Utilization of Telemedicine for Medical Staff As a Impact of the Industrial Revolution 4.0

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***Abstract*—Industrial Revolution 4.0 is influential in changing patterns of human work characterized by the emergence of remote medicine (telemedicine), biotechnology, data automation and artificial intelligence. The health service sector benefited from the industrial revolution 4.0. It is important for medical staff to know technological developments in the health sector so that the welfare of the community can increase and not lose competitiveness with other parties. Health care providers explore the potential of telemedicine for remote monitoring and treatment of patients through devices connected to the internet. The aim of this study describes the use of telemedicine for medical staffs as a result of the emergence of the industrial revolution 4.0. The method used in this study is a qualitative method by means of literature review that focuses on the use of telemedicine. Result of this study The application of telemedicine has an impact on improving patient health and the skills of medical staffs in conducting care. Gaps in the distribution of internet networks are challenges that the government has in developing telemedicine. The government should carry out cross-sectoral collaboration in the development of telemedicine**

Keywords— Medical Staff, Telemedicine, Industrial Revolution 4.0, Biotechnology, Distance Medication

I. INTRODUCTION

The word 'revolution' shows a radical and sudden change. Characterized by industrial revolution 1.0, industrial revolution 2.0 revolution 3.0 and revolution 4.0. The Industrial Revolution 4.0 is a digital revolution that has taken place since the middle of the last century. The combination of technology that has blurred the boundaries between the physical, digital and biological fields marked the Industrial Revolution 4.0. The Industrial Revolution 4.0 is considered more advanced and broader than the previous industrial revolution. Intelligent information technology from the Industrial Revolution 4.0 includes artificial intelligence, the internet, cloud computing, big data and cellular convergence in existing industries and services. Specifically, all products and services from the real world with new technology in areas such as three-dimensional (3D) printing, robotics, biotechnology, and nanotechnology were combined by the Industrial Revolution 4.0. The health sector is the sector most likely to benefit from the Industrial Revolution 4.0 due to the joining of physical, digital and biological systems [1].

Telemedicine is remote monitoring and treatment of patients through sensors connected to the internet [2]. The sensor can be placed in a device that is connected to a telecommunications device. Telemedicine is a long-distance health service through the use of communication and information technology that can provide health care solutions for remote areas where health facilities are inadequate. This is very suitable with the conditions in Indonesia which is a vast archipelago, so that access between one region to another takes a long time to travel. So to place expert doctors throughout the island clearly has its own constraints. Most expert doctors prefer to be in large urban centers, especially the provincial capital. Communities in districts, sub-districts or villages especially in border areas must be satisfied enough to be served by doctors who are not specialists or even paramedics and nurses [3]. It is important for medical staffs to know technological developments in the health sector so that the welfare of the community can increase and not lose competitiveness with other parties. Health care providers explore the potential of telemedicine for remote monitoring and treatment of patients through devices connected to the internet.

II. METHOD

The method used in this study is a qualitative method by means of literature review. Quantitative research is a research approach that represents positivism, while qualitative research is a research approach that represents naturalistic (phenomenological) understanding. The literature used is related journals that have been published by local and international journal agencies. The steps taken are collecting related journals, reviewing journals, and discussion. The purpose of this paper is to look at the use of telemedicine by medical staffs. This research uses the keyword "telemedicine for medical staff". The focus of this research is:

a. The development of telemedicine in the era of the industrial revolution 4.0.
b. Utilization of telemedicine for medical staffs

III. RESULT

a. Telemedicine concept

In general telemedicine is the use of information and communication technology combined with medical expertise to provide health services, ranging from consultation, diagnosis and medical treatment, without limited space or implemented remotely. To be able to run well, this system requires communication technology that allows the transfer of data in the form of video, sound and images interactively in real time by integrating them into supporting video-conference technology. Included as a supporting technology for telemedicine is image processing technology for analyzing medical images [4].

The goal of telemedicine is to strive for the achievement of health services equally across the entire population of the country, improve the quality of services, especially for remote areas and cost savings compared to conventional methods. Telemedicine is also intended to reduce referrals to doctors or health services in big cities, medical education facilities and also for emergency cases. Expansion of the benefits of telemedicine can reach disaster areas, long-haul flights, and for foreign tourists who are in tourist areas [5].

The types of telemedicine in their implementation are applied in two concepts, namely:

1. Real Time (Synchronous)

Telemedicine in real time (synchronous telemedicine) can be as simple as the use of telephone or more complex forms such as the use of surgical robots. Synchronous telemedicine requires the presence of both parties at the same time, therefore a media liaison between the two parties is needed that can offer real time interaction so that one party can take care of health. Another form of Synchronous Telemedicine is the use of health equipment that is connected to a computer so that interactive health inspection can be carried out. An example of using this technology is a teleotoscope that provides a facility for a doctor to look into a patient's hearing from a distance [6].

2. Store-And-Forword (Asynchronous).

Store-and-forward (asynchronous telemedicine) telemedicine involves collecting medical data and sending this data to a doctor (specialist) in a timely manner for offline evaluation. This type of telemedicine does not require the presence of both parties at the same time. Dermatologists, radiologists, and patalogs are specialists who usually use this asynchronous telemedicine. medical records in the proper structure should be a component of this transfer[7].

b. The use of telemedicine for health workers in the era of the industrial revolution 4.0.

1. Telemedicine to help nurses on homecare services

Some of the benefits of using telemedicine applications in homecare health services are (1) effective in modality therapeutic interventions; (2) increase patient awareness of drug compliance and reduce complications; (3) becomes a monitoring system in chronic patient disease services; (4) effectively providing health interventions that occur at the same time; and (5) providing time effectiveness and efficiency of the intervention, because the implementation of the intervention is done flexibly. Homecare services using telemedicine have an indirect impact on Telemedicine using a wireless network system in the interaction process. Previously, health workers and patients met face to face (face to face), after using telemedicine services, access to information can be done remotely. This condition is in accordance with the benefits of telemedicine which provides effective time for health services. Patients and nurses can communicate flexibly according to the time agreed by both. The next impact of telemedicine is to utilize technological developments as a solution in the intervention of patients' health problems [8].

2. Telemedicine to assist dentists in the treatment of dental implants

There are changes and advances in the field of dental implants. Proper planning and placement of dental implants is carried out with modern 3D imaging and implant treatment planning systems. This approach has been introduced and permitted the transfer of virtual planning to clinical procedures, allowing for less invasive surgery, adequate implant placement, reduction of postoperative discomfort, and fabrication of prosthetic structures prior to surgical procedures [9].

3. Telemedicine taking patient's medical image

Telemedicine application with concepts in Store & Forward (SAF) and Twoway Interactive Television (IATV) On SAF technology, the health care provider takes a still image of a patient's body and sends it to a consultant doctor who will review the data. Broadly speaking this technology involves the acquisition of medical data and signals such as ECG, heart rate, blood pressure, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and others then the data is transmitted to a specialist for consultation and evaluation. The equipment commonly used is a digital camera with a computer for web access. While on IATV technology, it is usually used when there is a need for face-to-face meetings between patients and doctors. This method requires a computer with a web camera, terminal adapter, laser printer, and high quality video conferencing system [10]

4. Tele-UKG dan Tele-USG

The tele-ECG system is built for early detection and monitoring of heart disease with three main components namely an ECG sensor, a PC or smartphone, and a server. ECG sensor is used to get the heartbeat signal from the patient, then recorded and processed, and then classified in predicting the patient's condition automatically, so it is known whether in normal conditions or have symptoms of heart disease. Then the signal is sent to the server to be verified by a cardiologist. Meanwhile, tele-ultrasound was developed to monitor fetal growth. The main function in the tele-ultrasound system is automatic fetal biometric measurement and detection of fetal growth disorders [11].

5. Electronic Recipe System (e-Prescription System)

Electronic prescription system hardware can consist of a PC computer to a computer network with a number of PCs connected in a local area network (LAN). This electronic prescription system basically functions as a system of recording, processing and reporting patient data and drug data (electronic medical record = EMR), integrated with an electronic prescription software module. The electronic prescription module software mainly functions to: provide pharmacological information about each available drug, conduct adverse drug reaction tests, conduct drug duplication tests, assist in calculating drug dosages, administer drug administration and reporting processes [12].

6. m-Health System (Mobile e-Health)

This type of e-health system prioritizes the use of cellular telephone networks, which in many countries are growing rapidly, with a growing number of users, and increasingly affordable costs. Increasing the number and types of cellular phone applications on the technology side, can provide various types of innovations for the development of public health service applications. The main keys to the development of this health system are: a good understanding of health services and their problems, facilities (features) of available technology and network infrastructure, synergistic cooperation of various parties, and innovations that are developed consistently and continuously. Various types of applications that have been developed by various parties such as: portable & ambulatory ECG, EEG, temperature; various SMS based applications, systems recording & reporting and monitoring [13,14].

7. Mobile Telemedics System

The mobile telemedicine system consists of two parts, the base unit and the mobile unit. The prototype of the mobile telemedicine system has been realized at ITB. Besides being used in vehicles such as ambulances, mobile telemedicine systems with multi communication links can also be used as mobile clinics that can reach remote areas to provide health services equally [15].

8. Telemedicine Surveillance Plague

To help outbreak management (biosurveillance), an e-health system can be used: web-based (internet), cellular-based telephone network, and a combination of both. This outbreak management telemedicine system consists of a monitoring station (a computer with application software and database), a number of reporting stations, and a telecommunications network in the form of an internet network and / or cellular telephone network [16].

IV. CONCLUSION

The application of telemedicine has an impact on improving patient health and the skills of health workers in conducting care. Gaps in the distribution of internet networks are challenges that the government has in developing telemedicine. The government should carry out cross-sectoral collaboration in the development of telemedicine

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