

Impact of Information Technology in Healthcare to Improve Lifestyle Chronic Diseases Handling

By

Priyanka Malhotra

*Dissertation submitted for the partial fulfillment of the
MBA Hospital and Health Management*

Academic year, 2015-2017



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TO WHOMSOEVER MAY CONCERN

This is to certify that **Priyanka Malhotra** student of **MBA Hospital and Health Management** from The IIHMR University, Jaipur has undergone internship training at **NTT Data Services, Bangalore** from **February 6th, 2017 to May 5th, 2017**.

The Candidate has successfully carried out the study designated to her during internship training and her approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish her all success in all his future endeavors.



Dr. Ashok Kaushik
Dean - Academics and Student Affairs
The IIHMR University, Jaipur



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NTT DATA Information Processing Services Private Limited

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To whomsoever it may concern

This is to certify that **Priyanka Malhotra** of **The IIHMR University, Jaipur** has been working with NTT DATA Services for her summer project.

Project Details:

Project Name : Impact of Information Technology in Healthcare to improve Lifestyle Chronic Disease Handling
Duration : 90 days
Location : Bangalore
Guide Name : Dr. Ramandeep Kaur & Preeti Thakur
Sponsor Name : Ajay Aiyar

She has successfully completed her project and her performance during the tenure of the internship has been found to be satisfactory.

Her findings in course of the project has been found to be practical and relevant and some of the recommendations will be incorporated on the floor on approval from the business.

Thanking You,

Regards,



Dilipkumar Santhanam
Business Partner Director, Services HRBP Team
NTT DATA Services

THE IIHMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled "**Impact of Information Technology in Healthcare to Improve Lifestyle Chronic Disease Handling**" and submitted by **Priyanka Malhotra** Enrollment No. IIHMR-U/01/2015-17/0327 under the supervision of **Dr. Monika Chaudhary** for award of Postgraduate Diploma in Hospital and Health Management of the University carried out during the period from 6th February 2017 to 5th May 2017 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.


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THE IIHMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that all ethical issues have been considered while collecting data for my dissertation titled **"Impact of Information Technology in Healthcare to Improve Lifestyle Chronic Disease Handling"**.

A handwritten signature in blue ink, appearing to read 'Priyanka Malhotra', with a horizontal line drawn underneath it.

Priyanka Malhotra

1. Introduction

According to Public Health Institute (PHI) (1), Chronic diseases are characterized as any state requiring progressing mind exercises and reaction starting with those patient, and the health awareness framework also in which patient's self-care exert will be critical.

Chronic diseases have become the substantial burden to healthcare worldwide. As stated by a report published by World Health Organization (WHO) in 2011, 57 million global deaths occurred in 2008, and out of which 63% were caused particularly by pulmonary diseases, heart failure, diabetes and cancer. PHI (2) contended that in the forthcoming decades, constant infections will keep on increasing horribleness and death rate in whole world. The perpetual ailment conditions won't just influence vast number of individual, additionally result in critical human and monetary expenses to clinic, wellbeing frameworks and society. Customary model of rambling consideration in doctor's facility and clinical setting is problematic for enhancing ceaseless way of life malady result. The limit of current human services framework will truly be tested, especially by clinical administration foundation requirements in type of expanding lack of qualified proficient guardians.

Healthcare is changing dramatically because of technological developments from anesthetics to antibiotics and from magnetic resonance imaging to robotics. The advent of internet and other technologies has allowed patients to access greater amount of information in order to guide decisions about healthcare. Information technology such as electronic health records (EHRs), electronic management of chronic diseases, e-prescribing decision support systems, and bar coding of drugs and biological products have been shown to reduce medical costs and errors. For example, Bates and Leappe (1998) study revealed (4) that electronic medical record that facilitates computerized physician order entry can prevent medication errors. In a study done by Galanter W. L (2005) showed (5) that E-Prescribing has lessen remedy blunders and enhance consistence with oversight mind models. Miller et al. and Gardener R.M. (2005) proved (6) that point of care decision support can provide providers with alerts for contraindicated medications.

The data innovation is progressively being utilized as a part of administration of unending ailments to encourage shared administrations (electronic wellbeing records and virtual wellbeing systems), learning administration (planning and data conventions) and in addition shopper based wellbeing instruction and proof based clinical conventions. Celler B., Lovell N., & Basilakis J. (2004) stated (3) that home monitoring includes clinical signs monitoring, automated scheduling and medication reminders. Apart from other technologies researchers have focused on mobile based technologies, particularly m-health. M-health particularly comprises of healthcare related utilization of multimedia telecommunications and mobile technologies within service delivery.

Mobile technology promotes healthcare services in the aspect of accessibility, effectiveness, and affordability. M-Health offers accessible health services to patients, reducing geographic and temporal barriers between healthcare professionals and patients. A WHO, overview of worldwide M-Wellbeing activities distributed in 2011 revealed a “groundswell” of activity in both developed and developing countries. Mobile technology innovations, for example, telephones and remote observing gadgets are continuously all the more being utilized as a part of social insurance for correspondence, understanding checking, and to encourage adherence to interminable infection administration. Hamine S., Guyette E., & Faulx D. (2015) concluded (7) that M-Health devices can improve service delivery and influence patient outcomes.

2. **Objectives**

- To assess the current and future aspects for information technology in chronic disease management with an emphasis on market need, potential benefits, and drivers and barriers in adoption of information technology.
- To assess the role of mobile technology based health interventions delivered to healthcare consumers suffering from chronic diseases.
- To explore the extent to which future technologies could play a role in development of an effective and affordable healthcare.

3. **Material and Methods**

3.1 Study Design:

It is a descriptive study wherein the information is collected without manipulating the environment

3.2 Study Duration:

Three months period from February 6, 2017 to May 5, 2017.

3.2 Data Collection:

Secondary Research was conducted. The existing data was gathered from various sources, compared and analyzed. The data was collected from:

- Internal Data such as previous primary researches
- Government statistics and information from government agencies like WHO.
- Different media like articles from journals, reports from research centers.

3.3 Sample Size:

The sample size will contain 50-70 relevant articles, journals, projects and papers published.

3.4 Exclusion Criteria:

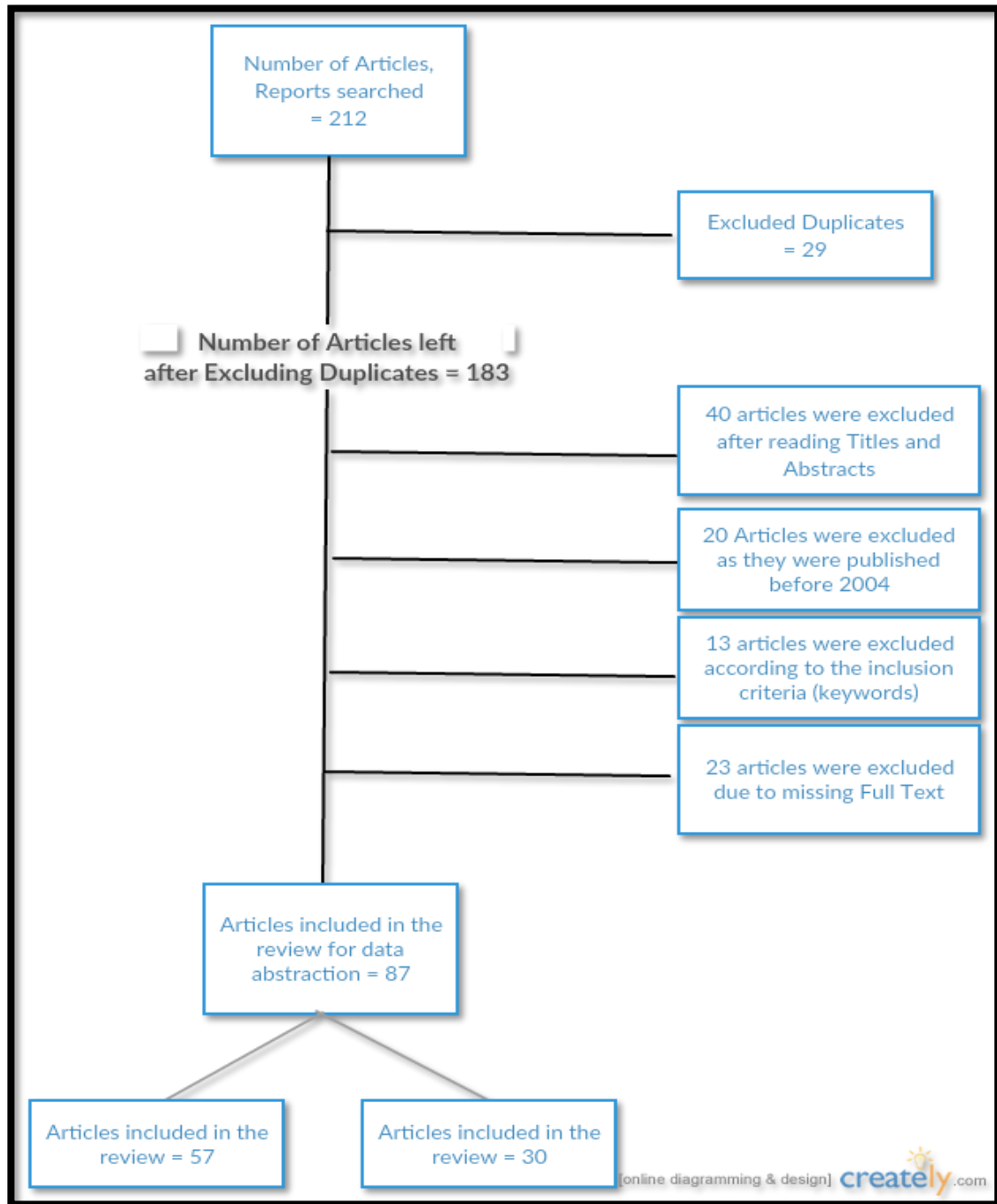
Papers on communicable and other non-chronic lifestyle diseases were excluded.

3.5 Inclusion Criteria:

Articles, journals, e-books, projects and papers published on the topic post 2004.

3.6 Keywords:

Lifestyle diseases, Health Data Management, preventive health, digital transformation trends, health interventions, mHealth, wearable technology, social, ethical and legal barriers to eHealth, mobile tools, internet of things.



4. Review of Literature

4.1 To assess the current and future aspects for information technology in chronic disease management with an emphasis on market need, potential benefits, and drivers and barriers in adoption of information technology.

4.1.1 Healthcare Trends and Challenges

A white paper was released by Canadian Global Information Technology (CGI) in 2014 which discussed (8) about the healthcare challenges and trends:

❖ Global Healthcare trends:

1. Transition from supply driven towards demand driven end user model:

- Patients have become stakeholders; they demand clearness in access and information about care, about the quality of service provided to them.
- Internet is changing subject conduct. Social insurance suppliers are embracing innovative answers for streamline procedures.

2. Informed patients and the rise of social media:

- Patients are progressively getting to be noticeably required in their social insurance, with a higher stake in the excursion.
- Social media is additionally driving medicinal services cooperations in novel ways. Patients are abusing these assets to talk about their medications, techniques and also individual specialists.

3. Patients exercising choices:

With Patient's being the partner, governments, wellbeing specialists and the therapeutic calling are tested to give patients the data and administrations that will enable individuals to resolve on educated decisions about their wellbeing.

4. Patient Centered Medical home:

- Episodic, disease-oriented care in hospitals is not the most efficient way to deliver care. The advent of the patient-centered medical home (PCMH) acknowledges this reality.

- The mind conveyance framework is composed so that it totally abuses data innovation, benefits in planning care over the group and screen the person's conditions, and backings understanding mindfulness.

- It is the advancement in IT to bolster continuous observing that will make PCMH the standard, the standard clinical practice. Patients will be released before from doctor's facilities, since they realize that the patient's condition can be continually surveyed, and intercessions can happen to guarantee sharpness is tended to outside the healing center condition.

❖ Global Challenges:

1. Rising Costs:

Spending on healthcare almost perpetually grows faster than GDP (Gross Domestic Product). The rate of growth of healthcare spending has exceeded that of GDP since the records began. Receivers and providers of healthcare are challenged by macroeconomic factors like aging populations or insufficient public funding.

2. Changing Demographics:

Service is in demand. The demand on the healthcare delivery organizations is increasing, in every country. The average life expectancy in OECD (Organization of Economic Co-operation and Development) countries has reached 80 years now and continues to lengthen. However, not only people are living longer, but people are living longer with chronic disease.

3. Filling the resource gap:

Global lack of clinicians. The test is not restricted to specialists either, nursing and paramedical staff has likewise diminished in a few nations.

4. Easy access:

With increasing demand, health economies should adjust simple entry to their administrations against the cost of working smaller facilities.

5. Focus on quality:

Patient's expectations are evolving. The nature of care is progressively important. As patients exercise their entitlement to pick how and with whom they include for their social insurance, they request straightforwardness of information and procedures.

6. Becoming customer driven:

Where the patient should be-at the heart of care. To address the requirements of the patient, and to begin the move of human services to a request driven model, doctor's facilities are setting the patient immovably at the focal point of all that they do.

4.1.2 Chronic Lifestyle Diseases

Lifestyle diseases are defined as diseases linked with people live their life. Normally caused by alcohol, drug abuse and smoking as well as lack of physical activity and unhealthy eating. Diseases that impact our lifestyle are heart disease, stroke, obesity and type II Diabetes (cited from 9).

In 2010 a review was done by WHO (10), and it was estimated that chronic diseases were responsible for 50% of mortality and illness in 23 developing countries. Surveys were conducted and it was concluded that large number of people in developing countries have adopted lifestyles of people in more economically and technologically advanced regions, in less than two decades. Childhood obesity, high rates of type 2 diabetes, lack of exercise, alcohol and smoking are increasing in poor and middle income countries. Also, WHO (11) concluded that approximately three quarters of people over 75 years have at least one chronic condition and over a third of men over 60 years have two or more chronic diseases.

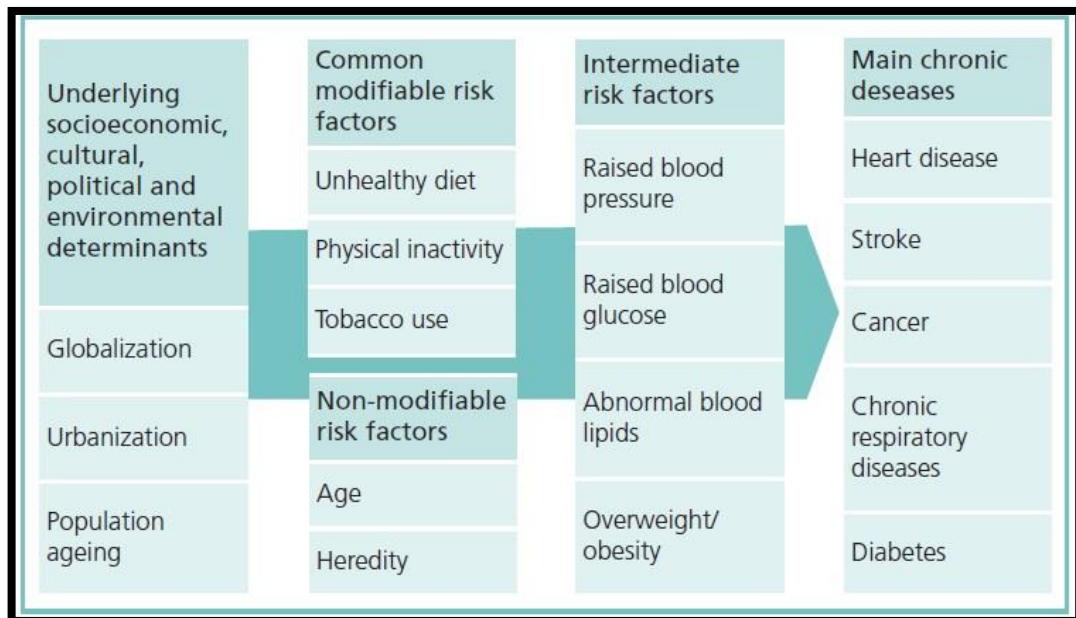


Figure 4.1: Major Causes of Chronic Lifestyle diseases

4.1.3 Global Trends of chronic lifestyle diseases

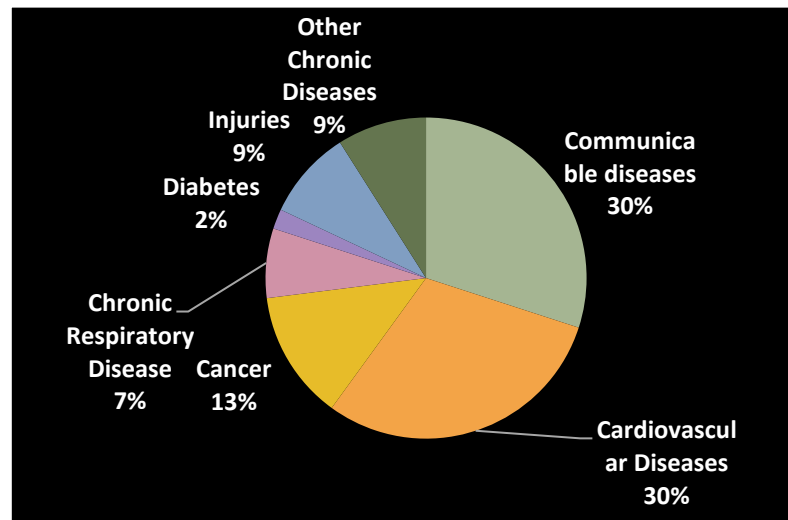


Figure 4.2: Main Causes of Death Worldwide

1. Cancer

- The National Cancer Research Institute(NCRI) has predicted that by 2020 the number of new cancers will rise to 41,743, almost double the annual number in 1998-2002. Irish Medical Organization (2008) forecasted (12) that the largest projected increases for both sexes are in cancers of the liver, kidney and melanoma. For women, increases in cancer of the breast and lung are expected to continue, while for men continuous increases in cancer of the prostate and testis have also been forecasted.
- Tobacco accounts for 30% of cancer deaths. Smoking is the cause of lung cancer in 86-90% of cases and is also an established risk factor for cancers of the pancreas, bladder, stomach, liver, kidney, cervix and certain forms of leukaemia. (American Cancer Society and Cancer Research, UK).

2. Heart Disease and Stroke

- According to the World Heart Federation, overabundance fat influences blood lipid levels and pulse, and meddles with the capacity to create insulin viably, bringing about diabetes. An eating regimen high in immersed fat and low in foods grown from the ground anticipated that would bring about around 31% of coronary illness and 11% of stroke around the world, while physical idleness builds the danger of coronary illness and stroke by half.

- It has been estimated that, by 2020, endless maladies will contribute for right around 75% of all passings around the world, and that 71% of passings because of Ischemic Coronary illness (IHD) and 75% of passings because of Stroke.

3. Diabetes Mellitus

The number of people in the developing countries with diabetes will increase by more than 2.5 overlay, from 84 million in 1995 to 228 million in 2025. Untreated diabetes and the complications from diabetes are major causes of ill health and premature death. Diabetic retinopathy is an important cause of blindness. After 15 years, approximately 2% of people become blind, and approximately 10% develop visual impairment.

4. Suicide and Mental Health Problems

- While women are three to four times more likely to suffer from depression than men, four times more men die from suicide than women. IMO (2008) also forecasted (12) that the rates of deliberate self-harm are high among females aged 15-19 years while suicide rates are highest for males aged 20-29. While genetic factors can account for up to 40% of the risk of depression, there is evidence that stressful life events - such as bereavement, relationship problems, job loss, financial difficulties or illness - can lead to the onset of depression in one in twelve cases.

5. Obesity

Obesity is linked to a range of serious physical and mental health problems. At least three quarters of type 2 diabetes, a third of Ischemic Heart Disease, a half of hypertensive disease, a third of ischemic strokes and about a quarter of osteoarthritis can be attributed to excess weight gain.

6. Tobacco

Some 95% of lung cancers is caused by smoking. The annual per capita consumption of cigarettes peaked in 1963, and except for an increase during 1971–1973, consumption has steadily declined since then. Smoking rates in the general population declined from about four of every 10 adults during the early 1960s to about two of every 10 adults today with greater declines for men than women (2009, cited from 14)

7. Alcohol abuse

4.1.4 Chronic Disease Management

An integrated care approach to manage illness which includes screenings, check-ups, monitoring and coordinating treatment, and patient education. According to health IT government in 2014 (cited from 16) quality of life can be improved while reducing health care costs by preventing or minimizing the effects of a disease.

Process:

The differing levels of asset utilize and power of intercessions related with care giving and parental figures in regard to required endless sickness administration objectives and activities crosswise over populace, frameworks and phases of illness are:

Target Population	Healthy	At-Risk	Minimal-Moderate Disease	Significant Disease
Intervention Goal	Keep population healthy	ID at-risk patients	Delay disease progression	Minimize complications & costs
Intervention Approach	Population health management	Candidate selection and enrollment	Personal health management	Acute clinical care
Intervention Actions	Health education Behavior modification Risk Assessment/Stratification			Develop individual care plan Coordinate with care team Patient condition monitoring Patient-provider interaction Treatment evaluation Intervention review and adjustment
Primary Settings of Care	Home Community			Ambulatory Hospital
Expertise Level	Self Paraprofessional			Mid-Level professional High-level professional

Figure 1: Chronic Disease Management process

Chronic Disease Management process can be discussed under three heads:

1. Target Population

2. Intervention Goals
3. Technology solutions.

1. Target Population

Chronic disease management reflects a mix of population, care givers, care takers and care settings and technologies. The role is to effectively “downshift” service capacity to community and to incorporate patients, their families and care givers in the process.

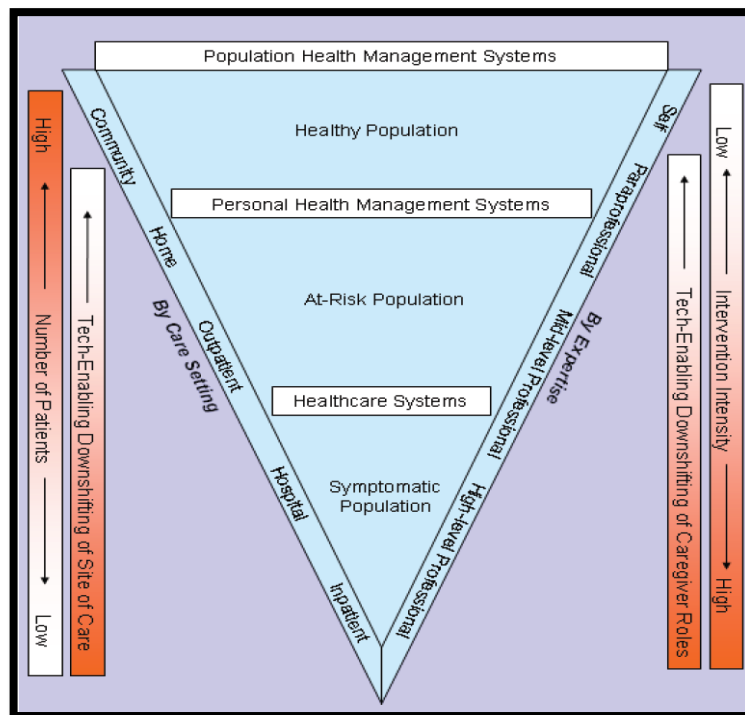


Figure 4.5: Chronic Disease Management Process: Target Population

2. Intervention Goals

Technology can allow to move chronic disease interventions that can incorporate prevention and management goals focused on healthy and at risk populations in order to slow down the future chronic diseases.

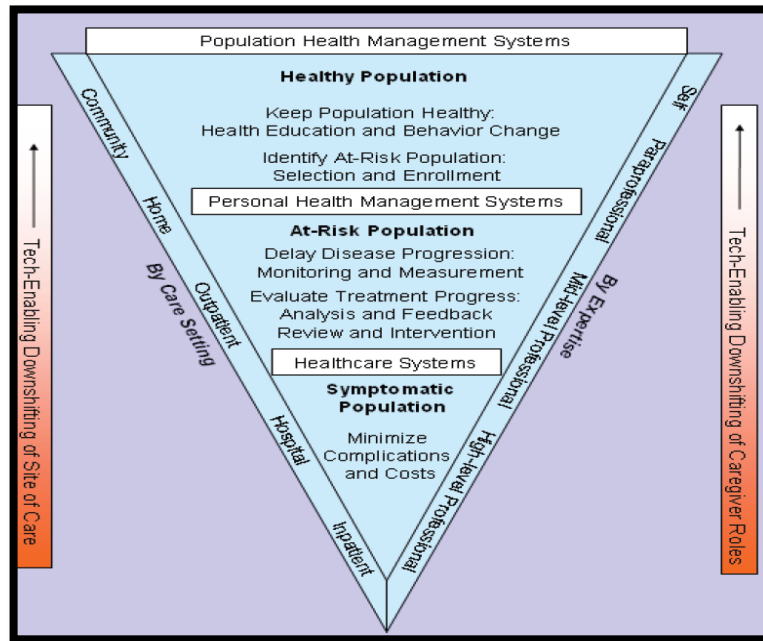


Figure 4.6: Chronic Disease Management Process: Intervention Goals

3. Technology Solutions

System and population has a wide array for technological options to support self-management intervention and provider-patient interactions.

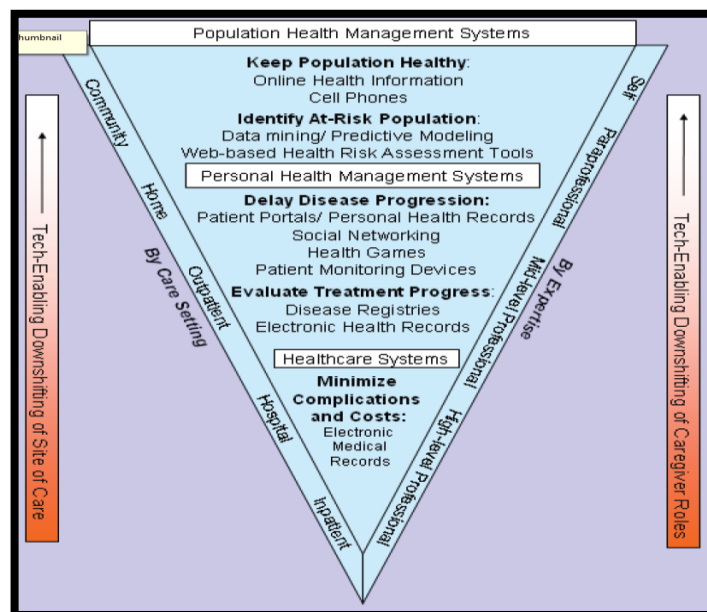


Figure 4.7: Chronic Disease Management Process: Technology Solutions

4.1.5 A framework for improving Chronic Care Management

The writing presents various structures for enhancing and understanding unending sickness administration. A standout amongst the most perceived and strong model is "Unending Consideration Show (CCM)". Medicinal services government (2014) (referred to from 17) expressed that the perpetual care model was initially created by Dr. Ed Wagner in 1993 in collaboration with Robert Wood Johnson Establishment. The CCM is entrenched system for constant care administration and practice change. The model is proof based, far reaching, multisystem approach and expands on between connections between six components that prompts enhanced clinical quality through arranged, proactive and populace based incessant ailment administration:

1. Delivery system design
2. Decision support
3. Clinical decision information systems
4. Organizational support
5. Self-management support
6. Community resources.

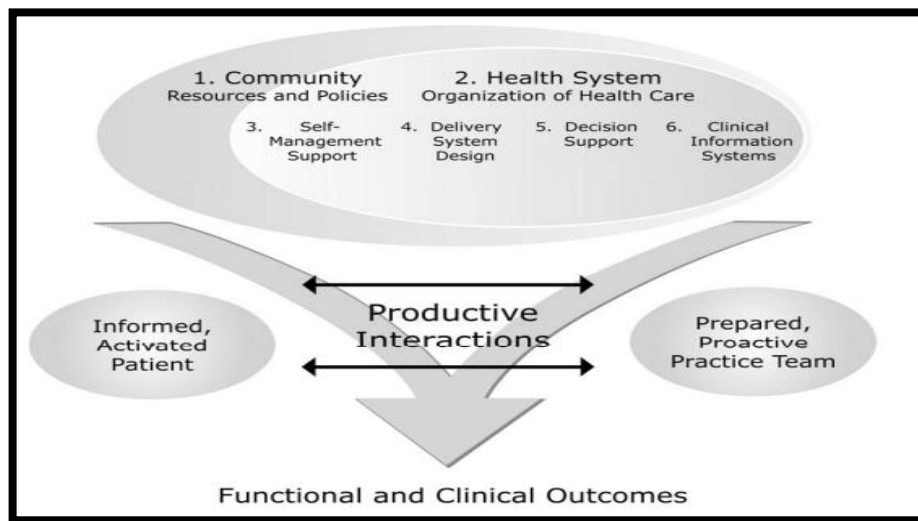


Figure 2: Elements of Chronic Care Model

1. Delivery System Design

Office framework and clinical procedures must be upgraded to suit arranged patient connections; proactive care and patient development. The parts and duties of colleagues ought to be expanded to accomplish successful and productive work process. In an all around outlined conveyance framework, in light of patients' needs clinicians arrange the visit well ahead of time.

The CCM underscores a few inventive conveyance mediations like "gathering visits" and extended utilization of group members(cited from 17). The patients meet their clinician and different patients with comparable medical issues.

2. Decision Support

Education, links with forte expertise, and reminder systems and aids providers to apply evidence based best practices.

3. Clinical Information systems

In order to provide good care, physicians must know their patients and whether they have received the services that are critical to manage their services. A registry is the foundation of managing chronic conditions or preventative care. The registry guides the course of treatment, anticipate problems, and track progress. A system for physician reminders, patient recall, and follow-up are also needed.(Cited from 18)

4. Organizational support

Organizational support addresses the culture of the practice and system leadership. A system that supports improved care for people with chronic conditions by developing public policy, allocating needed resources, including physician incentive programs.

5. Self-management support

Patients must be well-informed about their chronic condition and have the necessary skills and confidence to manage their chronic condition. Collaborative approaches whereby patients and providers work together to define problems, establish goals, build treatment plans, and resolve problems. (Cited from 17)

6. Community Resources

Human services experts find compelling projects and urge their patients to take part. Hones frame associations with group associations to create confirm based projects.

Roughly, 1500 medicinal practices utilizes constant care demonstrate. Prove from incessant care administration programs in view of CCM and incorporated with essential care shows quality change way to deal with administration of constant illnesses. Four key regions where multi part rehearse has been found to contribute most noteworthy change in wellbeing results are:

- Increasing supplier's aptitudes and ability
- Making care conveyance more group based and arranged
- Educating and supporting patients
- Making better utilization of registry based data framework

Since unique ceaseless care model was distributed, colossal advances have been created. In this manner a reexamined model was given by Fiandt K. (2017) e-wellbeing upgraded constant care show (eCCM) that offers knowledge into the part of eHealth in support of perpetual care patients(cited from 19,20).Two noteworthy segments are included interminable care display eCommunity (online group and web-based social networking) and eHealth. Information, data, learning and insight alludes to included estimation of aggregate contribution about care from the patient, the social insurance supplier and group. A noteworthy improvement is expansion of eHealth instruction.

4.1.6 Information Technology in Chronic care Management

Healthcare services is an information rich, data needy, divided process where the administration of data is noteworthy to enhance asset use and achieving process efficiencies that will prompt financially savvy quality care and enhanced wellbeing results. Data innovation is progressively being utilized as a suitable means for crossing over holes in wellbeing framework's ebb and flow way to deal with encourage and oversee stream of data identified with unending ailments.

It provides enabling technology components for an integrated and coordinated electronic health information infrastructure for chronic care interventions and communication that will provide relevant, reliable, timely and secure healthcare information and services.

4.1.7 Preventive Healthcare Technologies: Market Segmentation

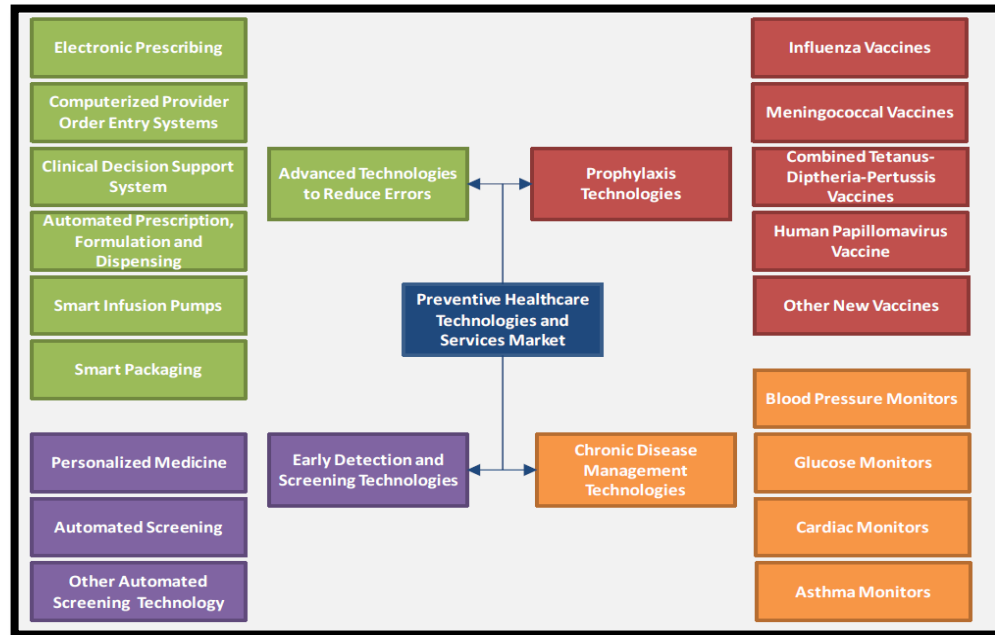


Figure 3: Preventive Healthcare Technologies: Market Segmentation

According to Transparency Market Research (2014), the preventive health technologies and service market can be segmented on the premise of early detection and screening technologies, prophylaxis technologies, advanced technologies to lessen errors and chronic disease management technologies.(Cited from 33)

A. Early Detection and Screening Technologies

Early detection and screening technologies are used in cancer diagnosis. Most of the times during initial stage, cancer go undetectable so a combination of early detection and screening technologies assist to understand the stage of cancer. Early detection technologies identify signs of cancer and prompt action is taken to prevent its progress. Screening is technology assisted process that helps to detect the severity of disease. (Cited from 32)

The early detection and screening technologies segment is further divided into personalized medicine, automated screening and other screening devices. Personalized medicine is

further categorized as genetic and proteomic tests and automated screening into telehealth kiosks, automated drug testing and eye health kiosk.

B. Prophylaxis Technologies

Prophylactic technologies also known as vaccination comprising of selective exposure of human body to a weakened or diluted form of an infectious agent that activates the body to produce antibodies against the agent. The prophylactic technologies segment comprises influenza vaccine, combined tetanus-diphtheria-pertussis vaccines, human papilloma virus vaccine, hepatitis B and pneumococcal vaccine. There are various types of preventive vaccines that are used such as live-attenuated vaccine, recombinant sub-unit vaccine, inactivated vaccine and toxoid vaccine for the treatment against bacteria and viruses.(Cited from 32)

C. Advanced Technologies to Reduce Errors

Information technology can decrease the mistakes with CPOE, bar coding meds to guarantee the conveyance of medication to the correct patient, thorough electronic wellbeing records that are open at Purpose of Care (POC) and are accessible all through the clinic. The other help given by data innovation are automated announcing of lab records, PC based technique update framework and programming supporting finding and treatment alongside clinical rules for taking choice

D. Chronic Disease Management Technologies

Successful management of chronic disease requires a close relationship between the patient and all healthcare providers. Thus, application of information technology provides effective and accessible communication between patients and healthcare professional to enhance the care and use of cost-effective information and communication technology. The chronic disease management technologies market is segmented as glucose monitors, blood pressure monitors, cardiac monitors and asthma monitors.(Cited from 32)

4.1.8 Information Technology in Chronic care Continuum

Information Technology on the basis of chronic care continuum can be divided on the basis of challenges faced by delivery system in chronic care management i.e. data management, data communication, exchange and management and workforce and care processes. The continuum can be done on three levels:

A. Patient Environment

Patient can use several self-care resources and educational resources. These provides a wide array of technologies to patients like personal health record, remote patient monitoring, personal communication devices, electronic health games, patient portals, social media and virtual worlds. These are described below:

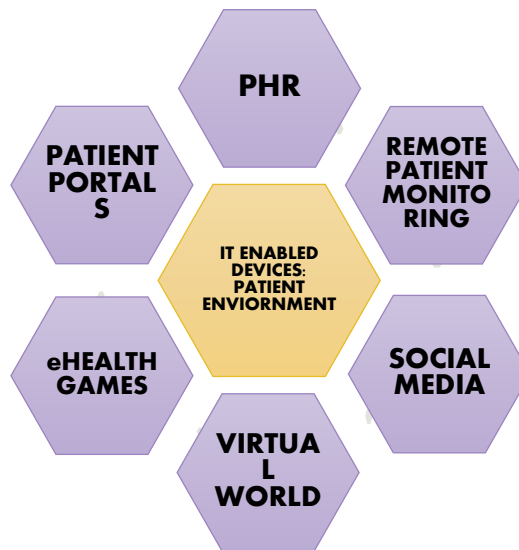


Figure 4.14: IT Enabled Devices: Patient Environment

- **Personal Health Records (PHR):**

Tang P.C. and Ash J.S. (2006) defined (24) PHR as, “A PHR is an electronic application in which patients can access, manage and share their health information, and that of others for whom they are authorized, in a private, secure and confidential environment”.

Pagliari, C., Detmer, D., & Singleton, P. (2007) suggested that with the help of a PHR, the patient can get more knowledge and insight in his progress, be more involved and gain more confidence and trust.

- **Remote Patient Monitoring:**

Remote patient monitoring includes utilization of innovation that fills in as a delegate amongst clinician and patient to empower remote clinical checking, assessment and administration. It is gainful for incessantly sick who have troublesome getting to wellbeing administrations on standard premise. Purpose of care checking gadgets, for example,

weight scales, glucometers, and circulatory strain meters might be utilized as independent gadgets to gather and report wellbeing information.

Remote patient advancements incorporate glucometers, utilization of computerized camera amid the visit to catch injuries and programming applications that dissect sensor inferred tolerant estimations in intense care settings and trigger activity, empowering upgraded observing capacities of various activity. The advantages incorporate early cautioning framework, mind integrator, scorekeeper, certainty manufacturer, limit developer and profitability enhancer.

- **Personal Communication devices:**

Accessible arrangements incorporate old phone framework, PDAs (versatile, remote individual specialized gadgets) and PDA (cell phone offering propelled abilities). Portable empowered stages have shown promising outcomes, for example, enhanced medicine adherence, wellbeing results, and decreased expenses.

- **Electronic Health Games:**

Accessible arrangements incorporate old phone framework, PDAs (versatile, remote individual specialized gadgets) and PDA (cell phone offering propelled abilities). Portable empowered stages have shown promising outcomes, for example, enhanced medicine adherence, wellbeing results, and decreased expenses..

- **Social Media:**

Online networking administrations interface patients with different patients and additionally to different partners. Interpersonal interaction is helpful for the constantly sick, to empower patients to discover others with comparative medicinal services needs and concerns. It enables groups of patients to associate and offer help to different patients and with their care suppliers, and team up with different clients. Electronic informal organizations use a different intends to encourage correspondence among patients and suppliers including dialog gatherings, informing, email, visit, video, and document sharing.(PHI 2010)

B. Communication between Patient and Provider

Remote monitoring services can be used to communicate between patient and provider. These provide a wide array of technologies like SMS, Health information Exchange, geographic information systems, data communication network, store and forward systems and interactive care communications.

- **SMS:**

SMS is a correspondence benefit institutionalized in portable interchanges permitting the trading of short instant messages between cell phone gadgets

- **Health Information Exchange:**

As per the national standards the movement of information electronically.

- **Data Communication Network:**

Accessible administrations go from the basic dial-up modem to cutting edge information data transmission administrations.

- **Store and Forward System:**

The gathering and capacity of clinical data or pictures carefully which is later sent for translation at once inaccessible from a direct clinical experience.

- **Interactive Care Communications:**

Community space that enables shoppers to counsel with specialists, medical attendants, and advisors by means of secure email; reestablish remedies; timetable and cross out arrangements; audit lab test comes about; view inoculation histories and get updates on preventive and unending consideration benefit needs, particular interminable wellbeing assets and confirmation based direction thus of analysis.(PHI 2010).

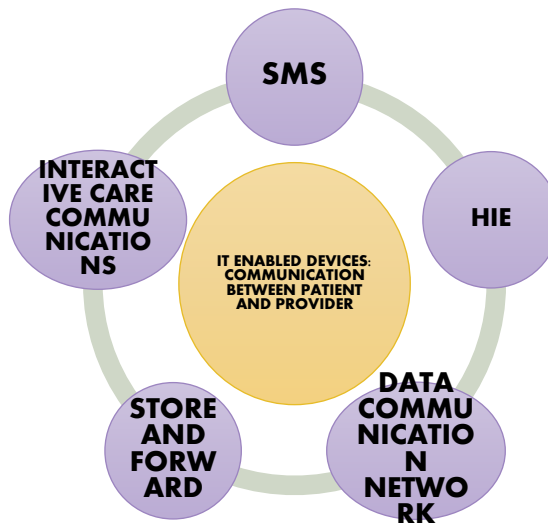


Figure 4.12: IT Enabled Devices: Communication between Patient and Provider

C. Provider Environment

Collaborative care solutions can be used in provider environment. These involves a wide array of technology like EHR, EMR, PHR, disease registries, e-prescribing and clinical decision support. They are described below:

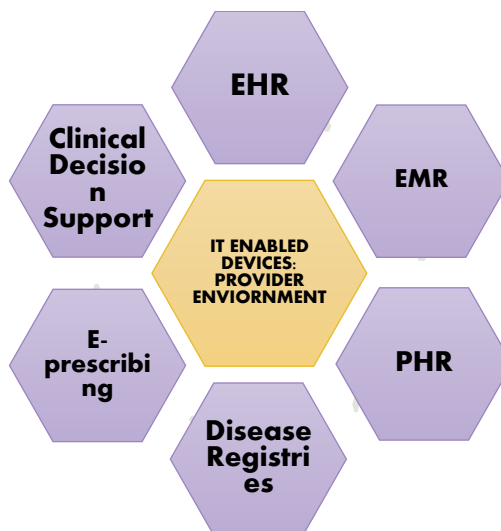


Figure 5.13: IT Enabled Devices: Provider Environment

- **EHR:**

An electronic health record is record of wellbeing related data on a person that can be made, overseen, and counseled by approved clinicians and staff crosswise over more than one human services association.

- **EMR:**

An electronic medical record is record of record of wellbeing related data on a person that can be made, assembled, overseen, and counseled by approved clinicians and staff inside one social insurance association.

- **Disease Registries:**

Doctor's facility and populace based interminable ailment administration frameworks that track and oversee illness..

4.1.9 Drivers of the Market

Those factors facilitating the current market growth are known as Market Drivers. The major drivers of preventive healthcare technologies are:

1. Favorable government policies for supporting healthcare information technology,
2. High demand of technological up gradation from healthcare sector,
3. Increasing social awareness about preventive health, and
4. Self-monitoring devices for patients suffering from chronic lifestyle diseases

Constructive government policies for development of technology market:

A global trend witnessed that most of the government of developed countries has reformed their healthcare policies and preference is given to strengthen preventive healthcare technologies market that would aid to lay off increasing burden of healthcare costs. The U.S. government spends about 16% of its GDP on healthcare which is more than any other country. Thus, governments are focusing more on preventive technology adoption than therapeutic services and technologies. The Affordable Care Act of 2010 passed by the U.S government aided to establish a National Prevention, Health Promotion, and Public Health Council that developed a prevention strategy for the healthcare sector. (Cited from 26)

4.1.10 Barriers in adoption of Information Technology in Chronic Disease Management

- **Proof of both return for money invested/business case and clinical results:** While a few advancements have possessed the capacity to show a return on initial capital

investment and enhanced clinical results, more noteworthy reception of these innovations will improve of execution to draw understanding.

- **Technologies still need ease of use and usefulness:** While many web, portable, and remote innovations are as of now accessible and these offerings have made awesome walks in usefulness and interface configuration, encourage changes in the advancements themselves will be an essential piece of future appropriation and arrangement. Keeping in mind the end goal to have the broadest interest conceivable to suppliers and in addition shoppers, advancements would profit by being more affordable, more dependable, more easy to use, and less demanding to consolidate into work process forms.
- **Lack of money related support:** Anderson J. (2010) finished up (27) that more than 80% of essential care doctors reviewed detailed the absence of budgetary support for IT applications as a noteworthy obstruction to reception.
- **Privacy Concerns:** Protection concerns are another hindrance impeding usage of IT since numerous EMR frameworks are Online, numerous doctors and patients expect that medicinal records may not be secure. This is much to a greater extent a worry when remote Web is utilized to transmit records to numerous areas.
- **Legal Boundaries:** Lawful obstructions to IT reception additionally exist in the U.S. Different laws identified with extortion and mishandle, antitrust, government salary impose, protected innovation, obligation and misbehavior and state permitting make an atmosphere of vulnerability for human services suppliers in executing IT. For instance, Rash M.C. (2005) expressed (30) that the doctor self-referral law and the counter kickback law show hindrances to healing facilities that might want to pay for electronic programming for subsidiary doctors.
- **Lack of trust in the framework:** Mill operator R. A. Also, Gardner R. M. (2005) portrayed (6)another noteworthy hindrance to the utilization of the intelligent buyer

wellbeing IT was the absence of trust of the data gave. Sudden messages or exhortation that negated a patient's ordeal made them question it and not take after the counsel. Frameworks that did not give a clarification to the prescribed activity are more averse to have the proposed conduct change impact on the clients of the framework. On the off chance that the framework's suggestion did not fit with the patient's impression of the circumstance, the patient was probably not going to agree to the exhortation. As a rule, if patients did not believe the innovation they improbable to utilize the framework or deal with their wellbeing as per the proposals. (Referred to from 33).

4.2 To assess the role of Mobile technology based Health Interventions delivered to Healthcare Consumers in Chronic Disease Management

4.2.1 M-health

In recent times, the advent of mobile technologies has allowed patients to access greater amount of information in order to guide decision making about health care. Sax Institute of Health Direct (2015) defined (34) mobile health as “the use of mobile telecommunication technologies for delivery of healthcare and in support of wellness”. According to WHO, m-health is an approach to public health and medical practice through mobile devices, such devices may be mobile phones, personal assisted devices, patient monitoring devices and other wireless services.

Liu C, Zhu Q, Holroyd KA & Seng (2011) described (38) that M-health service delivery requires a mobile device, a device operating system, a software platform and mobile applications that provides users with wireless network for information exchange and service provision.

Close to three quarters of world's population has access to mobile phone with increasingly powerful technical capabilities. (Cited from 38). In October 2014, the number of active mobile devices surpasses world's population: 7.22 billion devices (38, 39). Mobile device sales in US is projected to grow from 172 million in 2009 to 215 million in 2020, a 25% increase (39). The drivers for this growth are similar to other industries: rising consumerism, need for greater information, and increasing information dependence. Moreover, the tendency of people to carry phones everywhere, opens up opportunity for

continuous symptom monitoring and connecting patients with providers outside facilities. (Cited from 36)

Verma. S, et al. (2012) stated (40) that the healthcare industry is recognized as one of top three fields that are likely to propel mobile device growth for next five years.

4.2.2 History of Mobile devices



Figure 4.146: History of Smart Mobile Phones⁴²

4.2.3 M-health Market Shares

There are five chief platform providers of operating systems currently in market- Apple with iOS, Google with Android, RIM with Blackberry OS, and Microsoft with OS group Windows mobile and Nokia with Symbian OS. The largest provision of applications is by iOS by Apple. The global market share of smart phone distribution with respect to healthcare applications are between Android and iOS (Cited from 41). Mobile health technology opens the opportunity to addresses the persistent challenge of decreasing social disparity to improve health service delivery, access to health care, and provide continuous and ongoing care.

4.2.4 M-health Market Segmentation

The market service component of IT-enabled healthcare market is broadly classified into telehealth and m-health based on communication model used in deployment of services and their applications. Tele-health services include various long-distance healthcare services used by organizations, healthcare practitioners and patients. According to Transparency

Market Research (2012), “M-health interventions include applications related to wellness, monitoring services, diagnostic services, prevention services, treatment services and information and references”. (Cited from 44)

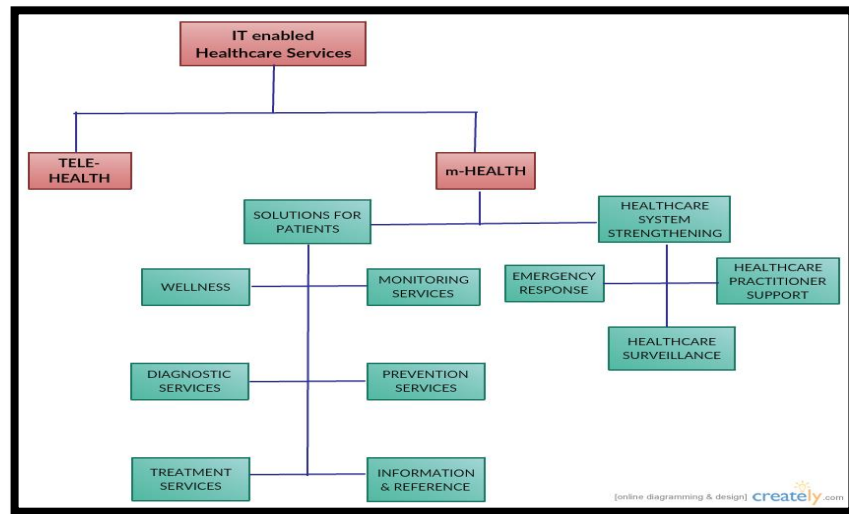


Figure 4.15: m-Health Market Segmentation

More precisely, the solutions for patients includes remote monitoring and treatment provisions that support access of medical care services, for example connecting a rural patient with a specialist in urban hospital. The preventive services, emergency response and healthcare surveillance includes mainly covers emergency response systems such as one-touch calling, location-tracing, and fall-prevention. Information sharing platforms or apps are comprised the themes of information and self-help. M-Health services contribute to sustainable development by providing healthcare to underserved citizens; promoting the effectiveness of communication; assisting public health programs and research; allocating resources reasonably; enhancing treatment compliance rehabilitating and monitoring chronic disease; and supporting clients live at home.

4.2.5 Mobile Tools used in Chronic Disease Management

The mobile tools used in Chronic Disease Management can be divided into four categories: SMS, phone plus software or application, phone plus specific instrument (medical device connected to phone), wireless or Bluetooth compatible device.

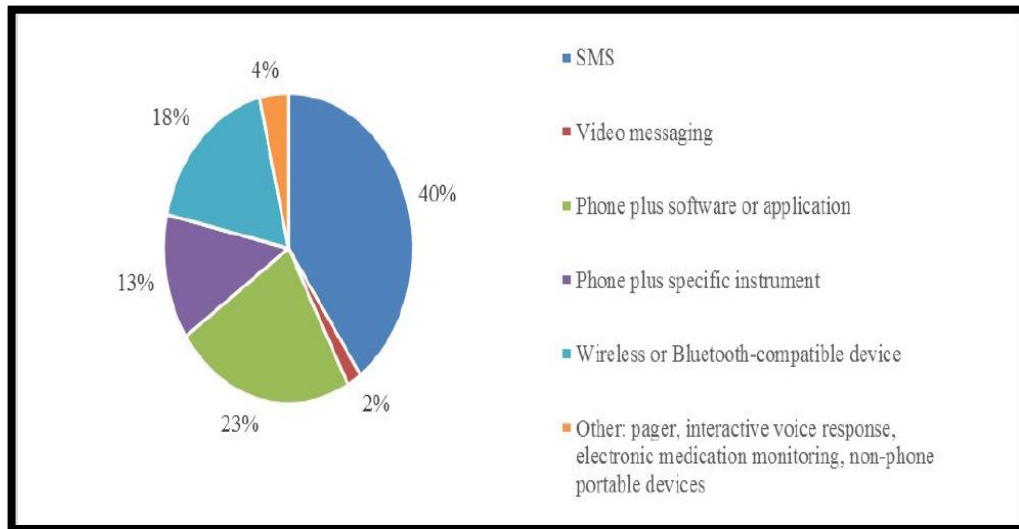


Figure 4.16: Mobile Tools used in Chronic Disease management

A. SMS

Short Message Administration or SMS have turned out to be a mainstream way to deal with achieve customers on substantial scale. (Referred to from 33) SMS mediations require minimum refined equipment and can be utilized to transmit data to patients on their cellphones. As indicated by WHO (2011) Patient-supplier correspondence, information accumulation and trade on sickness particular estimations and solution updates and in addition understanding training and inspiration are encouraged through SMS (Referred to from 35). Utilization of SMS updates for pharmaceutical admission with and without ongoing observing indicated huge upgrades in patient adherence rates. Hymn (2014) finished up (43) that content informing custom fitted to check negative convictions about asthma. SMS notices have been demonstrated powerful in expanding adherence to pharmaceutical after heart occasion. Lv Y, Zhao H, Liang Z, Dong H, Liu L, Zhang D, et al. (2012) said (45) that the utilization of electronic rankle pack with SMS correspondence enhanced adherence to DM (Diabetes Mellitus) prescription just and not to different sorts of medicine.

Therefore, SMS can be made accessible modestly on any cell phone, can be mechanized, customized and effortlessly incorporated into existing wellbeing frameworks. Be that as it may, SMS is very administrator subordinate, depending on dynamic engagement of patients and suppliers to screen side effects and trade data.

A portion of the SMS application utilized worldwide are:

- **AirTEXT:** airTEXT is a UK-based initiative that is intended to give text-based notifications on poor quality. airTEXT means to empower patients' self-oversee side effects and diminish introduction, to lessen intense effects of air contamination, and enhance tolerant nature of life.(PHI 2010)
- **CADA Project, China:** The CADA Extend permits elderly populace with diabetes in rustic and urban China to self-deal with their condition utilizing of advanced cells. Brath H (2010) expressed (46) that the telephone will send messages with recommendations identified with physical movement, blood glucose observing, pulse checking, weight estimation, and dietary patterns.
- **mDiabetes, India:** A non-benefit association called Arogya World has collaborated with Nokia to make mindfulness for diabetes and energize more advantageous practices that can keep an expected 50,000 people in India. In one year, the program selected one million people and has sent more than 45 million instant messages free of cost. The substance of the messages were produced for social significance and converted into 12 dialects.
- **Text Messaging for Health, South Africa:** Created for low-salary ladies with sort 2 diabetes to self-deal with their conditions, a content informing program use systems of ladies who bolster each other in overseeing NCDs.

B. Phone plus software or application:

Mobile phones now offer platform that assist the delivery of variety of health services to number of users. Specialized software or applications including patient portals, management systems and other communication platforms require a smart phone. Cell phone applications have demonstrated promising consequences for chronic disease management.

The rapid growing componenet of mHealth are Downloadable healthcare apps. Significant growth in the market estimates revenues from downloads, advertising and direct sales. An average of 25000 apps are available across multiple operating platforms. Verma S. et.al (2012) projected (41) that 70% of apps target consumer wellness and fitness segments. 30%

of apps target health professionals, facilitating access to patient data, patient consultation, diagnostic imaging and monitoring.

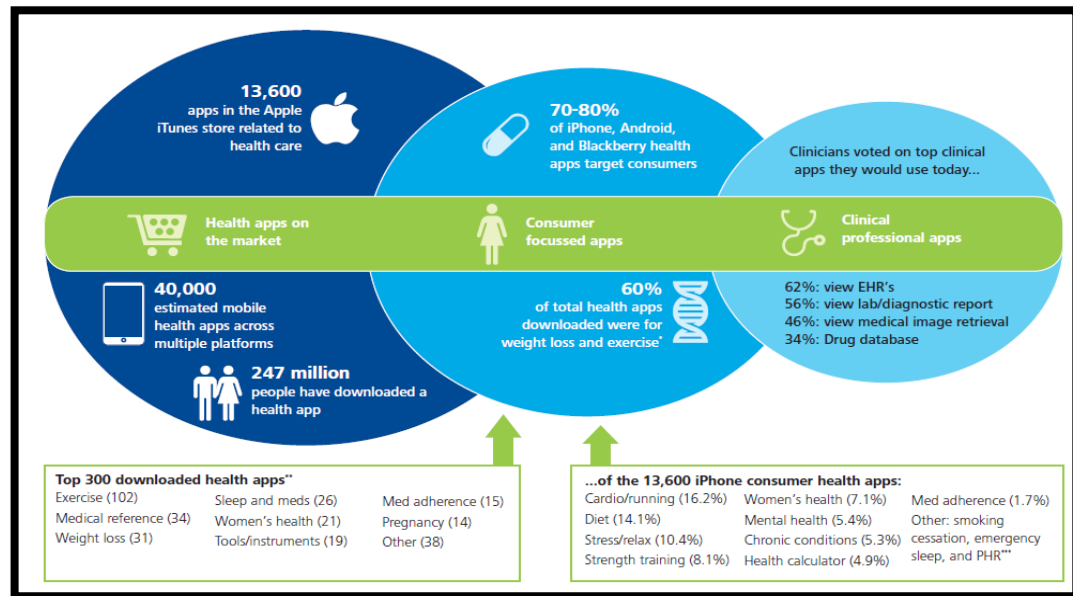


Figure 4.77: “There is an app for that....”

C. Phone plus Specific Instrument

Remote patient observing includes phones with particular instrument. Remote patient checking (RPM) is a particular innovation stage application advancement that encourages information accumulation and transmission to enhance constant ailment mind coordination forms, decrease superfluous asset usage, and enhance mind results. Advances give informing, observing and estimation, and intelligent interchanges capacities, remote discussion, early finding, infection treatment, and persistent checking and appraisal applications. Point-of-care (e.g., home) checking gadgets, for example, weight scales, glucometers, and circulatory strain screens, might be utilized to gather and report wellbeing information, or they may turn out to be a piece of a completely joined wellbeing information accumulation, investigation, and announcing framework that conveys to different hubs of the wellbeing framework and gives cautions when wellbeing conditions decay. As indicated by market wire (2012) after incorporates a few cases of remote patient administration advancements (Referred to from 49):

- A glucometer with a telephone/modem association with transfer understanding blood glucose readings from a locally established setting to a medical attendant/essential care supplier (checking).
- Programming applications that dissect sensor-inferred tolerant wellbeing estimations in intense care settings and trigger activity, empowering improved observing capacities of various patients (dynamic patient checking/choice support in intense care).

D. Wireless or Bluetooth compatible Device

Wearable devices are wireless or Bluetooth compatible devices available in the market. A wearable is any scientific device that the user uses to track their behaviors or to measure or monitor the physiological and biomechanical systems of their body. It must contain advanced circuitry, wireless connectivity and at least minimal level of independent processing capability. The key market drivers for wearable technology include rising average life expectancy, increased prevalence of chronic diseases, larger proportion of patients requiring long term care and a need to decrease hospital care

Many wearable devices are wireless and this, coupled with the small size of many of the sensors used, makes them integrated into wearable systems. Sensors have been integrated into garments, wristbands, socks, shoes, hats, eyeglasses and other devices such as wristwatches and headphones making them truly wearable.

The applications of wearable technology in chronic disease management include personal health and fitness management and management of disease within healthcare.

1. Personal Health and Fitness management

Personal health and fitness are vast areas for wearables, with heart rate monitors, exercise trackers, and step counters being popular items to measure and potentially improve an individual's lifestyle choices.

- **Activity monitors:** Activity trackers are the major devices used in personal health and fitness management. One in ten US adults now own an activity tracker. Popular activity trackers in the market include Fitbit, Nike's Fuelband, Pebble+ activity tracker, and Jawbone. Fitbit is the market leaders in this domain with recent data showing that Fitbit devices accounted for nearly 50% of the world's 2.7 million wearable band shipments in the first quarter of 2014 (Cited from 51,52). Nike's

Fuelband is a wrist-worn activity tracker that allows the wearer to track their physical activity, steps taken daily, and amount of calories expended. Jawbone's latest wristband tracker UP24, is designed to wirelessly track steps, sleep, and calories. The device syncs with iPhones and Android phones.

- **GPS Monitoring:**GPS monitors are used in both recreational and competitive sports to deliver performance information to the user. Garmin, the biggest providers of GPS navigation devices, have also developed a number of fitness-focused watches and bands that are used by both elite athletes and recreational sports people. Garmin's Forerunner watches measures distance, speed, time, altitude, and pace using GPS with some models also measuring heart rate.
- **Other devices:** Beside from devices that track activity there are a number of other wearable devices that have the potential to change how consumers view their personal health. The PosturePulse is one such example. It is a sensor-laden belt worn around the waist that monitors the position of the spine and vibrates whenever the person is in an improper posture for more than seven seconds (52).Lumo Back is a similar device, which can measure metrics such as posture, the number of steps taken and the amount of time spent sitting or sleeping (53). The BioMan t-shirt from AIQ Smart Clothing is another consumer product for health and fitness management. The BioMan t-shirt has "smart sleeves" that measure the user's heart rate, respiration rate and skin temperature (54).

2. **Wearable Technology in Prevention, Diagnosis and Management of disease**

Early wearable gadgets had concentrated on the wellness business however current years have seen various advancements in the human services area. Advancements have demonstrated the business potential that wearable innovations need to reform medicinal services. Sensors are produced to gauge everything from hydration, heart rate, glucose levels, circulatory strain, and breath, to rest. Observing of these factors utilizing wearable sensors could help in the avoidance, determination, and administration of sicknesses and conditions, for example, hypertension, coronary illness, and asthma. Different advances utilized as a part of counteractive action, analysis and administration are:

- **FabUlyzer:** Wearable breathalyzer that the user breathes into, to inform them how much fat was burned during exercise. Data gets stored in the cloud and is viewable via the web or connected apps.
- **Propellar Health for respiratory conditions:** An inhaler with an in-built sensor that helps individuals with respiratory conditions such as asthma or COPD understand and manages their condition. It monitors medication use with a record of the time, and can be used with both rescue and controller medications for tracking symptoms and adherence. The Propeller sensor wirelessly syncs with a smart phone via Bluetooth to deliver feedback to the user to help them better understand and manage their condition.

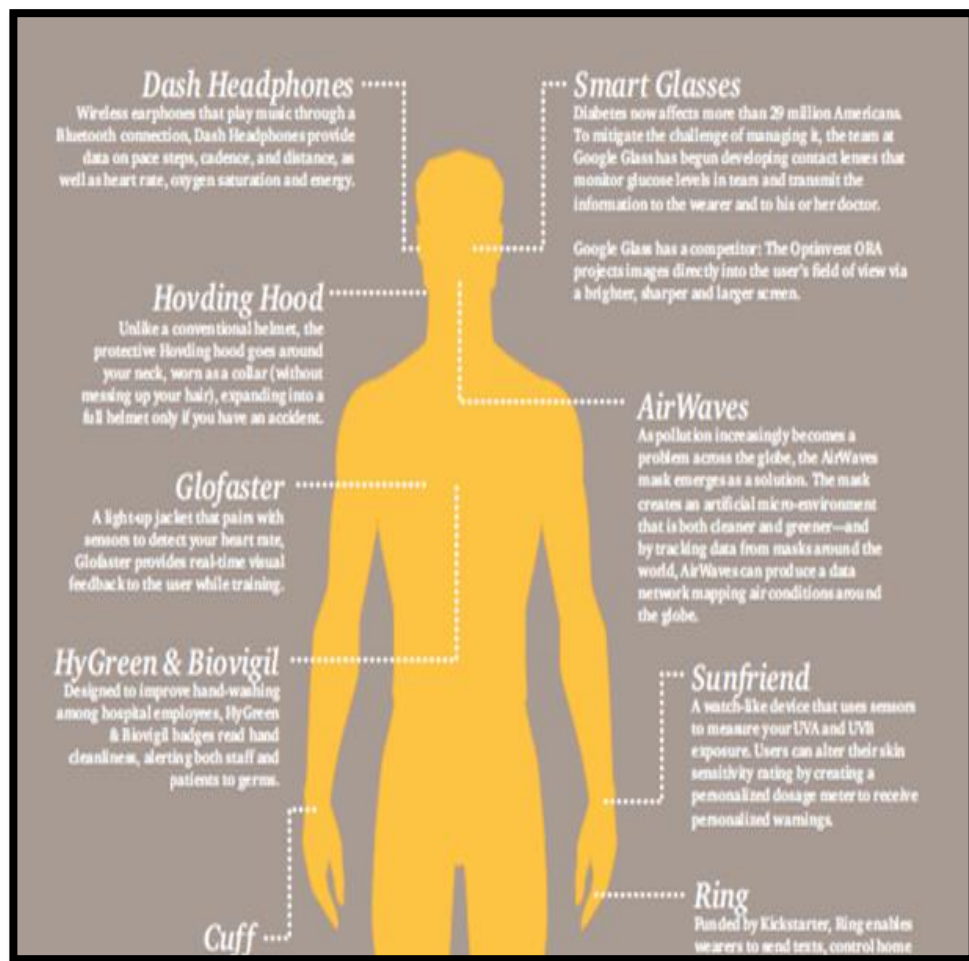


Figure 4.188: Wearable Devices can be worn: ALMOST EVERYWHERE

4.3 To explore the Extent to which Future Technologies could play a role in Development of an Effective and Affordable Healthcare.

Healthcare changes significantly due to mechanical advancements, from anti-toxins to sedatives to attractive reverberation imaging scanners and radiotherapy. Arthur C. Clarke, the futurist and sci-fi author, said that any adequately propelled innovation is unclear from enchantment. Maybe the primary contrast out of the nineteenth century is they are certain it's enchantment, while we have quit considering it, and simply underestimate it. Time travel fiction begins to dive into interesting issues we may regularly abstain from pondering. Shouldn't something be said about improved people? Shouldn't something be said about organ reaping? Shouldn't something be said about end of anti-microbials? Will robots assume control?. What appears sci-fi to us today will be standard in future.

When we recount great stories, we get into them, however there is not one tale about future. Everything without exception is conceivable, and we require heaps of stories to investigate great and terrible and uninterested decisions. Also, the future will too have another future. There is not one future, but rather numerous. There are no agreeable arrangements, as there will dependably be new things to attempt and investigate. This week it is Cloud or characteristic dialect handling, however before we get hand of it, some individual will have developed something that takes care of more issues and sounds similarly alluring.

Therefore, the story is that the future will be better. Innovation will progress and there will dependably be new and energizing arrangements. Today we have mechanical surgery, and things can just improve. We have choice guides to enhance conclusion, and they will just show signs of improvement. A few people would indicate the fundamental drivers: innovation is getting quicker, better and littler. Moore's Law expresses that the speed of advancement is quickening. The basic story is we will simply appreciate the ride. Be that as it may, the more intricate story uncovered exchange offs. For instance, new PCs are for sure considerably speedier, however to exploit them we have needed to discard the moderate PCs so they can be supplanted. Truth be told, we are in a constant battle to stay aware of advancements – it costs a great deal, and a considerable

The world live in the anticipation of flashy future that awaits us. They expect today's tech gimmicks to find place in future with virtual reality, wearables and even space explorations

promising to go mainstream. People such as Elon Musk, Tim Cook and Mark Zuckerberg are changing the world than we anticipated. Technologies for chronic disease management and prevention have already come into action but as technology is ever changing, one cannot predict what is coming in the future.

Some of the technologies which can come in next ten years are as follows:

4.3.1 Intelligent Biomedical Clothing

Intelligent Biomedical Clothing (IBC) is useful for those anguish from perpetual way of life maladies, high hazard patients and elderly populace. Shrewd sensor framework and new ways to deal with break down and translate information joined with financially savvy approach can viably change interface amongst patient and social insurance supplier. IBC can possibly be key empowering influence innovation for financially savvy sickness administration, restoration, illness anticipation and general way of life administration.



Figure 4.19: Intelligent Biomedical Clothing

Potential Benefits of Intelligent Biomedical Clothing:

IBC has the potential for ceaseless estimation, preparing of physiological and physical parameters from patients to specialist organizations and patients. The outline and mix of various types of sensors, and in addition the suitable calculations to prepare the information could offer new potential for checking and anticipating wellbeing dangers (e.g.,

cardiovascular infections). IBC can screen body kinematics and break down stance with significant applications for ergonomic, virtual reality, recovery and treatment development.

The utilization of IBC can diminish frequency rates by

1. Predicting intense occasions by long haul slant investigation.
2. Providing moment analysis of intense occasion and connections to social insurance supplier framework
3. Reducing an opportunity to give intercession.

Diabetes could be overseen by opportune guidance in view of educated choices, if accessible, non-intrusive observing and insulin conveyance frameworks. The persistent blood glucose checking remains a test. Best in class glucose sensors and in addition scaled down implantable insulin conveyance gadgets have been created in model level. Additionally, scaling down and on-line basic leadership frameworks are a work in progress.

A few constant ailments require pharmaceutical over a timeframe. The capacity of the client to take the pharmaceutical on time is a noteworthy issue prompting solution blunders. IBC can possibly bolster auspicious conveyance of solution (through canny microsystem fixes or utilizing miniaturized scale pumps), screen the conveyance and its belongings and also input imperative parameters to the therapeutic specialist co-ops. New methodologies must be created to dissect and translate the medicinal information so as to accomplish a dependable finding and proper treatment, and, savvy wearable with wellbeing checking offices, intended for day by day utilize.

5. Discussion

From the prior literature, it has been found that there is a global epidemic of chronic diseases, and complications thereof, with no signs of abatement. The cost of healthcare is increasing tremendously due to need for treating chronic complications of NCDs including cardiovascular diseases. Healthcare systems in developing countries are rapidly approaching a crisis point, due to ageing population, increase in number of chronic disease patients and dwindling pool of healthcare professionals. An integrated framework of managing these chronic lifestyle diseases have been identified i.e. Chronic Care Model (CCM).

The science of chronic disease management is continuously evolving. The market is continuously growing with the purpose of improving chronic disease management handling. The major drivers of the market include favorable government policies, demand of technological up gradation, increasing social awareness and need of self-monitoring devices for patients suffering from chronic diseases.

Healthcare is changing dramatically because of technological developments. From the past decade, there has been a significant development in technologies related to management of chronic diseases.. These challenges are faced by patients, providers and also during communication between patient and provider.

Information technology can assist patients using PHR, social media, virtual world, eHealth games and patient portals. For providers, it can help using EHR, EMR, PHR, e-prescribing and disease registries. Moreover, information technology can improve communication between patient and provider using SMS, HIE, Store and forward and interactive communication. SMS has been found to be most effective means of communication between patient and provider.

Porter's Five force Analysis:

The analysis of Health Information Technology Market on the basis of Porter's five force Model is done.

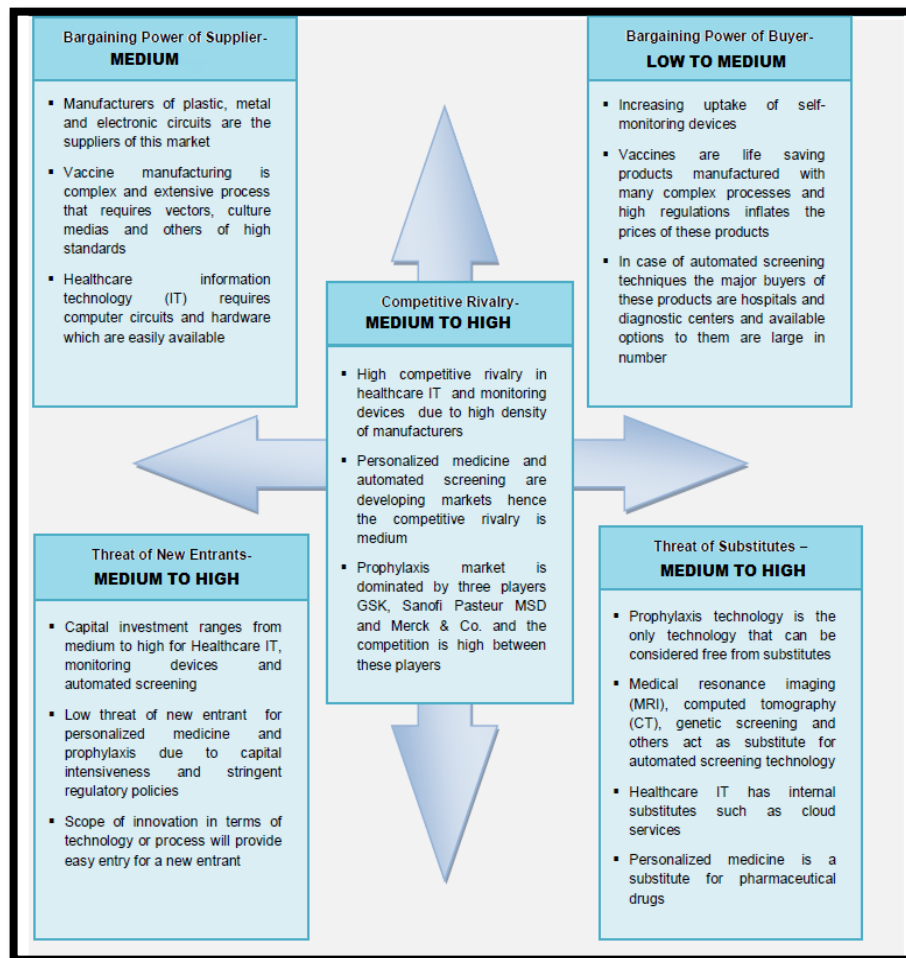


Figure 5.1:Porter's Five Force Analysis

Despite of having advantages, there are various barriers associated with adoption of information technology. The barriers can be divided into system level and individual level barriers. System level barriers can be further divided into technical and health care barriers. Technical barriers refers to usability, workflow issues and data security. Healthcare system barriers include reimbursement systems and incompatibility between patient applications and healthcare systems. The individual barriers refers to clinician or patient.

The table shows the barriers associated with adoption of Information Technology in Healthcare in improving chronic disease management, barrier types and solutions to address those barriers:

Barriers	Barrier Type	Solutions
Proof of both ROI/business case and clinical outcomes	System Level Barrier(Healthcare)	- Financial Incentives. - Conducting feasibility studies that shows benefit versus costs of implementing.
Technologies still lack usability and functionality	System Level Barrier(Technical)	- Sometimes it is important for hospitals to redesign their medical and administrative workflow to match with EMRs specifications. This adaptation is important for the successful implementation. - Less complicated system with system's interface design more reliable and convenient to use. - Using data standards is an essential step in validating data on the systems and consequently important for the quality, accuracy and reliability of such source.
Lack of financial support	System Level Barrier(Healthcare)	- Allocating the proper funding and enough capitals investments while preparing annual budgets for the hospital. - Conducting feasibility studies that shows benefit versus costs of implementing.
Privacy Concerns	System Level Barrier(Technical)	- Certifications of vendors' applications. - Users should be educated, trained and committed.
Legal Barriers	System Level Barrier(Technical)	Ministry of health should start developing rules and regulations

Lack of trust in the system	Individual Level Barrier	• Certifications of vendors' applications.

Moreover, Venturing into the 21st century, versatile correspondence have been connected to differing areas of medicinal services framework. This is credited by the advances in versatile innovations, the nonstop scope of portable systems and the regularly rising open door for incorporating portable idea with existing administrations (WHO, 2011). Versatile advancements are highlighted as inescapable, compact, prompt, and helpful that settles on them as a perfect decision of new medicinal services approach. Open doors for new mHealth applications, substance, items, and administrations are developing day by day. New fields of attempt incorporate exceedingly customized medicinal services, populace wellbeing, diagnostics, and usage administration, focusing on particular populaces for general wellbeing efforts, and overseeing irresistible ailments and worldwide plagues.

SWOT Analysis of mHealth

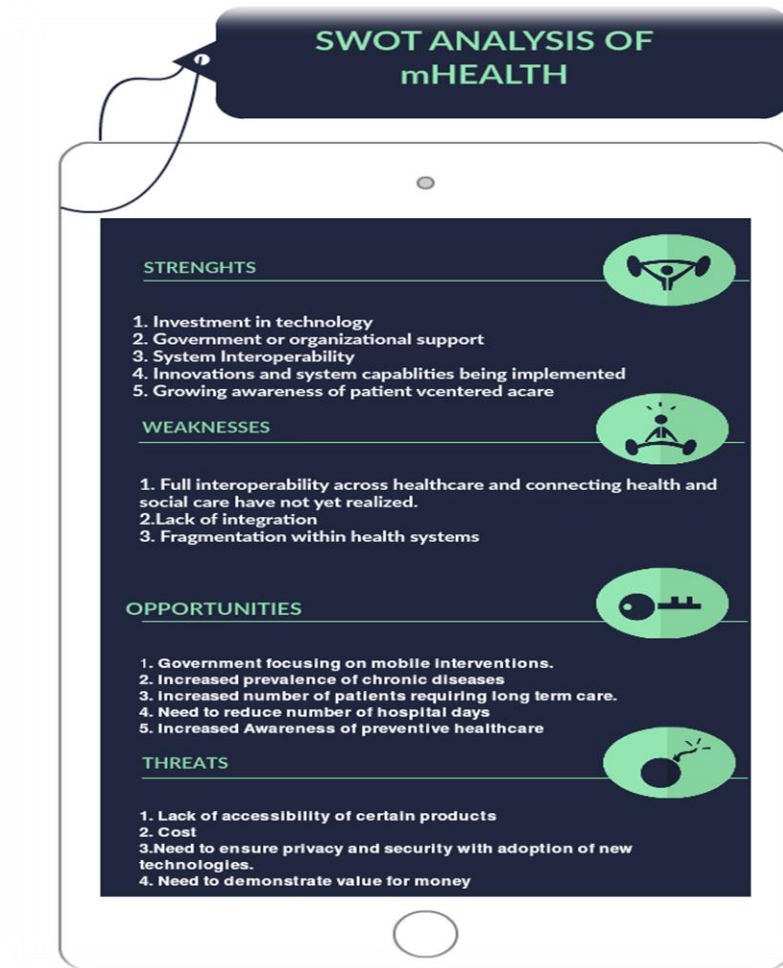


Figure 5.2: SWOT mHEALTH

Future technological innovation will change medicinal services, yet while advances (new medications and medications, new gadgets, new web-based social networking support for medicinal services) will drive development, human elements will stay one of the steady impediments of achievements. New types of administration of incessant illness are under development. These adventure cell and informal organizations, investigate a lot of information, and highlight genomic sequencing. The entry of IT into medical treatment is inevitable. In the coming decade, the technologies which will empower the management of chronic diseases are intelligent biomedical clothing, eSkin digital tattoos, tooth embedded sensors, my UV patch, COPD testing devices and digital contact lens.

4.6 Results

Objective 1: The major drivers of the market include favorable government policies, demand of technological up gradation, increasing social awareness and need of self-monitoring devices for patients suffering from chronic diseases.

Information technology can assist patients using PHR, social media, virtual world, eHealth games and patient portals. For providers, it can help using EHR, EMR, PHR, e-prescribing and disease registries. Moreover, information technology can improve communication between patient and provider using SMS, HIE, Store and forward and interactive communication. SMS has been found to be most effective means of communication between patient and provider.

The major barriers for adoption of IT in healthcare are lack of patient self actualization, technology still lack usability and functionality, privacy concerns, lack of trust in the system, legal barriers and lack of financial support.

Objective 2: Mobile technologies are featured as pervasive, portable, immediate, and convenient that makes them as an ideal choice of new healthcare approach. New fields of attempt incorporate exceptionally customized social insurance, populace wellbeing, diagnostics, and usage administration, focusing on particular populaces for general wellbeing efforts, and overseeing irresistible infections and worldwide pestilences.

Objective 3: The entry of IT into medical treatment is inevitable. In the coming decade, the technologies which will empower the management of chronic diseases are intelligent biomedical clothing, eSkin digital tattoos, tooth embedded sensors, my UV patch, COPD testing devices and digital contact lens.

4.7 Conclusion

Based on the above discussion, I would like to conclude that, Healthcare Information Technology is reforming healthcare by becoming mainstream tools to assist patients in

management, monitoring and decision making, driving a shift towards personal adoption of digital and web based tools. New media and technology will allow patients with chronic diseases to access health information, get online support and engage health professionals for disease management support anywhere and everywhere. The evolution of e-health and mobile tools and use of social networking have led to opportunities to achieve better clinical outcomes. These interactive, technologically mediated interventions can engage, empower and revolutionize chronic disease care in the coming decade.

Thus, Information technology can create phenomenal impact in managing chronic diseases by not only treating patients but by creating healthier and happy individuals. A revolutionizing change will be seen in the coming decade with effective use of participatory technologies and imbibing these technologies in the lifestyles of individuals.