



Environmental Health and its Role in Raising the Health Level of Employees against COVID 19 using RTLS

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Abstract

Background: As the world strives to achieve universal health coverage, the sudden occurrence of the Covid-19 pandemic and the unpreparedness of countries to respond quickly and appropriately impose an additional burden on health systems and achieve the goals of sustainable health development Got into trouble. In such a situation, the only strategy against coronary heart disease seems to be to prevent infected people from coming into contact with others by finding infected cases or reducing contact. Public health surveillance or tracking systems are critical in preventing and control ling disease in population. Implementation of these systems is possible by using RTLS technology and database to analyze and monitor information.

Objectives: In fact, the virus can be prevented by using an intelligent system that can send alerts to people who do not follow the relevant social distance. This article summarizes the implementation of the proposed system to prevent the spread of infectious viruses, and in particular COVID-19 in an office suite.

Results: Implementing the proposed RTLS system will have the effect of reducing disease damage to COVID-19 and increasing environmental health care.

Discussion: The principle cause of spread of COVID-19 is movement and interaction of individuals within a community. To mitigate the spread of and fatalities caused by the disease, countries have to implement approaches suited to the peculiarities of their environment.

Introduction

Coronaviruses are a large family of viruses that cause a variety of illnesses, from the common cold to the acute and severe respiratory syndrome. The SARS-COV-2 epidemic was first reported by the World Health Organization of China and is now becoming an epidemic, indicating the extremely high prevalence of the virus, which has caused great concern and stress among people around the world. Has created [1]. Research shows that many of the world's common practices have been unstable by the coronavirus epidemic [2]. Also in transmitting the virus, prevention and education of risk exposure to individuals and promoting self-care behaviors lead to a reduction in the rate of disease transmission in communities and identifying the sources of disease transmission can be effective in controlling it [1]. Coronavirus is a challenging disease and is easily spread in public places. Therefore, providing positive psychological programs and

using prevention methods, in addition to reducing mortality and the number of patients, can reduce psychological problems in society [1] so, in order to prevent the spread of COVID-19 and to prevent the increase of this disease, more monitoring should be applied and health protocols in that environment should be fully observed. Proper monitoring and control in preventing the occurrence and spread of infectious diseases helps maintain the health of people in the community, which is the responsibility of environmental health expert's.

Environmental health (EH) is a branch of public health protection that is concerned with all aspects of the natural and built environment that may affect human health. Other terms that refer to the discipline of environmental health include environmental public health and environmental health and protection. EH is a field of science that studies how the environment influences human health and disease. "Environment" in this context means identifying and addressing how the environment impacts human health [3].

Environmental public health tracking is the ongoing collection, integration, analysis, and dissemination of data from environmental hazard monitoring, human exposure tracking, and health effect surveillance [4].

In today's modern world, the Internet is a new concept in the world of technology and communications. Using the Internet of Things is possible in locating objects or even individuals using various technologies such as RFID and the use of instantaneous tracking and positioning. By immediate locating and Tracing people, objects, equipment, etc. in an integrated environment

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with RTLS data, along with other organizational data, it is possible to obtain the knowledge necessary to convert these data into valuable information for prediction and completion of processes [5].

In short, RTLS is a completely automated and RF- based system that show alternates the location of individuals or objects in an environment.

This tracking system uses wireless standard (Wi-Fi) access points as reference tools for locating tags and as a platform for the transfer of relevant information [5].

This article summarizes how to use the mentioned technologies to increase the level of health of the employees of a group by preventing the transmission of corona virus or reducing the transmission of this virus among the employees of that group.

In the following In the first part, the corona virus and its destructive effects are explained in general, in the second part, environmental health is introduced, in the third part, RTLS systems and how these types of systems work are explained, and in the last part, a system implementation is discussed. In order to promote the health of the organizational environment and its role in increasing the health of employees, a collection will be discussed.

Corona virus

Coronaviruses are a group of viruses that were first identified in the 1960s. In recent decades, coronavirus infections have affected the respiratory system, gastrointestinal tract, liver, and central nervous system. A new mutant called COVID-19 appeared in China at the end of 2019, and an outbreak of the virus caused about 140 countries to become infected in the last week of 2019 [1].

As of September 2021, coronavirus 2019 (COVID- 19) disease has affected more than 230 million persons globally [6], and many more have been infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) but were undetected asymptomatic cases or were not recorded [7]. Factors associated with infection have been well established, particularly proximity to infected persons in indoor spaces through airborne transmission [8].

The epidemic has highlighted the importance of public health professionals around the world, especially environmental health experts (EHPs) who have played an important role in controlling the new coronavirus, SARS-CoV-2 [9]. All stages of disaster management are due to having various specialties. Due to the comprehensive approach, Ehps are in a good position to assess the impact of disasters on the population and to evaluate responses [10].

The majority of early cases of COVID-19 have been linked to the Wuhan Seafood Wholesale Market in China, and these patients may have contracted it through exposure to contaminated animals or the environment; but further transmission of the disease through human-to-human contact has occurred and has become

an epidemic. As of early January 2020, it is estimated to affect an average of 2.2 people per person. The epidemic continues as long as this number is greater than 1. In the case of the coronavirus, the challenge is that there are a large number of patients with mild cases, but the possibilities for isolating these patients and quarantining them are limited [11]. Various environmental health measures were taken to prevent the spread of SARS-CoV-2. Ehps have been called upon to play a role as health care providers [12]. They have long-term consequences. Their diverse roles and responsibilities in promoting safety and health in the workplace, home and business environment are invaluable in the context of a unique epidemic [13]. Due to the rapid spread of SARS-CoV-2, different groups of people and occupations, especially occupational direct contact occupations, are vulnerable, so the majority of epidemic cases are occupational and work-related [14]. For this reason, worldwide, all individuals, including employees and employers, must follow the necessary guidelines, training and measures for prevention [15].

In the early days of the outbreak, despite warnings from the World Health Organization, most governments' policies were to ignore, deny and downplay the issue; an issue that caused the disease to become more prevalent among the people. As the dimensions of the issue and its seriousness became clear, governments gradually refused to implement policies such as quarantining urban centers as a source of pollution and social distancing. Recommended policies Such as staying home voluntarily and enforcing laws as needed, banning public gatherings, closing schools and offices [16]. Social distance means minimizing contact with people and keeping at least two meters of distance between oneself and others, avoiding public transportation, working at home, and avoiding crowds and limiting unnecessary travel. According to experts, this strategy saved thousands of lives during the Spanish flu epidemic of 1918 [17]. Since the outbreak of the coronavirus worldwide, social distancing has been one of the most effective ways to combat the outbreak of the coronavirus. This has a logical and compelling reason; People who become infected with the coronavirus carry the virus for 5 days before the onset of symptoms; therefore, restricting social media communication, even between seemingly healthy people, can greatly slow the spread of the virus [18].

The only strategy against coronary heart disease is to prevent infected people from communicating with others by finding infected cases or reducing contact. An epidemic means a rapid outbreak of a disease among a large and distinct population, but a pandemic means an epidemic that spreads over large areas or around the world. Political leaders must consider the negative effects of quarantine and social distancing policies, and first evaluate the effectiveness of social distancing strategies in relation to their social and economic costs and expenses, and secondly, they must immediately consider ways to reduce these costs and expenses. According to previous research, 7.5 (seven and a half percent of people with COVID-19 have no symptoms of the disease [19].



Governments should implement remediation and improve health as a precautionary measure, and implement these policies, even though the incidence of the disease is low in their own country [20].

Environmental health

Environmental health is a branch of public health that focuses on the relationships between people and their environment. Promoting human health and well-being; and fosters healthy and secure communities. Environmental health is a key part of any comprehensive public health system. It works to advance policies and programs to reduce exposure to chemicals and other environments in air, water, soil and food to protect people and provide healthier environments to community's [4]. The environment can directly and indirectly impact on our health and wellbeing. Environmental health examines the interaction between the environment and our health.

We use the following definitions:

Environmental health refers to aspects of human health (including quality of life) that are determined by physical, chemical, biological, social and psychosocial factors in the environment.

Environment broadly includes everything external to ourselves, including the physical, natural, social and behavioral environments.

Health is a state of complete physical, mental and social wellbeing, and is not merely the absence of disease or illness.

We need safe, healthy and supportive environments for good health. The environment in which we live is a major determinant of our health and wellbeing. We depend on the environment for energy and the materials needed to sustain life, such as: clean air, safe drinking water, nutritious food, safe places to live.

Many aspects of our environment – both built and natural environment – can impact on our health. It's important that we interpret health issues in the wider context of our environment and where we live. Many aspects of the environment can affect our health. Environmental hazards can increase the risk of disease, including cancer, heart disease and asthma [21-23].

EH professionals are best known for their efforts to ensure the safety of what we eat, breathe, touch and drink. EH professionals are the individuals who monitor air quality, water and noise pollution, toxic substances and pesticides, conduct restaurant inspections, carry out vector control and promote healthy land use and housing. EH professionals also perform research on a variety of topics including environmental toxins, communicable disease outbreaks, human health impacts of environmental catastrophes such as hurricanes and more. The increase in environmental health threats such as bed bug infestations, tainted food outbreaks such as *Escherichia coli*, failing waste water systems, West Nile virus, SARS (severe acute

respiratory syndrome), bio/agro-terrorism (intentional tainting of food) and the human health impacts of terrorist attacks and environmental catastrophes, demonstrate the need for more trained professionals in the field of environmental health [3].

Introduction the RTIS systems

RTLS, or Real Time Location Systems, are combined hardware/software systems that are used to automatically identify the location of objects or people inside of buildings.

There are three components to every RTLS system: First, the physical infrastructure, or "backbone" that includes the many fixed reference points, repeaters and readers that blanket the facility; Second, the active or passive RFID (radio frequency identification) tags which are attached to objects or people and communicate with the backbone; and finally, a software layer that collects data, compiles everything together and presents it to end users in a visual layout.

RTLS are used to automatically identify and track the location of objects or people in real time, usually within a building or other contained area. Wireless RTLS tags are attached to objects or worn by people, and in most RTLS, fixed reference points receive wireless signals from tags to determine their location.

Examples of real-time locating systems include tracking automobiles through an assembly line, locating pallets of merchandise in a warehouse, identification of people for security and safety reasons or finding medical equipment in a hospital. The physical layer of RTLS technology is usually some form of Radio Frequency (RF) communication, like BLE (Bluetooth 4.0), UWB (Ultra Wide Band) or proprietary systems, etc. Tags and fixed reference points can be transmitters, receivers, or both, resulting in numerous possible technology combinations.

RTLS are a form of local positioning system, and do not usually refer to GPS, mobile phone tracking. Location information usually does not include speed, direction, or spatial orientation. Instead they are very cost effective, need minimal batteries, work indoor and outdoor, do not need a mobile telecom operator and use open protocols [5].

RTLS usually consists of two main parts, as shown in figure 1: a set of hardware that collects and communicates the data to a central IT system (typically called location engine/LE) that interprets the data and prepares it for further applications [8,7]. To provide a reliable location of the tags within the multidimensional environment, anchors are placed at known locations and ideally the tag can receive strong signals from several anchors for tracking. Tags are available in different variants in terms of geometry, power supply and sensing capabilities. Depending on those specifications, tags can be attached to any factory object, such as machines, logistic elements (e.g., fork lifters, automated guided vehicles/AGV), raw materials and/or (semi-)finished products as well as humans (e.g., operators, visitors) [24].

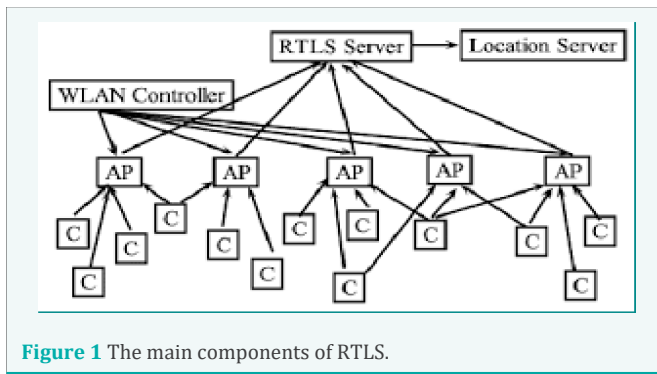


Figure 1 The main components of RTLS.

Implement a system to promote organizational environmental health

As the world strives to achieve universal health coverage, the sudden occurrence of the Covid 19 pandemic and the unwillingness of countries to respond quickly and appropriately impose a double burden on health systems and achieve the goals of sustainable health development Caused problems [25].

Prevention and control measures to protect employees against exposure to the corona virus and its infection depends on the type of work performed and the risk of exposure to infected people and environmental pollution [26]. Prevention and control measures at three levels including engineering controls, Office controls and Personal Protective Equipment (PPE) are classified. Engineering controls include proper ventilation, barrier between employee and customer, and disposable protective equipment such as masks and gloves [27,28]. In addition, the separation of employees from the customer, and employees from each other, especially in places where interaction between Staff and customers and staff together, it is essential and should be implemented using glass and plastic barriers [29]. Administrative controls are also a useful tool in the prevention and control of infectious diseases. These measures include limiting the number of employees, reducing working hours, using disposable tools and equipment, maintaining social distance, quarantining sick employees, and so on [30,31]. Although personal protective equipment (PPE) is considered as the last resort in the workplace, the use of PPE due to its high prevalence is one of the essential protection of employees against COVID-19. PPEs are recommended for everyone to prevent the spread of the new coronavirus. Proper PPE preparation based on the type of task is very important. Equipment may include a respirator, eye protection, special gloves and clothing, or a social distance warning system between employees [28,32,33].

Public health surveillance or tracking systems are critical in preventing and control- ling disease in populations. Accurate and timely surveillance data permit public health authorities to determine disease impacts and trends, recognize clusters and outbreaks, identify populations and geographic areas most affected, and assess the effectiveness of public health interventions [34]. Most of the public health surveillance currently in place in the United States focuses on infectious diseases [4].

As mentioned, one of the most important measures to prevent COVID-19 disease is to maintain social distance. This is even more important in office environments among employees. In office environments, this social distance is sometimes ignored due to communication between employees. In this system, we use several RTLS tools to achieve several goals. First, we use this system to control the distance between people. Second, warning employees to keep a social distance from each other. Due to the efficiency of RTLS systems, it is recommended that each employee carry a tag that can be in the form of a watch, or that we implement the system using Wi-Fi mobile phones. Thus, the general structure of the system consists of two separate parts. Receive information from each person's tags or cell phone. Second, the information storage system and alert.

The abandonment of traditional methods and the use of modern technologies in various fields has always been the basis for increasing productivity and efficiency. In this paper, it is assumed that an intelligent tracking system is used to monitor the spread of the virus, which is fully explained in the following. For this purpose, at first, according to the area of the work environment, a number of APs are used, which are based on the range or the maximum distance covered. The primary purpose of using Ap is to extend the network throughout the environment. Each employee is considered as a node. In order to enter these nodes into the network, the authentication and identification of nodes must be performed. The system uses mobile Wi-Fi or Wi-Fi watch interest to connect to any wireless network node. By turning on Wi-Fi for each person, a message based on entering the user ID and password will be sent to identify and register it. After each user enters his user ID and password, the accuracy of this information is checked by the database that is located inside the server. If the information is correct, the authentication process is completed and the individual is connected to the internal network as a node. The RTLS system is now used to determine the exact location of an individual at any given moment. In fact, this system operates based on the local location of each person [5].

In these systems, first the location of employee A is specified, then the location of employee B is specified. Then the distance between two people is calculated.

As shown in figure 2, depending on the administrative area, a number of AP are used. , the power of global positioning or GPS can be used, but given that this method can always see the error of about 2 or 3 meters, perhaps more associated here is better that used local location. In fact, three access points or more are used to find the coordinates of each person that includes latitude and longitude and height [5].

To measure this system, the points where each person is present are first considered as point A. everyone else in the environment is considered a B- point. How people are placed in the figure is visible.

Figure 3 shows the current location of each person, and then the routing of points A and B is also specified and transferred to the server.

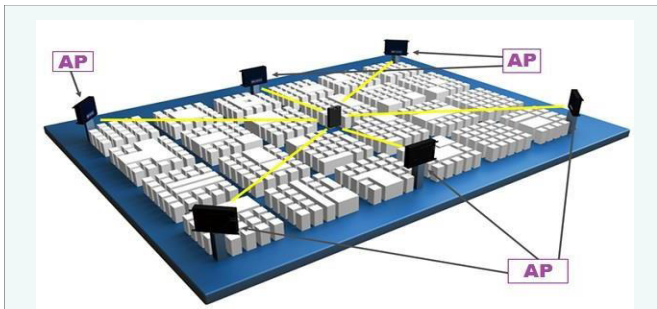


Figure 2 Location of APs.

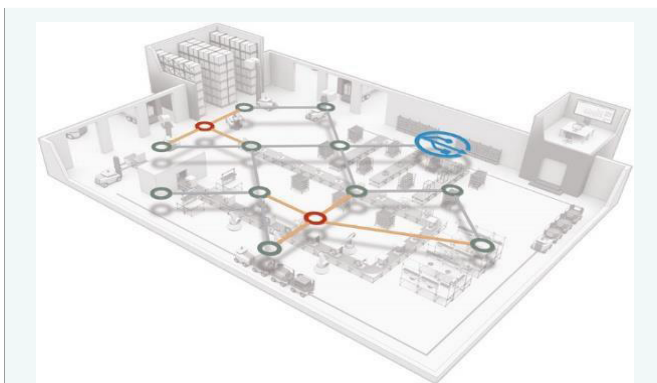


Figure 3 People's current location.

After determining the location of the person and immediately navigating the location of each person and sending it to the information server, we need to sort the data. At this stage, according to the distance between each person and each other with the instructions written in the RTLS program, if each person does not observe the social distance to prevent Covid disease, this system first identifies the desired employee and then a message to ninety to warn the person sends the desired. An example of placing people at a suitable and inappropriate distance from each other can be seen in Figure 4.



Figure 4 Placing people at a suitable and inappropriate distance.

Conclusion

At first it seems that monitoring systems can have negative effects on public opinion, but with a closer look and a full description of such systems, the final results will be different from the initial results. This paper presents a monitoring system in which individuals are controlled to maintain social distance in order to reduce or eliminate Covid disease. These systems can be examined in two ways. First, observing social distance in their office environments increases the parameters of environmental health, which leads to the health of individuals and employees of a complex. Secondly, considering the epidemic of Covid 19 disease and also considering the fact that this virus acquires new strains after a while, according to the points mentioned in this article, the best way to reduce or prevent this disease and Mortality is lower by observing social distance and wearing a mask. In this article, we tried to explain the advantages of using RTLS systems and using it to increase the monitoring of the distance between people in a set, which in turn increases the efficiency of that set. Because when the employees of a group get this disease in different positions, first they and their families are involved for at least a few days, and according to health experts, it has been proven that this disease will also have psychological consequences, and secondly, if this If an organization or group loses one of its employees' specialized parts for a few days, the work of the group becomes difficult and in the long run, there are negative economic effects for the group. In the end, it can be said that each system has advantages and disadvantages, but it is concluded that the implementation of this system will have an effective effect in reducing the incidence of Covid 19 disease.

Conflict of Interest

All authors have participated in (a) conception and design, or analysis and interpretation of the data; (b) drafting the article or revising it critically for important intellectual content; and (c) approval of the final version.

The authors have no affiliation with any organization with a direct or indirect financial interest in the subject matter discussed in the manuscript.

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