COVID-19 Bow-Tie Model

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Since the beginning of human creation, safety barriers have been used to protect people and properties from enemies and natural hazards. One of these risks is the emerging and highly contagious COVID-19 disease. This pandemic has left many severe consequences in various aspects such as economy, medicine, society, culture, sports, education, military, and security all over the world, including Iran. Therefore, the health of human society has faced a serious challenge.

General public and workers are always at risk of getting infected by this virus. Awareness of this risk is the best way to prevent and slow the transmission of COVID-19 pandemic, which can be achieved through risk assessment. Effective risk communication is an important measure to control this disease. Various organizations such as the Occupational Safety and Health Administration (OSHA) and the World Health Organizations (WHO) have given recommendations to employers to prevent the spread of the Coronavirus disease in different workplaces, which can be in the form of preventive and control strategies.

Hollnagel describes two main functions for safety barriers: prevention and protection. Barriers are placed before the start of a specific event as a means of prevention. As a result of the intervention of this type of barrier, it is assumed that the accident (COVID-19 pandemic) will not happen, or its progress will be slowed down on the way to becoming an accident (pandemic). Barriers considered after the occurrence of a specific initial event are used as a means to protect people and systems from the consequences of a pandemic. [1]

One of the most famous models for risk assessment in industrial health and safety is the bow-tie model and layer of protection analysis (LOPA). In the bow-tie model, the left cone represents the possible causes and events leading to the disease and introduces the preventive layers that the system has prepared to deal with the pandemic. The cone on the right side also has the role of reducing the consequences. According to various studies, in this editorial, preventive and mitigation approaches in industries were addressed. People in industries have different responsibilities which may be exposed to this virus according to the type of job, relevant organization, and population density. In general, the applicability and simplicity of implementing individual and management controls are much more. The layers are constantly evaluating the effectiveness of their actions in a dynamic system and will make new decisions according to the conditions, which is by the Deming cycle in management systems.

Therefore, it can be said that the COVID-19 pandemic causes a problem with a medical shell and a systemic core; so, leaving the solution to the responsibility of the healthcare system alone does not solve the problem.
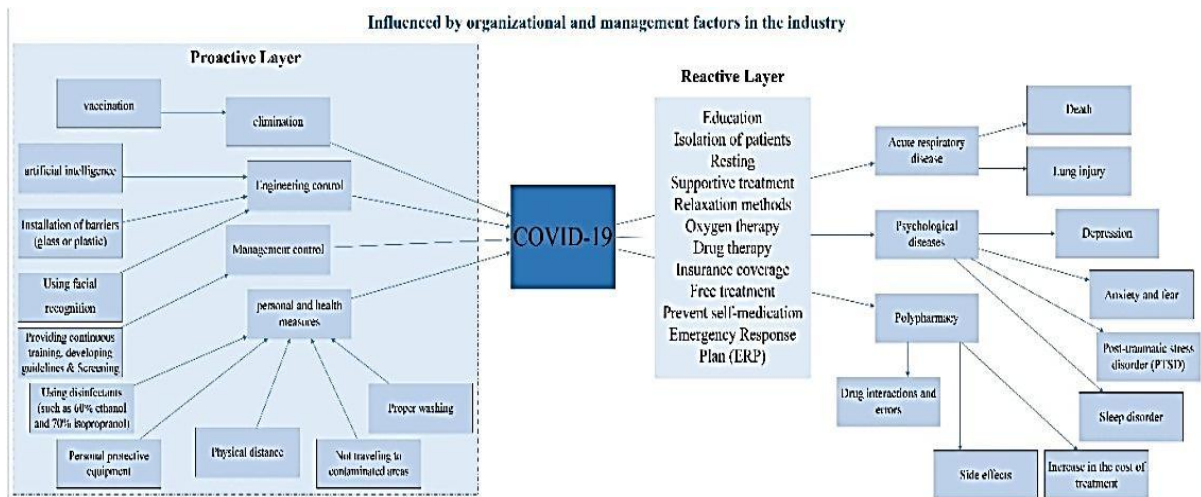
Figure 1. COVID-19 bow-tie model at workplace

On the other hand, using different specialties with a systemic approach can create a stronger barrier against the spread of this disease and its resulting damages.[2] According to Figure 1, preventive measures for Coronavirus disease include engineering, management, personal and health measures, and vaccination. Moreover, reactive measures against the pandemic include having an emergency response plan (ERP), remote working, resting at home in case of symptoms of Coronavirus infection, using video conferences to hold meetings, and canceling unnecessary meetings. Management participation can be considered the main factor in preventing the disease. Individual and managerial actions are important indicators in both proactive-reactive layers.

The application of engineering measures, especially the use of artificial intelligence and information technology, can increase the chance of identifying the behavior pattern of people and the virus by analyzing big data. Designing a ventilation system with certain average ventilation is one of the basic measures of engineering in controlling pandemics. Using facial recognition instead of fingerprints in industries can also reduce the level of contact with contaminated surfaces. Providing continuous training, developing guidelines, and considering enough budget to deal with the disease are also management measures regarding prevention.

The classification of personal and health measures plays an effective role in the prevention of COVID-19, which should be considered in industries. These include personal protective equipment, using hand washing soap and disinfectants, maintaining proper physical distance, not using shared tools and equipment, and screening people by various thermometers and laboratory tests (like Rapid Test-PCR).

Vaccination is also a very important and valuable measure used to prevent infectious diseases at a low cost. The side effects of Coronavirus vaccine are negligible compared to the benefits of using it. The side effects of the vaccine may lead people's minds to unfortunate events, while these side effects generally include: headache, lethargy, body pain, bruised feeling in some places, etc., and will last between 1 and 2 days. However, the important point is that the injection of vaccine will ensure that people will not severely get infected as long as their body is vaccinated. In addition, the injection of the vaccine will prevent people from dying due to the Coronavirus disease.

References

1. Hollnagel E. Barriers and accident prevention: Routledge; 2016.
2. McLeod RW. Designing for human reliability: human factors engineering in the oil, gas, and process industries: Gulf Professional Publishing; 2015.