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Framework for Future Telemedicine Planning and Infrastructure using 5G Technology

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Abstract. Current and upcoming Information and Communication Technology (ICT) solutions for quick access to the healthcare system are promising as well as very challenging. On the one hand, these solutions are providing solutions for healthcare ecosystem according to patient-specific needs and demands, but on the other hand, adoption of technology is moving through evolution and some part revolution. In consequence of continuous transition, people are not getting used to of these endless variations in technological solutions, and they have concerns that these deployed technologies will change after some period. Seeing this situation, we recommend continuous eHealth literacy is need of this transition era and development of new business models to increase involvement, motivation and revenue generation.

People from medical and technical background have a different attitude for work, which can cause difficulty in solving medical related problems and adaptation of new technologies. Therefore, it is essential to involve medical experts when developing telemedicine service from technological point of view. Consequently, we recommend that there is a need to sketch a framework and plan before introducing any telemedicine service. The telemedicine services should be user- friendly and have the ability to integrate all stakeholders to pursue a system which is sustainable and acceptable for all. A framework which is proactive, open in various dimensions with flexibility, gives chances to industries for public-private partnership and practice value-based business models.

Keywords: Telemedicine, eHealth ecosystem, eHealth literacy, 5G, Framework, Planning, Sustainable Business Models.

1 Introduction

With the use of ICT solutions, such as future wireless communication technologies (5G) and Big Data analytics, healthcare sector can be more efficient and improvised. The efficiency can be achieved both economically by an introduction of technology-based business models and qualitatively through reliable communication technologies. The success of a health care system can base on three fundamental pillars of technologies. a) Communication technology b) Big data analytics c) Health Care: Medical and Medicines. That is why a cross-disciplinary approach is a prerequisite for future telemedicine services.

It is essential to understand what are the needs of a healthcare ecosystem concerning ICT solutions. What kind of telemedicine services we can integrate by using 5G technology. Standards for telemedicine are still in early stage, and available security frameworks are not enough for telemedicine services before we see any promising features of the 5G technology. Health-care is a vast area itself. There has not been much research done to conclude what parts of healthcare sector needs or can work more efficiently by using 5G and Big Data.

Framework importance for telemedicine services arises due to three factors; one is the economic factor as health services are in general costly, second is the availability of some specialized services internationally, the third element is the availability of specialized services to remote areas within a particular country, less involvement of the stakeholders and industries. It is important to recognize that how we can meet these demands of accessibility by introducing a basic framework or sketch to identify and provide possible solutions.

Coming innovative technologies requires understanding and acceptance at first place that these are going to revolutionize our healthcare system. Transitional phase means that technology is still emerging and causing less engagement and understanding for the people where it is going to be deployed. These people feel pressure or burden in understanding as technology is not their primary field or area. What is important here is to make a plan or use a bottom-up approach which means to consider the deficient areas of eHealth sector rather than to integrate new technologies with newly formed telemedicine services. Before introducing any service, planning with a basic understanding, assessment regarding cost and affordability, associated deficiencies or defects and benefits are essential parts to be considered to avoid future anomalies [1].

This paper discusses what could be the realistic planning for future infrastructure of telemedicine and 5G technology. This article has nine sections. Planning of a telemedicine service and many frameworks have been discussed considering problematic areas and future possibilities with a proposed telemedicine framework and lastly conclusions.

2 Planning of services considering supply and demand

Supply and demand for telemedicine services are one of the most significant challenges especially in the areas where access to hospitals is limited. Current practices and

ongoing research are still in the line of progression. There are still not good solutions available to fill the gap between supply and demand. Strategic plans are needed as telemedicine integrate two professions, e.g., medical and technical areas. There is a need to understand what are the clinical requirements and how latest technologies more practically provide solutions to the problems related to supply and demand.

2.1 Data analysis

Qualitative and quantitative data of a particular area can be collected to see what kind of patients are existing with needs. Susceptibility to diseases and treatment satisfaction based questionnaires can help to formulate what kind of telemedicine services are needed. We cannot use one telemedicine service universally as different areas of the countries may have different conditions and disabilities related to environmental factors and genetic susceptibility. Before supply of any telemedicine service, there is a need to consider the first disease affected people, and their collected data can be beneficial after that there is a need to search for non-clinical care providers like politicians, the ministry of health, medical team and related stakeholders. Before making a plan, all constraints should be considered [2]. UC medicine school in California has conducted a study on March 21, 2017, regarding the use of video conference with patients and physicians and they have checked their data for the last 18 years. It showed that treated patients saved nine years of travel time and US dollar three million traveling expenses [3]. Access to high-quality video conference using 5G will give a considerable edge compare to the existing wireless technologies.

Many variables for supply and demand have been discussed in recent researches with needs and access theories. But there is a need to think another way around that how supply and demand can be accomplished and what are the other factors that can contribute and these will be discussed later in the paper [4].

2.2 Acceptability of innovative technologies

Acceptability of a new technology or innovation begins when people are more accepting and have knowledge related to a particular area with understanding. Variables that should be analyzed before considering supply and demand, for example, behavioral or attitude variable of people regarding new innovative and current technologies, hospital variable for instance what kind of services available with the grant, physician number, diseases addressed and size of the hospital. Market variable concerning competition with supply and demand based on the patient needs are also critical variables to be noticed. These three variables can be utilized to see supply and demand in a particular area with mental susceptibility, hospital occupancy, and industries involvement for initiation of telemedicine services [5].

In Scandinavia, Denmark is where the eHealth solutions are in progress at a higher rate. Denmark has strong collaboration among municipalities and surrounding regions which is less seen in other European countries. Denmark has formulated a Digital Welfare Strategy for 2013-2020. It also has unique telemedicine projects for example for COPD (Chronic Obstructive Pulmonary Disease). This project shows that telemedicine is a multidimensional approach which requires participation and

understanding at all levels. Collaboration is vital to see the solution for patient problems regarding supply and demand [6].

3 Sustainable infrastructure as part of planning

Sustainable infrastructure during a transition phase of innovative technologies is difficult to maintain. Accomplishment or sustainable telemedicine services depend on many sectors. These sectors, if integrated with proper connections, can provide a framework in which we can assimilate medical or clinical structure.

More than 75% telemedicine services designed for the care providers fail because of practical instability. Successful business models are needed to generate value for the involved companies and the treated patients [7]. There are many business models which have been discussed in many research articles. However, for a successful business model concerning telemedicine, there is a need to define whether it's a revenue model, a cost-saving model or a strategic model. There should be a clear objective and set goals for what we are going to achieve with proper measurement to see if it meets the expectation as part of planning. Senior managerial staff is required to develop a sustainable business model for eHealth [8].

3.1 eHealth literacy

Technological eHealth literacy is basically to acquire, understand and integrate health information to technical or ICT solutions to solve health-related problems and issues. These are essential skills to treat patient anomalies and dealing patient empowerment due to innovative technologies in coming future. In America and Canada, more than 40% adult people have very baseline literacy for social participation. User- friendly ICT solutions are required at all levels of sustainability of health solutions in developed and underdeveloped countries primarily for the telemedicine services in distant areas where a physician is not available [9].

Deployment of solutions related to technologies for sustainability is difficult when these come to a complex organization, for example, tertiary hospitals and eHealth ecosystem in developed countries. Current ICT solutions are very good theoretically, but practically these offer multiple problems and require engagement or involvement of different sectors. Patient empowerment is the following challenge in developed countries which needs the participation of varying industry at all levels [10].

Consultation at all levels is necessary to understand what are the requirements and practicality of ICT solutions. One thing which should be focused that clinician should come forward because solutions are available for fast healthcare ecosystem and there is a need how to guide these solutions for expected benefits. Physicians have in-depth knowledge of the health issues and diseases. They can better guide the requirements which need faster solutions. They can discuss what the current problems and disparities are. ICT solutions will be then aligned accordingly. There is a need that physician should understand and accept the technological platform and be open. Integration with the innovative solutions and technologies are the future success of the hospital. Realization of patient empowerment at pharmaceutical industries and physician level

is vital with a recognition that technology is the crucial connecting area for future best practices.

A study has been conducted on 170 patients in Peshawar, Pakistan about ICT solution and e-governance at Government and private hospitals level. Statistical analysis has been utilized to visualize the data. A very few number of people and physician know about ICT solutions and e-governance. Policies and infrastructure, are very disruptive. In case of natural disasters and floods and because of inappropriate infrastructure, the situation could be worse. The Study was conducted to see awareness, usage of technology, required facilities availability and Government policies. Sustainability needs more attention in underdeveloped countries, as an example Africa, India, and Pakistan [11].

eHealth literacy to understand ICT and eHealth solutions in underdeveloped countries where poverty is at a high level, and people are less educated, and these solutions can put more harm than benefit. There is a need for better understanding in developed and underdeveloped countries to get the benefit of any technology. Community programs and physician technician meetings before planning of telemedicine or ICT service at all levels is essential to understand each other.

The Concept of blended staff for multipurpose tasks like ICT position intermediate care provider is critical. These people will be responsible for integrating technical and medical assistance and able to locate faster solutions for current disparities as it is hard for a medical doctor to understand technical areas and same is with the pure technical person. In this case, we need integrated assistance which could be in the form of ICT positions in eHealth ecosystem as part of planning [12].

3.2 Standard and laws for security

Constitution or laws are needed for defining standards and security issues for sustainability. Security problems can harm care plan for the patient and destroy trust. Patient and physician relationship needs privacy. Sometimes, there is a requirement of customized strategies according to the need of patients. Planning is the key factor before starting the service. For very critical and emergency situations like risky pregnancy, chemotherapy and surgical procedures are very demanding, and telemedicine at some point is not the solution if the remote staff is not well trained in the medical or technical area especially to handle security issues.

Planning for each deployed device with its interaction with other devices and connection should be considered. Security rupture in medical devices or sensor especially M2M communication are of many types, like data attack, hacking communication connection nodes, and by this one can quickly locate the position and misinterprets the whole care plan. It will lead to the physical assault or other harms. It is imperative to consider security aspects as part of planning [13].

QR code which is two-dimensional barcode matrix is utilized nowadays in different applications and websites like secure authentication to avoid hacker attacks. It is one-time password authentication, and after logout, a person should again scan this QR code. Password and login are assigned to medical staff for using a particular device, and in case of attack, additional QR code requirement secure the system in the precise way [14].

There are many differences between international to national and then local laws. Telemedicine is a broader term and services can be provided through globally. For a collaborative project between Europe and US, rules and standard guidelines for telemedicine are comfortable as in US federal states govern it, but in case of Europe union, any law or regulations cannot be implemented without permission or consultation from the member countries [15].

Information transmission by using IP address protocol as well as low bandwidth should consider as this is acceptable to hacking attacks if the local or publically available internet provides the teleconsultancy.

There are no unanimous laws and guidelines for the telemedicine services worldwide. ICT professional can provide a good source of security information before implementation of any telemedicine services, and technical staff can tell about what are the possible available solutions for secure network, with these available standards for telemedicine must be seen as part of the planning of a framework.

3.3 Telemedicine services reimbursement and solid financial plan

Currently, telemedicine services are expensive. Reimbursement or indemnity needs attention, e.g., in teleconsultation, innovative business models can help if some sponsorships provide services. Proper knowledge about the technological infrastructure available at the site recommended for telemedicine service should consider the business model before giving any service. For building telemedicine service in particular area revenue generation or payments should be considered before planning of telemedicine services.

29 states of Colombia have passed parity laws for the reimbursement of telemedicine services via private payers. Patients directly pay their charges through online service. The insurance does not cover it. Before planning of a telemedicine service, it is essential to have a solid financial plan. Payment models can be changed flexibly [16].

In EU Directive (Article 3(d) of Directive 2011/24/EU) allows reimbursement of cross-border telemedicine if the patient resides in an EU country. However, in Germany, compensation is only through the health insurers otherwise patient have to pay by his pocket while in France some telehealth services are paid as well as in UK and Sweden [17].

3.4 Customized telemedicine services planning

Customized services and 3D telemedicine planning services considering patient needs, genetics, metabolism and disease situation, personalized services are in progress with individual plans. In chronic disabilities and long-term diseases, telemedicine and home care rehabilitation are the ultimate solutions for patients. Patients cannot be hospitalized for a lifetime as it will be costly.

2D video conference has been used in the hospitals and connected care centers. New 3D video conferencing is now the future development which is not utilized widely. This technology will cover the gap inherit from 2D technology. Light –Field displays (LF) can be used efficiently in the teleconsultation and surgery. For quick decision making and as sitting remotely or at a distance require intelligent decision-making data and algorithms. Analysis of big data LFV is difficult with video compression although

standards are defined but still not wholly applicable to address the issue for example progression challenges like how to analyze and understand 3D enormous information in one platform and make decisions. But this 3D technology provides more extensive and open knowledge as compared to 2D conferencing [18].

4 Planning business models for telemedicine services and marketing

Before considering planning, industries and the sector that can support with payments and marketing should be considered. Rehabilitation and long-term disabilities can involve potential business models with providers of the view that their equipment and technical staff with products can handle and benefit from telemedicine services. To create a sustainable structure with long-term benefits marketing and business model ideas will keep the system inflow.

4.1 Public Private Partnership and revenue generation

Denmark is one of the highest telehealth users in all of Europe. Denmark is looking for the public-private partnership, and many hospitals are working to explore new markets, and available solutions like Living Lab Denmark is a successful public-private partnership program where Danes and Multinational companies testing their products for the elderly population and with different care centers in 22 municipalities in the southern region of Denmark. The government of Denmark is taking many initiatives and collaboration with American companies to seek new solutions and invest in new business models for the health sector and to meet the needs of the patients. Denmark is going to make 16 new hospitals in which eight hospitals will be with complete IT state of the art structure. This innovative and unique IT equipped hospitals will decrease the number of beds to 20% and length of stay in hospital from 5 to 3 days. Dollar 7 billion money is allocated for this task for the next ten years. Many projects related to telehealth have been established. US Epic company recently got the opportunity to invest USD 1 billion in building IT infrastructure in two of the central region of Denmark [19].

Talkspace, a software company, is connecting licensed physician to the patients through unlimited messages and provides virtual connections. They are using data analysis to find out right practitioner for the patient and provide service for 25 dollars per week and has raised Dollars 9.5 million led by spark capital [20].

London Kings college hospital is using wearable Apple watch for chemotherapy to see medication adherence and therapy. This clinic is piloting an application from Medopad, a tablet-based mobile application technology company. This company has done a collaboration with England and China in the health sector and has raised 2.8 million dollars from 2011. Apple watch will be likely to save one pill cost of chemotherapy which is dollar 1,575 to dollar 78 per patient [21].

Public and private partnerships are vital in the healthcare sector. Pharmaceutical industries and tech industries can take part and can-do investments by seeing what kind of telemedicine services are needed. This partnership depends on three primary factors what kind of stakeholders likely NGOs, R&D, educational or healthcare sector are

involved, second what kind of collaboration like is it short term, middle or long term, third is the supply and demand management, by seeing needs of the patients. Long-term partnership is risky, but this investment would be very beneficial in case of chronic diseases and remote patient monitoring [22].

4.2 Medication therapy adherence and value-based business models

Applications can be installed with the prescribed medication for therapy adherence and remote patient monitoring as part of telemedicine service like Novartis has proposed home-based telehealth application for patient adherence and remote patient monitoring. These eHealth digital solutions can provide new business models for pharma and practice new services aligned with telemedicine as part of planning to develop a framework for future telemedicine. Neurometrix Quell is working for digital pain management, WellDocs for digital diabetes and asthma therapy through digital therapy inhalers applications [23].

Telemedicine business models and public-private partnership is essential both for developed as well as underdeveloped countries to find a way for payment and revenues. Many sectors through this digital eHealth concept can be involved to provide solutions for the emerging countries as well.

Myca Nutrition is a web, and mobile video platform in Canada established in 2007 and is providing consultation on nutrition, and this online system is saving most of the physician cost. Doctors are charging approximately dollars 20 a month for five patients and approx., 89 dollars for 100 patients while the patient is giving 12 dollars per month. Arizona telemedicine in the US is a teleconsultation for dollars 5,000 per year. Tective Telemedicine is working for mental health in Netherland with euro 200 per patient profit. These are the digital eHealth or telemedicine business models that can be utilized as part of planning before the introduction of telemedicine service in developed countries.

In underdeveloped countries like Pakistan Telenor, a telecommunication company is providing TeleDoctor services for 24 hours a day in case of secondary medical advice. They are receiving around 10 thousand calls per day and charging 8PKR (0.08 USD). India, Apollo is providing Telemedicine services for rural areas. Teleconsultation cost varies from dollar 20 to dollar 30 with a net profit of dollar 10 per patient. In China Pla Telemedicine is providing teleconsultation, saving time and reducing the cost for patients as well as getting revenue, are the examples for business models which can be considered before introducing telemedicine service [24].

There is a need to introduce Government investment, pharmaceutical and tech industries which can make affordable devices and networking system for proper channelizing of health care services and their provision nationally and globally. This factor will overall enhance value-based Healthcare business models and give more opportunities to the public and private sector to invest and get the benefits. Pfizer in the UK is pursuing integrated care programs for health care system. This model is based on rewards to clinical as well as economic outcomes instead to only pay for the products. These programs reduce cost and reimbursement is basically through health insurance companies or local health authorities per patient basis, and this example can be seen in UK, Germany, and Switzerland [25].

5 Sustainable eHealth business models, policies, European commission and 5G

Policy recommendation requires help from all stakeholders, industries, and technology, e.g., 5G health authorities and the public to pursue the good practices [26].

- Introduction of different business models in healthcare ecosystem with pilot actions and modelling approach
- Utilization of good practices in making business models for continuous and valuable healthcare ecosystem
- Provide the understanding of benchmarking so that every industry act innovatively and utilize best practices business models for health care.
- Reimbursement and financing health care sector with good practices
- Legal clearance in different matter related to personal health data and exchangeable data nationally and geographically
- Facilitate industries and market to come and give solutions for unsorted technical issues.

EU is moving ahead to use 5G for better internet access for citizen and business models because 315 million population in Europe is using the internet and use of IOT has been raised and continuously growing. They have made a plan for 2025 where it is decided to change 100Mbps to Gbps. All communication and remote monitoring in case of telemedicine services will be revolutionized [27].

6 5G solution for healthcare

5G will revolutionize connected services and devices by improving reliability, connectivity, and cloud-based storage. This technology will provide a base architecture for the assimilation of virtual devices in the health sector with a broad capability of computing intelligence with more speed and a big range of bandwidth. The more advanced form for the previous generation has amalgamate nature and combing all previous generations, sensors and wireless technology devices, the wavelength in millimeters, Wi-Fi. 5G is combining or connecting virtual systems to cloud with artificial intelligence and helping in the derivation of the different models of computing [28].

In 2020, 50 billion devices will be connected to 212 billion sensors when this 44 zettabytes (ZB) will be accessible. 5G will develop an ecosystem where all the devices and system are connected. The speed of the internet will make many innovative

applications of the healthcare system, and rehabilitation enable. Immersive data traffic and system configuration will help in the process of decision making and location access. Rehabilitation by utilizing virtual coaching with real-time will be possible. Data analytics and algorithm will help in faster treatment and quick decisions. This cloud architecture and central data network will provide new opportunities for new business models with a customized approach. Internet-based services will give more opportunities to start-ups. Clinical trials and cost for human will be decreased in computational and digital structures as 5G will allow making intelligent networks and data analytics possible [29].

7 5G health sector, future society, marketing and economy

Due to digitalization and the faster speed internet healthcare area is continuously developing in the technological point of view as it is of course need of the time. More and more industries will involve that have not any medical background but can make a structure or provide a basement for the flow of medical information by utilizing 5G technology. American firms are putting more investments dollar 232 billion for ICT environment, and this will grow to dollars 357 by 2019.

Imaging and diagnostic are enhanced nationally as well as internationally. Cancer detection remotely can be done through the 5G connection of wearable sensor and devices to monitor baby respiratory patterns through android applications.

All the medical industries are now interested in transferring their medical devices into real-time connected devices. It will provide setup for the establishment of new business models focusing customized solutions. Through modified business models and more involvement of people from different professions can provide help to connect biological system to virtualized system and ultimate quick access without doing significant procedures, developing of ICT software, reducing clinical trials in the augmented and virtual reality way.

5G equipped technology is going to open and invest in new business models with healthcare sector with reliable solutions. By this method, pharmaceutical industries and medical device industries will be able to help in standardization and enhance their role from manufacturing of products to value-based business models. Wearable devices, sensors, technology architecture, software, different drug delivery systems, diagnostic and imaging devices will give chances for industries to introduce business models to connect different system as one ecosystem.

To create value and to develop sustainable healthcare ecosystem business models are necessary, and 5G can help to make this approach accurate [30].

7.1 Current Threats in the ongoing health care system and medical team

- Patient personal data is mostly stored in one place in the form of repository, only exchanged with the authenticated users. But most of the time this data remains at one location as hospitals and doctors are not connected sufficiently.
- Fair utilization of incentives for the healthcare sector and access to eHealth system at all levels from city to rural areas should be without discrimination.

- Less availability and insufficient training of the medical staff and patient can put more problems. As both come from different fields or areas and they need an understanding of each other [31].
- Rehabilitation is difficult in hospitals for the long term in case of chronic diseases. Solutions should be like that patient can get care at their home doorstep with convenience. Which is difficult because of expenses and medical teams are not technically aware of any difficulties if arise at the level of devices which can put more harm than benefit.
- More practical and intelligent medical care system is still not available, and poor practices have been seen in data analysis and handling. [32].
- Less integrated and more paralyzed structure of health care, problems in information system especially in the underdeveloped country where infrastructure is not adequately built [33].
- Connectivity issues with real-time and bandwidth problems and by this access in case of medical images or transfer of big data in telesurgery creating hindrance due to end to end latency. Latency beyond 200ms effects surgeons and it is difficult for surgeons to operate [34].

Intelligent medical team with having the realization of patient condition and technological infrastructure of the area is critical. The Accomplishment of any telemedicine service depends on cast or crew as these are the people going to handle or initiate particular telemedicine service.

8 Framework for future telemedicine planning and involved infrastructure

The Principal approach here is "escalation" that every working facility or sphere are interconnected and overlap to make the backbone of the skeleton of the healthcare ecosystem. This overlapped skeleton will help in the understanding of every linked unit and its importance before starting of any telemedicine or eHealth service. If one unit change because of the requirement of the innovative technologies, other will begin to strategize plans accordingly to keep all the units in stable and sustainable position.

8.1 Escalation Model

This escalation model has four necessary vital parts which are giving shape or stability to the skeleton. First is the government making their policies, defining regulations for best practices. Second is the ICT industries, which are coming with new innovative systems, sensors, and devices for faster access to data and quick response. A Third is a wireless technology such as 5G providing all the data and quick response with real-time and low latency. The Fourth area is the industry itself, for example, technology industries, startups, pharmaceutical industries, etc. which will provide investment and will practice new ideas and business models to make a sustainable, rewardable eHealth ecosystem. All the systems will coordinate and involve in action and required reactions. A Single unit cannot work more efficiently alone. All need to work together to get the

This escalation approach requires that every connected system or a subsystem or unit have a proper description or knowledge of each performed the task in providing and dealing telemedicine or medical emergency care with the overall goal to decrease the burden on hospital and connected units. In this way, every individual will be treated on a priority basis rather than to get treatment on selection basis. There will be more revenue and investment would be available. This escalation model system will help in connecting of different units of health care system as well and in case of any change because of transition and innovation; it will give us the systematic way to absorb and come back accordingly. This approach will help to maintain the overall goal of this escalation and sustainable infrastructure.

Outcomes regarding patient satisfaction and trust will come from the coordination of all the overlapped units. Since any unit in this escalation is not alone, there is coordination so the burden will be shared and revenue will be divided to all the units concerning less pressure and with more investments. For achieving a big target, it is required to put multiple, and differential efforts as this approach will make the system more secured and harmonized.

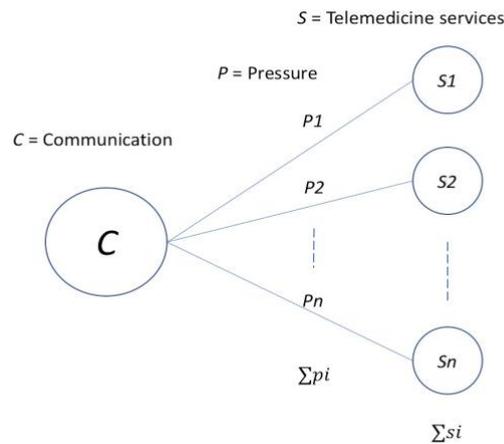


Fig. 2. This mathematical modeling approach describes pressure sharing between all the overlapped units. Communication factor will play a significant role in the orientation of a particular plan for eHealth ongoing, and future-oriented services.

$$C * \frac{\sum Si}{\sum Pi} \quad (1)$$

Pressure sharing formula is described in eq. (1). By this, we can also see what the problem areas in the ongoing telemedicine services are and where are the holes or gaps to be filled up in case of remote patient monitoring or eHealth overall services for the public. Issues related to connectivity and real-time access in this escalation that will be solved with 5G technology in coming days as there is a need of high definition breakage free wireless communication that can fill up the gaps of space (which means less

occupancy of patients) and time factor (response is quick). Patient and physician can communicate data from different attached sensors, exoskeletons and robotics to see patient movements. Smart pharmaceutical devices which are providing dose tailored on suggestive and maintained therapy on a signaling pathway by the physician in real time with no delay especially for remote areas as part of escalation model.

It is a basic framework to consider before implementation of any telemedicine or eHealth service as this model still needs more exploration in cooperation and coordination point of view.

Productivity can be measured by yearly data analysis of performed tasks by each overlapped unit. By this measurement, we can see what the problem areas that are creating hindrance in the efficiency of a particular task are and accordingly we can improvise.

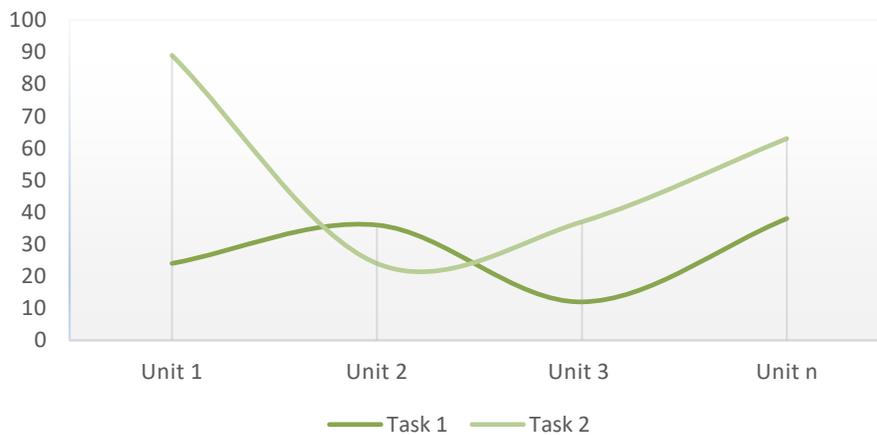


Fig. 3. Productivity achieved regarding specified points.

8.3 Performed tasks analysis

This productivity measurement can analyze many factors like there is any communication gap, proper task handling, understanding with the medical area, technology utilized, available resources use, commercialization and marketing, value-based business model creation, motivation level, etc.

This productivity measurement will help to find out efficiency, engagement, and service experiencing patient satisfaction. Productivity points will be assigned to the units after data analysis of performed tasks. The Yearly report will make the framework more applicable and accountable for sustainable infrastructure. The Provided study will set future more stable structure and sustainable healthcare ecosystem with stable telemedicine services.

9 Conclusions

Network coverage and access are limited or fragmented in distance areas. Infrastructure is fundamental and still in the stage of development to carry out eHealth care or telemedicine services. Lack of interest by the private sector due to less transparency in the medical services and inadequate managerial supervision on the healthcare ecosystem are the leading factors in less affordability of patients for expensive solutions and deployments of the vastly oriented health care system. The Practice of clinical applications and telemedicine services are still not affordable due to less awareness about proper utilization of different devices and software, basic and preliminary system of wireless communication with less bandwidth and disruption in the ongoing implemented healthcare ecosystem.

There is a need to introduce government investment, pharmaceutical and tech industries which can make affordable devices and networking system for proper channelizing and monitoring of patients through telemedicine services and their provision nationally and globally. Planning for the implementation and ongoing system disruption accountability is very important. Cooperation and coordination in healthcare ecosystem will enhance human workforce, less financial burden and give more opportunities to the public and private sector to invest and get the benefits. For communication, connectivity and real-time, 5G will play an essential part. Security and standard definition are still in the line of settlement. Universities, governments, and industries are putting philanthropic efforts for establishing value-based telemedicine and eHealth services, but there is still more research needed to get the sustainable infrastructure for eHealth ecosystem.

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