilitate the population living in rural regions of Pakistan where the availability of basic health facilities is scarce and the population mainly relies on the experimentation of quakes. To this end, this document compiles the required skill priorities of various stakeholders that include doctors, medical students, and paramedical staff. These skill priorities are essential to provide a remote health monitoring system.



## 1. Introduction

As the world progresses toward remote health monitoring for real-time and rapid diagnosis of health disorders, remote healthcare becomes an active research and development area. Remote healthcare can be divided into several categories, all of which refer to the use of technology to monitor patients outside of the hospital settings. There are manifold benefits of remote health monitoring, including early detection and prevention of diseases, continuous monitoring of the patients, cost reduction, especially the traveling and hospitalization costs, and more accurate creation of patients' health records. Remote health monitoring targets various sub-groups like the elderly, infants, and pregnant women. All these target groups require continuous monitoring and support. However, it is essential to appreciate various perspectives to develop an efficient remote health monitoring system that can serve the purpose. To better understand these perspectives, the consortium organized a one-day international workshop on remote health monitoring systems titled SAFE-RH. This document details the proceedings of the workshop and the outcomes and priority skills identified during the workshop.

## 2. The international workshop on SAFE-RH

The International Workshop on SAFE-RH (Sensing, Artificial Intelligence and Edge Networking towards Rural Health Monitoring) was held at Capital University of Science and Technology (CUST), Islamabad on April 22, 2021. The workshop was held under the SAFE-Rural Health project which is co-funded by the Erasmus+ program of the European Union. In all, five universities are involved in the project:

- 1- Capital University of Science and Technology, Islamabad
- 2- COMSATS University Islamabad, Wah Campus
- 3- Islamia University of Bahawalpur
- 4- University of West of the Scotland, Scotland
- 5- University of Lorraine, France

There were around 13 presenters and 40 participants in the workshop. The focus of the workshop was to discuss the issues related to the monitoring of elderly people, maternal and infants. The presenters were from the medical and IT domains. The outcome of the workshop was a set of requirements and challenges to establish a SAFE-Rural health monitoring system.

The local arrangement team included Dr. Nadeem Anjum and Mr. Salman Ahmad, whereas the workshop was hosted by Ms. Sahibzadi Anjum and Ms. Saba Nawaz. The event started with the recitation of the Holy Quran. Welcome Speech was given by Dr. Nayyer Masood from CUST, in which he mentioned that the workshop is being held in an online mode due to the current COVID situation and that the purpose of the workshop is to discuss and understand issues and priorities regarding remote monitoring of people in rural areas. The target groups for SAFE-RH are:

1. Elderly people
2. Maternal and Infants

The First speaker was Dr. Naeem Ramzan, from the University of West of Scotland (UWS), who is the coordinator of the SAFE-RH project. He gave a brief description of the project and introduced the partner universities included in the project. He also showed some glimpses of the R&D projects being carried out at UWS.

Next speaker was Dr. Hassan Rabah from the University of Lorraine who further introduced the objectives of RHM. Dr. Hassan Rabah explained the architecture and data flow of RHM, how it will be monitored and what challenges RHM will bring. Dr. Nayyer Masood then presented the role of CUST in the SAFE-RH project. He explained that the target group assigned to CUST was Elderly People. He presented different perspectives in which CUST is working on the project. He also discussed the progress on all the perspectives achieved at CUST so far.

After Dr. Rabah, Dr. Ehsan Munir from COMSATS University Islamabad (CUI), Wah campus then shared the role in the SAFE- RH project. He explained that CUI has achieved one of its deliverables and that is the development of the project website, which has been developed and deployed at <https://safe-rh.eu/>. He then shared the progress regarding the rest of the tasks for CUI.

Next presentation was by Dr. Dost Muhammad Khan from Islamia University of Bahawalpur (IUB). He presented the activities performed by his team regarding establishing a technology lab at IUB. The main target of this lab is to use RHM to reduce the infant mortality rate. He described the major modules and components of the technology lab.

After the overview of the SAFE-RH project and brief presentations from each partner, the session on keynote speeches started to highlight the various perspectives and to understand the skill set required to develop and execute a remote health monitoring system.

#### A. Health care of the elderly people

Dr. Khurram Baig, who is a medical doctor and has experience of 20 years of working with agencies like USAID, World Bank, and DFID. He talked about the health care of elderly people (age 60 and above). Dr. Khurram's talk created awareness on the scale of the problem from global and national statistics, an overview of the health issues in the 60+ population, and the social and cultural challenges related to health-seeking behaviors on the increased demand side.

Following requirements were outlined at the end of the session that is reported stakeholder wise:

##### i. Doctors/ health workers

1. What test reports are required to see of an elderly person with no disease history?
2. What test report is required to see if an elderly person with cardiac disease at priority. Arrange the equipment accordingly?
3. What are the 5 most vital signs that need to be observed for elderly persons?

##### ii. Elderly people

1. what measures should be taken so that this lack of knowledge and ability does not become a hindrance in using the Remote Health Monitoring System?
2. what strategies should be adopted to counsel the uneducated, to some extent stubborn, elderly population using digital devices?
3. should we establish training facilities for uneducated and illiterate people in remote areas on how to use/maintain/carry these sensors?

##### iii. Students

1. How much Remote Health Monitoring System can facilitate to provide real-time health care facility given the fact that RHMS often rely on heavy data transfer over the network in real-time?

2. Security and Privacy issues must be handled with extreme caution.
3. **how to ensure the security of** data transmitted through sensors as we know that these devices are vulnerable to cyber-attacks?
4. Who will be responsible to establish fog nodes and how their security will be managed?

iv. **SAFE-RH Team**

1. Do we have some wearable device that gives us signals/data in some format so that we could store and process it?
2. What should be the hierarchy of devices/sensors we should be working on?
3. **When we define the order of devices/sensors, what type of data we can receive, and where we store**
4. Using the above data, what we can predict
5. If possible, can/should we have a demo of such a system
6. There is a list of best wearables, maybe we should select and buy one and check if they share signals
7. We do not have the construction of an old home in our case study, for fog/edge computing, do we need to transform the residence of every old person into a small old home?
8. What will be the accuracy regarding the sensors available in the market in comparison with hospital equipment?
9. Security and Privacy issues must be handled with extreme caution.
10. **selection** of the most appropriate elements is critically important for a reliable RHMS system.
11. Are sensors capable of storing data for some time?
12. What will be the accuracy level of data transmission from patient to doctor?
13. How the product will work in areas with no internet?
14. Is sensor disease-specific?
15. Are all devices effective for all persons/skin types?
16. Establish help centers in remote areas to assist people in case a planted device malfunction?
17. Who will be responsible to establish fog nodes and how their security will be managed?
18. **who shall bear** the cost of these sensors in the long term as this project expands

**B. Health care of the maternal and infants**

Dr. Anoosh Aqdu discussed in detail the maternal and infant health issues. She threw light on during-pregnancy issues of mother and infant, during delivery, and after delivery. One of the major issues she discussed was the lack of awareness in the women in rural areas due to which people consult non-professional people who spoil the case that ultimately results in the death of child or mother or both.

Following requirements were outlined at the end of the session that is reported stakeholder wise:

i. **Doctors/ health workers**

1. What are the major maternal and infant health issues?

2. **what** are the causes and what are the major symptoms that can be measured to detect the problem?
  3. What are the tests required to see the disease?
- ii. **Maternal/ Infants**
    1. The social issues can be handled by providing awareness in the rural areas.
    2. What methods should be adopted to provide awareness uneducated population in rural areas using digital devices?
  - iii. **Students**
    1. How the data can be acquired and transmitted?
    2. What should be the methods to keep the data secure?
    3. What should be the predictive algorithms?
    4. What these will predict?
    5. What will be the data storage mechanism?
  - v. **SAFE-RH Team**
    1. What will be the accuracy of the sensors available in the market in comparison with hospital equipment?
    2. How to reach a consultant?
    3. what are the deficiencies in rural areas of Pakistan that are causing a high death rate?

## C. Digital Health System

Dr. Azhar Mahmood, who talked about digital health monitoring. The main points he discussed include:

- Concept of digital health
- How digital health monitoring works
- Technologies in digital health monitoring (DHM)
- IOT and wearables
- Methods and approaches
- Cloud integration services
- Top 10 DHM tools
- Progress of DH in Pakistan
- National and Provincial health framework
- Last five years progress
- Case study: elderlies healthcare services
- Case study: maternal and infant health services
- Opportunities and future of DH in Pakistan

The talk of Dr. Azhar was followed by a panel discussion, where panelists include Dr. Amir Qayyum and medical Dr. Saif ur Rehman. Dr. Amir in his talk highlighted the importance of time and effort required to provide RHM in a rural area and to evaluate its impact on the patient. He recommended that a smart ambulance may be helpful, as a patient can be provided some medical support while on the way from the rural area to the major city hospital. Dr. Saif ur Rehman, the second panelist, highlighted the importance of the Doctor's observation of the patient's appearance or gestures. This, he said, is also very helpful in the proper diagnosis and medication of the patients.

### 3. Common Points with Government Standpoint on Public Health Policy

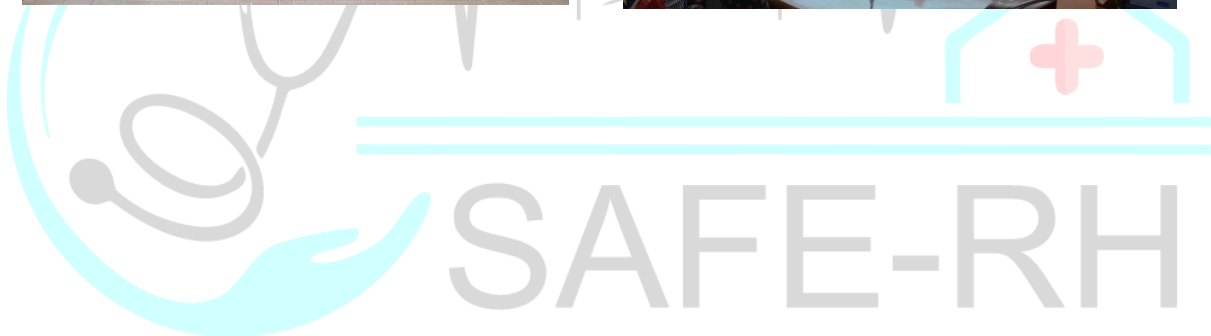
A webinar was conducted by Health Service Academy Pakistan and the UK Faculty of Public Health with the title The Future of Public Health in Pakistan: Challenges and Opportunities on January 27, 2021. The purpose of this meeting was to learn lessons from the response to the COVID-19 Pandemic and identify the main opportunities to strengthen the Public Health system in Pakistan to meet current and future challenges. The Public Health issues in the perspective of Pakistan were discussed in a broader spectrum, however, certain points coincide with the prospective outcomes of the SAFE-RH project as listed below:

- Dr. Faisal Sultan Special Advisor to the Prime Minister in his address mentioned that some of the major targets in the Prime Minister's National Action Plan for Health (2019-2023) are protecting people from health emergencies and promoting a healthier population.
- We need to make an indent in the high prevalence of malnutrition in children and women in Pakistan by specific science-based interventions covering 40% of the population, mainly in a higher burden of disease districts.
- There is a need for reliable information and disease surveillance systems and building workforce skills and capacity, particularly within the nursing sector.

### 4. Conclusion

As the world is moving from traditional medical facilities to remote health monitoring facilities. The Government of Pakistan is having the vision to employ these technologies to facilitate the people living in rural areas to provide them the best health facilities without enforcing them to travel to the major cities. Keeping the same vision, the consortium organized one day workshop to understand the viewpoints of all stakeholders. This report compiles the needs and requirements of all stakeholders and organized them in a way that can help to develop an efficient remote health monitoring system.





## References

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