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16 July 2016

Online at <https://mpra.ub.uni-muenchen.de/82959/>

MPRA Paper No. 82959, posted 29 Nov 2017 05:37 UTC

# An Analysis of Knowledge Management for the Development of Global Health

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## Abstract

Recently knowledge management (KM) has become very important part of the everyday work in healthcare practices. The KM transforms a health organization into a learning organization able to generate new knowledge, create knowledge systems and base organizational actions on knowledge in healthcare. It makes the close and long-term relationship among healthcare providers and patients to create a greater mutual understanding, trust, and patient involvement in decision making. The paper discusses telemedicine, information technology, efficient nursing system, medical errors and reduction of these errors, healthcare cooperation among different healthcare providers in healthcare systems. It briefly discusses healthcare strategy in four developed and developing countries. This paper investigates the creation, sharing, storing and utilization of knowledge in medical science. The aim of this study is to apply the concept of KM and to investigate the use of KM to the health sector. An attempt has been taken here to discuss overview of KM, its methods and techniques, and applications of efficient KM in health sector.

**Keywords:** Knowledge, Knowledge Management, Healthcare, Health Information, Health Organizations, Healthcare Cost, Nursing, Medical Errors

## 1. Introductions

Knowledge in healthcare is growing exponentially. In the 21<sup>st</sup> century knowledge management (KM) becomes an established discipline in many sectors, but its adoption in healthcare is limited. To provide quality of care in health efficient KM is necessary in health sector. At present KM in health sector is helping in reducing medical errors, also sharing of knowledge is saving more human lives. So that, healthcare professionals can take better decisions and hence can improve the quality of the healthcare industry.

The healthcare system is one of the most complex systems that we encounter in the society [157]. Healthcare is a multidisciplinary environment in which decisions are made by teams of physicians, specialists, pathologists, nurses, radiologic technology technicians, lab technicians, social workers, respiratory therapists, psychologists, counselors, pharmacists and other medical professionals [168]. Healthcare industry consists of hospitals, clinics, clinic administrators, managers in finance, drug companies, human resources, healthcare ministry, healthcare insurance companies, activists groups, education organizations, research communities, etc.

The main rise of healthcare cost is the surge in chronic diseases. Global chronic diseases related deaths were estimated to be 35 million out of 58 million annual global deaths in 2005. The number of people that die annually from cardiovascular diseases is almost twice the number of people

who die from all infectious diseases combined [191].

Knowledge Management (KM) is defined by World Health Organization (WHO) as “*A set of principles, tools and practices that enable people to create knowledge, and to share, translate and apply what they know to create value and improve effectiveness*” [189].

Healthcare depends on KM more than any other organizations due to the overwhelming concern for patient welfare [174].

Medical science is a rich area of knowledge but the depth of this knowledge is not used to satisfy the patient's needs [3]. Clinical training is an essential component of the educational programs in medicine [104]. Clinical decision support systems are available in the form of up-dated e-books which can be used easily for restoring information [122]. Experienced physicians use about two million pieces of information to manage their patients. So that medicine can be considered as a knowledge-based business [161].

Healthcare service organizations can provide high quality, high value cost-effective medical care by using technology and its related strategies [106]. Medical records and history such as, medical treatment received, medicine consumption history, family illness history, genetic, medical imaging, X-ray, etc. are necessary both for doctors and patients in treatment procedures [8].

In health sector, the transfer of environmental knowledge occurs through observing, listening, questioning, sharing ideas, recommending, identifying guidelines and adapting

behavioral patterns [27]. In the healthcare referral services, it is important that effective and rich professional communication and knowledge sharing with each other increases the performance to look after the patients efficiently [126].

Healthcare organizations are knowledge intensive organizations [67]. In hospitals and other medical centers try to use their experts' knowledge not only for their patients, but also among their employees to create an integrated knowledge network that benefits all the members [101].

The healthcare system is one of the most complex systems that we face daily in the society [157]. The complexity of the healthcare sector is a great challenge for the adoption of KM systems in healthcare [20]. A typical healthcare provider needs to know about 10,000 different diseases and syndromes, 3,000 medications and 1,100 laboratory tests [48].

Despite many attempts for the development of healthcare, it seems a special challenge at present to the use of KM such as, system complexity, impact of medical errors, substantial growth of knowledge in the medical field, and an increased healthcare cost.

## 2. Literature Review

B. Ghosh and J. E. Scott [73] indicated that the effectiveness of KM systems in healthcare delivery, as measured by impact on both organizational level and patient care benefits, is dependent on the levels of KM infrastructure (structure, technology) and KM process (acquisition, conversion, application, protection) capability.

Zhou et al. [196] indicate that knowledge sharing barriers in Chinese healthcare referral services. They identified thirteen such barriers and stressed on increasing of knowledge sharing practice in Chinese hospitals.

Oluwale Adekanmbi and Paul Green confirm that the success of a healthcare system depends on three essential processes: i) collection and analysis of data, ii) continuous exchange of billing, clinical information, and iii) utilization of the information [5].

Atif R. Butt in a review article expressed that 4.2 million (17%) of adult Canadians believed that a medical error occurred when they received healthcare services in the previous two years [30]. In a study at Harvard University R. Gavande stated that engineers are specializing in human factors and health systems are needed to reduce medical errors [71].

Jon-Arild Johannessen and Tom Karp confirm that nurses constitute the largest group of knowledge workers in Norwegian hospitals to provide proper and efficient healthcare services to the patients and they believe that the importance of the activities of nurses are same globally [100]. Several recent studies on KM applied to nurses have emphasized the knowledge infrastructure, the importance of technology and culture [74], the importance of measuring and reporting knowledge [125],

and the importance of having knowledge strategies [166].

J. Gabbay and A. Le May have found that communities of practices (CoPs) provide a new pathway to sharing clinical evidence and new knowledge between the various different specialized healthcare professionals (physicians, nurses, technicians, pharmacists, etc.) that are members [69].

Bergman et al. [24] identified the five main processes in a healthcare system are as: i) diagnosing diseases, ii) detecting health problems, iii) treating diseases, iv) keeping healthy, and v) providing for a good end of life.

## 3. Objectives of the Study

The objective of the study is to express KM techniques in health sector. The intention of the research approach is to discuss:

- Importance of IT healthcare.
- Healthcare strategy in four countries.
- Sharing of knowledge in healthcare.
- Medical errors, healthcare cost and reduction of them for the welfare of the patients.

## 4. Methodology of the Study

Methodology of the study is the systematic procedure that maps out the processes, approaches, techniques, research procedures and instruments [111]. This article is prepared giving priority on the secondary data. We have used websites, books, previous published articles, case studies and various research reports to prepare the paper. In this study we have stressed on healthcare for the welfare of the humanities. We have included healthcare policies of four countries to analyze the global situation of healthcare.

## 5. KM Strategy in Healthcare

Knowledge management (KM) has been defined as the process designed to help organizations create, capture, analyze, apply, and reuse knowledge to achieve competitive advantage [186]. KM in healthcare is to discover, develop, utilize, deliver, and absorb knowledge inside and outside the hospitals through an appropriate management process to meet current and future needs of the patients [160].

Healthcare faces special challenges in KM such as, insufficient knowledge in the medical field, system complexity, impact of medical errors, and an increased healthcare cost. KM supports healthcare workers in using available knowledge to improve the performance in the treatment and reduction of cost.

KM techniques in a healthcare system are optimization of information by processing data and technology, collaboration of experience and expertise to achieve organizational optimal growth and performance [7]. The quality of healthcare can be enhanced by finding, sharing, collaborating, and developing clinicians' KM techniques

[158].

To use KM it is important to reveal the knowledge creation and transfer, knowledge needs, health professional roles, information seeking behavior, knowledge organization, and knowledge sharing behavior. The aim in KM is to transform a health organization into a learning organization able to generate new knowledge, create knowledge systems and base organizational actions on knowledge [60, 131].

### 5.1. Patient Service in Healthcare

Patient service is a philosophy and a business strategy, supported by a technology platform, business rules, processes, and social characteristics, designed to engage the patient in a collaborative conversation in order to provide mutually beneficial value in a trusted and transparent business environment [79]. The KM in healthcare is how to manage the close and long-term relationship among healthcare providers and patients to create a greater mutual understanding, trust, and patient involvement in decision making, which may help to improve patients' health and health-related quality life and more effective in chronic disease management [15, 165].

For efficient patient service we can use Web technology to extend services beyond its traditional practices, which provides a competitive advantage environment for a healthcare provider to achieve a complex patient care goal [194]. This network creates multi-ways communications and sharing of experience and knowledge among patients and healthcare providers [38].

Patient service can be developed by updating personal data, preference services, transaction, payment/billing data, activities, personal health promotion and education, email, appointment, friend in networks, forums, chatting, etc. These activities can improve patients' referral treatment with satisfaction [8].

To deliver quality healthcare we should deal with following six areas [192]:

*Effectiveness:* It is achieved by delivering healthcare which is adherent to an evidence based. The results must be in improved health outcomes for individuals and communities.

*Efficiency:* It is gained by delivering healthcare in a manner which maximizes resource use and avoids waste.

*Accessibility:* It is the process of delivering healthcare timely, geographically reasonable, and provided in a setting where skills and resources are appropriate to medical need.

*Acceptability:* It is a healthcare system which takes into account the preferences and aspirations of individual service users and the cultures of their communities.

*Equitability:* It is a system of delivering healthcare which does not vary in quality because of personal characteristics such as gender, race, ethnicity, geographical location, or socioeconomic status.

*Safety:* It indicates the delivery of healthcare which

minimizes risks and harm to patients.

### 5.2. Information in the Healthcare

In the 21<sup>st</sup> century, one of the most important powers in the world is information. Information flow is also a vital part for the planning any process in healthcare. Information in the healthcare management consists of implementation, maintenance, and development systems of the effective and efficient patient health information for production, storage, retrieval and dissemination [108].

The information in the healthcare is any information, verbal or registered in any form or in any environment, created or received by a supplier of health services (e.g., medical offices, hospitals, polyclinics), by medical staffs (e.g., physicians, nurses, auxiliary staffs), by public health authorities (e.g., Ministry of Health, Department of Public Health), by institutions of health insurance (e.g., National House of Health Insurances), schools, universities or centers of medical assistance which are related to the past, the present or the future of the health condition of any individual, with the supply of the medical service of a person or with its past, present or future payment [188].

The use of information technology (IT) decreases healthcare cost in electronic health record, e-home care, telemedicine, tele-radiology, tele-dermatology, e-public healthcare, etc. Physicians, nurses and other healthcare providers need to treat a patient's medical information properly [139].

### 5.3. Telemedicine on Healthcare

Telemedicine is defined as the use of advanced telecommunications technologies to exchange health information and provide healthcare services across geographic, time, social and cultural barriers. It provides healthcare to patients in distant and rural areas from hospitals or clinical centers. It also advocates accessibility and availability of healthcare with lower costs. More than half a century, telemedicine has been benefited to the healthcare industry [36].

The rapid development of telecommunication technologies is a revolution in the healthcare services delivery. Telemedicine has many benefits in knowledge sharing for physicians and healthcare employees by reducing travel time and for increasing the accessibility of healthcare services with lower cost [92]. Telemedicine healthcare systems can facilitate efficient and effective patient care information input and access at the point of patient care [77]. Web 2.0 services help organizations to create customer values and to build customer relationship through collaboration and social networking [169].

About 80% of American internet users have searched for health related topics [68] and about 117 million adults look for healthcare information online [112].

### 5.4. KM in Nursing

Like other healthcare professionals and patients, no universally accepted definition of nursing exists. The

American Nurses Association (ANA) defines nursing as “*The protection, promotion, and optimization of health and abilities, prevention of illness and injury, alleviation of suffering through the diagnosis and treatment of human response, and advocacy in the care of individuals, families, communities, and populations*” [9].

Knowledge and caring are the critical dyad in definition of nursing. Seven essential features of professional nursing have been identified by ANA as follows [10]:

- Provision of a caring relationship that facilitates health and healing.
- Attention to the range of human experiences and responses to health and illness within the physical and social environments.
- Integration of assessment data with knowledge gained from an appreciation of the patient or the group.
- Application of scientific knowledge to the processes of diagnosis and treatment through the use of judgment and critical thinking.
- Advancement of professional nursing knowledge through scholarly inquiry.
- Influence on social and public policy to promote social justice.
- Assurance of safe, quality, and evidence-based practice.

Nursing, a part of healthcare, is dramatically changing globally. Nurses are the largest health professionals and involve both in-patient and out-patient settings, long-term patient care on hospitals, public health and other emergency settings [85].

Nurses are knowledge workers and KM is a critical role in healthcare. Nurses can utilize and manage their knowledge in nursing process effectively. J.A. Anderson and P. Willson argued that KM is valuable to organize nursing knowledge, so that it improves the quality of healthcare services [11].

A great portion of healthcare services is performed by nurses and they need considerable knowledge regarding the healthcare services. The nursing processes cover variety of activities, all of which are dependent on knowledge. Nursing practices including assessment, making a nursing diagnosis, developing and implementing a care plan as well as evaluation are dependent on creation, codification, transfer and application of knowledge [90, 146]. Nurse Managers should play a key role in the development of a supportive culture for KM in their wards [43].

It requires nurses to be constantly aware of new developments, new medications, and new technologies among others. The use of IT in nursing is necessary to improve the quality and safety of patient care. Nursing informatics appeared over the past 25 years to assist nurses fully using IT to improve the patient care [179].

At present the nursing profession is turning towards using computers for many areas of their daily tasks like documentation, communication between shifts,

departments and even facilities and building an information database, the steps of utilizing information, applying knowledge to a problem and acting with wisdom form the basis of nursing practice science [47].

The ANA [10] identified the key issues collaboration with patients to assess, plan, implement, and evaluate care related to the knowledge base for nursing practice as follows:

- promotion of health and wellness,
- promotion of safety and quality of care,
- care, self-care processes, and care coordination,
- physical, emotional, and spiritual comfort, discomfort, and pain,
- adaptation to physiologic and pathophysiologic processes,
- emotions related to experiences of birth, growth and development, health, illness, disease, and death,
- meanings ascribed to health and illness, and other concepts,
- linguistic and cultural sensitivity,
- health literacy,
- decision making and the ability to make choices,
- relationships, role performance, and change processes within relationships,
- social policies and their effects on health,
- healthcare systems and their relationships to access, cost, and quality of healthcare, and
- the environment and the prevention of disease and injury.

Pamela Cipriano indicated that there are five ways of knowing which are useful in understanding how one knows something. A nurse might use them in every step of her profession [39].

- a. Empirical knowing focuses on facts and is related to quantitative explanations, such as, predicting and explaining.
- b. Ethical knowing focuses on a person’s moral values, such as, what should be done.
- c. Aesthetic knowing focuses on the nurse’s perception of the patient and the patient’s needs, emphasizing the uniqueness of each relationship and interaction.
- d. Personal knowing focuses on understanding and actualizing a relationship between a nurse and a patient.
- e. Synthesizing knowing allows the nurse to understand the patient better and to provide higher quality care.

## 5.5. Benefits of Health Cooperation

In the healthcare, cooperation among different healthcare providers creates knowledge transfer networks and it is crucial to deliver quality healthcare [12, 63]. Cooperation increases the current and future healthcare field of research for the development of global health. Lack of cooperation in healthcare causes many medical mistakes [96].

The benefits of cooperation in healthcare are as follows [32]:

- improve access to healthcare,
- increase best possible healthcare and services,
- enhance the quality and safety of healthcare,
- increase trust and respect among the healthcare providers,
- enhance the coordination and efficiency of healthcare,
- understand and respect the roles and skills of providers within the healthcare team,
- enhance intra-professional collaboration within medicine and inter-professional collaboration with other providers,
- provide leadership in the evolution of collaborative healthcare at all levels, and
- enhance morale of provider and reduce burnout within healthcare professions.

Cooperation in healthcare individuals must have clear roles and responsibilities, understand the scope of practice and competencies of all members of the team, understand the leadership and decision-making roles within the team, have earned mutual respect and trust among its members, and have established clear processes of communication [95].

## 6. Medical Errors in Health Sector

Medical error is defined as errors or mistakes committed by health professionals which result in harm to the patients [113]. All kinds of medical errors are unfortunately inevitable in healthcare. Some of these errors are largely preventable [34]. Many medical errors are occurring in health sector and patients die each year. At present medical errors are global challenges for healthcare professionals, and health policy makers. Medical errors are made by all types of medical professionals such as, physicians, doctors' assistants, nurses, pharmacists and administrative personnel at different stages of administration of medical care [19].

### 6.1. Incidents of Medical Errors

Errors can occur at any level of medical care, such as, in inappropriate prescriptions, incorrect or delayed laboratory results, wrong diagnosis and/or improper or inadequate treatment [22, 159]. Errors may occur within hospitals, clinics, surgery centers, physicians' offices, nursing homes, pharmacies, urgent care centers and care delivered at home [124].

One in seven Medicare patients in hospitals experiences a medical error. Most errors are resulted from problems created by today's complex healthcare system. Errors also happen when doctors and patients have problems of communication [6]. About 40% of autopsies show that a major misdiagnosis leads to patients' deaths [72].

In November 1999, in the Institute of Medicine (IOM) L. T. Kohn, J. M. Corrigan and M. S. Donaldson revealed that the number of deaths related to medical errors in the USA may range from 44,000 to 98,000 each year, with an

associated cost of \$17 to \$29 billion [48, 110]. Since then research institutions, healthcare organizations and policymakers worldwide began to develop research agendas and patient safety programs to prevent medical errors and increase patient safety [58]. But some errors are difficult to prevent because of the complexity of medical knowledge, the uncertainty of clinical predictions, time pressure, communication and other factors [121]. It is said that about 54% of these errors are preventable [99]. In addition, about 800,000 people are injured or die each year in the US hospitals from adverse drug events (ADEs) which cost between \$1.56 and \$5.6 billion each year [23, 105]. Most of the people of the USA die as a result of medical errors than from automobile crashes (43,458), AIDS (16,516) or breast cancer (42,297) [97].

In the United Kingdom (UK) the cost of financial compensation for medical errors was estimated to be more than £400 million in 2003 [143]. In a report according to National Health Services (NHS) of the UK about 72,000 patients have died due to medical errors where as in Canada 24,000 patients have died because of the same reason [81]. In a study in 2000, it was found that of the 2.5 million hospital admissions in Canada, about 185,000 (7.5%) were victim of medical errors in surgical, drug or fluid-related incidences and about 70,000 cases (37%) of errors were preventable [19].

### 6.2. Types of Medical Errors

The following ten categories of medical errors occur in healthcare [97, 118, 119]:

- Medication error, such as a patient receiving the wrong drug, error in the dose or method of using a drug.
- Surgical error, such as amputating the wrong limb, error in the performance of an operation, procedure or test.
- Diagnostic error, such as error or delay in diagnosis, misdiagnosis leading to an incorrect choice of therapy, failure to use an indicated diagnostic test, use of outmoded tests or therapy, misinterpretation of test results, failure to act on results of monitoring or testing and failure to act on abnormal result.
- Equipment failure, such as defibrillators with dead batteries or intravenous pumps whose valves are easily dislodged or bumped, causing increased doses of medication over too short a period.
- Preventive error, such as failure to provide prophylactic treatment, inadequate monitoring or follow-up of treatment.
- Infections, such as nosocomial and post-surgical wound infections.
- Blood transfusion related injuries, such as a patient receiving an incorrect blood type.
- Misinterpretation of other medical orders, such as failing to give a patient a salt-free meal, as ordered by a physician.
- Avoidable delay in treatment or in responding to an

abnormal test, inappropriate care, error in the administering the treatment.

### **6.3.Reduction of MedicalErrors**

Errors in healthcare may cause adverse drug effects. KM helps to reduce medical errors of the practitioners by providing a decision support [1]. Various studies reveal that KM is capable to reduce the medication case report errors as high as 55% [128].

To reduce medical errors, identification and classification of errors must be stated clearly. But it is a very complicated process, which may be simplified by implementing an effective classification system [138, 181]. Many researchers believe that medical expert systems have great potential to improve healthcare by reducing medical errors.

Information technology (IT) can be used to reduce errors. Computerized physician order entry (CPOE) can reduce errors by 55% to 86% [56]. Implementation of CPOE has been slowed due to both financial cost and administrative structure [114]. About 10% of the US hospitals have made CPOE completely and about 7% have made partially available to physicians [16].

Some policy proposals to reduce medical errors are as follows [187]:

- building public awareness of medical errors,
- building purchasers' awareness of the problem,
- giving best guide to the healthcare providers to improve patient safety,
- using decision-support systems and information technologies,
- using standardized procedures, data integration, and
- checklists, and the results of human factors research.

## **7. KM in Health Sector of Four Countries**

Healthcare is expensive and advanced in developed countries than that of developing countries. In this section we have briefly discussed the KM strategy in health sector of four countries.

### **7.1. Healthcare in the USA**

The USA is among the wealthiest nations in the world, but it is far from the healthiest nation [98]. It is a world leader in medical technology, innovation and healthcare research. It possesses the world's top marked research institutions and hospitals. From 1950 to 2006 the USA has received 60% of the Nobel prizes awarded in medicine and physiology [141].

The Department of Health and Human Services (HHS) is the federal government's principal agency involved with healthcare services. The HHS includes the Centers for Medicare and Medicaid Services (CMS); the Centers for Disease Control and Prevention (CDC), which conducts research and programs to protect public health and safety; the National Institutes of Health (NIH), which

is responsible for biomedical and health-related research; the Health Resources and Services Administration (HRSA), which supports efforts to improve healthcare access for people who are uninsured, isolated, or medically vulnerable; the Agency for Healthcare Research and Quality (AHRQ), which sponsors, conducts, and disseminates research to improve healthcare quality and safety; and the Food and Drug Administration (FDA), which is responsible for promoting public health through the regulation of food, tobacco products, pharmaceutical drugs, medical devices, and vaccines, among other products. The Institute of Medicine (IOM), an independent non-profit organization that works outside of government, acts as an adviser to the policymakers and the private sector on improving the nation's health [140].

#### **7.1.1. Public Healthcare in the USA**

Two public healthcare programs are dominant in the USA: Medicare and Medicaid, and both were created in 1965 under Lyndon Johnson's presidency, run by the HHS and cover about 87 million Americans. Medicare is the federal government's health program that primarily serves Americans over the age of 65, whilst Medicaid is a joint federal-state program principally designed to finance healthcare for the poor and both provide care for the disabled. Together, Medicare and Medicaid cover about 87 million Americans. In 2004, there were 42 million Medicare beneficiaries in the USA and the total cost of the program was \$297 billion [102]. In 2009, the total cost of Medicaid was over \$366 billion, split between federal payments of \$243 billion and state payments of \$123 billion [64].

On June 20, 2000, of 191 nations, the World Health Organization (WHO) ranked the USA in 37 in healthcare systems (France ranked 1 and Italy 2) [180]. For this ranking five measures were used: i) overall level of health or life expectancy, ii) health fairness or life expectancy as measured across various populations within a country, iii) responsiveness or how well people rated performance of their healthcare system, iv) fairness in responsiveness among different groups in the same country, and v) fairness in financing among different groups [49].

The USA spends more money on healthcare than any other nation in the world. It spends 2.5 times more than the OECD average health expenditure per person (twice as much as France). The USA provides more healthcares, such as, more doctors' appointments, more surgery, more drugs, more diagnostic tests, longer stays in hospital than in the other countries [150]. Koechlin et al. [109] found that average unit quasi-prices of certain US hospital procedures are as: appendectomy \$7,962, normal delivery \$4,451, caesarean section \$7,449, percutaneous transluminal coronary angioplasty (PTCA) \$14,378, coronary artery bypass graft \$34,358, hip replacement \$17,406 and knee replacement \$14,946.

The rate of increase in US spending on healthcare continues to exceed economic growth at an unsustainable pace. Half of healthcare spending is used to treat just 5%

of the US population. Some 47%–50% of Americans account for 0% of all healthcares spending [147]. In 1960, total US spending on healthcare was 4.7% of the gross domestic product (GDP). Between 1960 and 1999, real per capita health spending exceeded growth of the GDP by about 2.4% per year [164]. From 1965 to 2007, US health spending as a percent of GDP has steadily increased from 5.9% to 16.2% [51].

According to Medicare actuaries, in 2007, the USA spent on healthcare was about \$2.38 trillion (16.2%) of the nation’s GDP \$14.29 trillion (\$7,421 per person per year) [82]. In 2010, it spent over \$2.6 trillion, 18% of GDP on healthcare (UK 9.6%, Germany 11.6% and Japan 9.5% of GDP) [142]. The Centers for Medicare and Medicaid Services (CMS) of the USA estimate that American health spending will reach nearly \$5 trillion, 20% of GDP, by 2021. Another study showed that by 2017, healthcare spending is expected to reach \$4.3 trillion (\$13,101 per person per year) and 20% of the GDP [41]. The Congressional Budget Office (CBO) projects that without any changes in federal law, total spending on healthcare will reach 25% of GDP by 2025, 30% by 2035, and 49% by 2082 [42]. From 2000 to 2010, healthcare spending grew by 5.6% per year, while overall inflation grew at 2.4% per year and GDP grew at 2.9% per year [142].

The major components of US healthcare spending are hospital costs (31% or \$814 billion), costs of physician and clinical services (21% or \$544 billion), pharmaceuticals (10% or \$259.1 billion), administrative costs (14% or \$361 billion) and other spending (25% or \$647.8 billion) [42]. The USA uses 10% fewer drugs per capita than the other OECD countries, but the drug cost is 50% more than equivalent products in other OECD countries [141].

One in four Americans experiences a mental illness or substance abuse disorder each year, and the majority also has a comorbid physical health condition [107]. Here substance abuse disorders mean conditions resulting from the inappropriate use of alcohol, prescription drugs and/or illegal drugs [184]. In 2009, more than 2 million patients discharge from community hospitals were for a primary diagnosis of mental illness or substance abuse disorder [145].

Annual US healthcare per capita expenditures, expenditure increase, per capita expenditure by age and gender are given in table 1.

**Table 1.** Annual US healthcare expenditures per capita (2011–2013). Source: [177].

Year	2011	2012	2013
Per capita expenditure in \$	4,514	4,681	4,864
Expenditure increase %	4%	3.7%	3.9%
Per capita expenditure in \$ by age			
0-18	2,356	2,461	2,574
19-25	2,427	2,561	2,676
26-	3,945	4,127	4,25

	44		8
	45-5	5,867	6,094
	55-64	8,727	8,898
Per capita expenditure in \$ by gender	Men	3,997	4,132
	Women	5,011	5,211

Prices for drugs, physicians’ visits and treatment procedures are highest in the USA. The prices for generic drugs are lower in the USA than in other countries, whereas prices for brand-name drugs are much higher. Also the USA uses more expensive medical technology than other countries. The US primary care doctors (\$186,582) and particularly orthopedic doctors (\$442,450) earned greater income than in the other countries. The US commercial average diagnostic imaging fees (\$1,080 for a magnetic resonance imaging (MRI) and \$510 for a computed tomography (CT) exam) are far higher [117, 150]. The unnecessary medical tests costs in the USA vary from \$30 billion to over \$100 billion [185].

A study of the 50 top-selling prescription drugs found that US pharmaceutical prices were at least 60% higher than those in five large European countries in 2007 [103]. Average prescriptions use in Americans is 12.2 per year. The average cost of a medical prescription was \$58.99 in 2014 and prescription drug costs are expected to increase 6.4% in 2015 [46].

At present Americans are living longer and better than ever, but unfortunately such longevity comes with great healthcare costs. One in five Americans will be over age 65 by 2030 and about 27.4% (110 million) will grow over 60 by 2050 and additional healthcare cost will be three times greater than for younger individuals [178]. Healthcare in the USA is uneven and is not better than in most other industrialized countries despite the higher level of expenditure [149]. In spite of high spending the US healthcare system it is ranked last among the developed nations on patient safety, patient centeredness, efficiency and equity [49].

This highest spending in the USA is not for higher income. It is for an aging population, or greater supply or utilization of hospitals and doctors. It is also due to higher prices and more readily accessible technology and greater obesity. More than 35% of the US adults and 16% of children aged 2–19 years are obese. About 40% of Americans are involved in little or no physical activity [178]. Obesity in the USA costs the healthcare system about \$150 billion per year, which is 10% of the US healthcare budget [156].

More than 75% of healthcare costs in the USA are due to chronic conditions such as, heart disease, cancer, stroke, diabetes and arthritis, which cause 7 in 10 deaths each year. The National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP) points out the following about key chronic diseases [147]:

- Heart disease and stroke are the first and third leading causes of death respectively, accounting for

more than 30% of all US deaths each year.

- Cancer, the second leading cause of death, claims more than half a million lives each year.
- Diabetes is the leading cause of kidney failure, non-traumatic lower extremity amputations, and new cases of blindness each year among US adults aged 20–74 years.
- Arthritis, the most common cause of disability, limits activity for 19 million US adults.
- Obesity has become a major health concern for people of all ages. One in every 3 adults and nearly one in every 5 young people aged 6–19 are obese.

End-of-life care in the USA is as follows [147]:

- 27 to 30% of Medicare payments cover the cost of care for people in the last year of life.
- 12% of Medicare spending covers people who are in the last two months.
- 10% of Medicare beneficiaries account for 70% of program spending.

### 7.1.2. Limitation of Healthcare in the USA

The USA does not have many physicians relative to its population (2.4 physicians per 1,000 population), it does not have a lot of doctor consultations (3.9 per capita), it does not have a lot of hospital beds (3.1 per 1,000 population), or hospital stays, when compared with other countries, and when people go to hospital, they do not stay for a long time (average 4.9 days). Life expectancy in the USA is 78.2 years which is below the OECD average (OECD average is 79.5 years), despite the high level of health spending [150].

Americans are in worse in at least nine health areas compared with the other developed countries [150]:

- infant mortality and low birth weight,
- injuries and homicides,
- obesity and diabetes,
- heart disease,
- adolescent pregnancy and sexually transmitted infections,
- HIV and AIDS,
- drug-related deaths,
- chronic lung disease, and
- disability.

About 18,000 people in the USA die each year, because they are uninsured and more than half of all bankruptcies are caused by medical debts [76].

## 7.2. Healthcare System in the United Kingdom (UK)

The UK is a sovereign state located off the North-Western coast of Europe. It includes the island of Great Britain (England, Scotland and Wales), the North-Eastern part of the island of Ireland and many smaller islands. Its population is 62,262,000 and a reported GDP of \$2.260 trillion. In 2009, the English population (white) was estimated at 51,809,700, constituting 83.8% of the total population of the UK [28, 35].

The healthcare system of the UK is one of the most

efficient in the world. The UK provides public healthcare to all permanent residents, about 58 million people. Healthcare coverage is free at the point of need, and is paid for by general taxation. About 18% of a citizen's income tax goes towards healthcare, which is about 4.5% of the average citizen's income. Overall 9.3% of the GDP of the UK is spent on healthcare (£189.84 billion, £0.70 = \$1.00) [154]. Total healthcare expenditure in the UK, from both public and private sectors, was £150.6 billion (£125.5 billion or 83.3% from public sector and £25.1 billion from private sector) in 2013 (£2,350 per person), with an increase of 2.7% from 2012. It is expected that the UK health expenditure will be £116 billion in 2016. While in 1997, total UK healthcare expenditure was £54.9 billion. Public sector healthcare expenditure grew by 3.2% between 2012 and 2013, while private sector expenditure grew by 0.3%. Northern Ireland spends the most on health services (£2,106 per head in 2010/11) and England spends the least (£1,900 per head per year) [115, 120].

In 2008, life expectancy at birth is 80.6 years (78.6 years for males and 82.6 years for females) [155]. Main causes on mortality and health status in general are levels of cigarette smoking, alcohol consumption and obesity in the population [93].

In 2009, the total numbers of doctors working in the National Health Service (NHS) were 140,897. Primary care in the UK is delivered mainly through general practitioners (GPs). In 2013, of these doctors there were 40,236 (46% women) GPs in 7,962 practices, with an average of 7,034 patients per practice and 1,575 patients per GP. This compares with 41,220 hospital specialists and a further 54,576 hospital doctors in training [84].

In 2009, total staffs working in the NHS were consultants 36,950, doctors in training 14,394, registrars 37,108, nurses and midwives 395,229, practice nurses 21,935, pharmacists 43,244, dentists 4,342, other medical and dental staffs 12,176, allied health professionals 73,953, scientific, therapeutic and technical staffs 75,647, ambulance staffs 17,992, support to clinical staff 377,617, other GP practice staffs 92,333, and manager and senior manager 44,661 [94]. The UK has 1.7 doctors and 4.1 hospital beds per 1,000 populations [163].

In England, there are regulators for different healthcare professions; doctors, nurses and midwives, pharmacists, dental teams, optical professionals, chiropractors, osteopaths, and health, psychological and social work professionals [144].

### 7.2.1. Top Healthcare Providers in the UK

The UK provides healthcare services through both public and primary healthcare processes. Public expenditure on healthcare in the UK is large.

#### i. Public Healthcare Providers

The UK has a government sponsored universal healthcare system called the National Health Service (NHS), which consists of a series of publicly funded healthcare systems in the UK. The NHS was founded on

5<sup>th</sup> July 1948, and is responsible for the public healthcare sector of the UK. It provides a comprehensive service available to all irrespective of gender, race, age, religion, disability, sexual orientation, pregnancy and maternity, etc. The NHS services are free of charge to the patients of England. The services focus in diagnosis and treatment of diseases. It plays an important role in both preventing ill health and improving the physical and mental health. These services deal with over one million patients every 36 hours [144].

Public health in the UK is primarily responsible to the Department of Health, which does not deliver services but works through the NHS, local authorities and currently the HPA, as well as other government departments and the private and voluntary sectors, recognizing that education, employment, economic status, transport, environment and housing all have an impact on public health [55]. Most of the frontline services that support public health priorities are delivered through NHS staff working in hospitals, primary care and the community [54].

Before the establishment of NHS, healthcare in the UK was generally available only to the wealthy, unless one was able to obtain free treatment through charity or teaching hospitals. In 1911, David Lloyd George introduced the National Insurance Act, in which a small amount was deducted from an employee's wage and in return they were entitled to free healthcare [35].

The health insurance system in the UK is governed and guided by NHS which aims to publicly fund the healthcare companies in all of the different parts of the UK. According to the World Health Organization (WHO), government funding covers 85% of healthcare expenditure in the UK. The remaining 15% is covered by private sector. Between these expenditures, 76% comes from general taxation and 18% from national insurance [28].

The eight special health authorities provide a national service to the NHS, under Section 11 of the National Health Service Act 1977 are [144]: National Institute for Health and Clinical Excellence (NICE), National Patient Safety Agency (NPSA), National Treatment Agency for Substance Misuse, NHS Blood and Transplant Authority, NHS Business Services Authority, NHS Information Centre for health and social care, NHS Institute for Innovation and Improvement, NHS Litigation Authority (NHSLA).

The NHS Plan sets out 10 new principles on which future health policy will be based on as follows [52]:

- It will provide a universal service for all based on clinical need, even which have no ability to pay.
- It will provide a comprehensive range of services.
- It will shape its services around the needs and preferences of individual patients, their families and carers.
- It will respond to different needs of different populations.
- It will work continuously to improve quality

services and to minimize errors.

- It will support and value its staffs.
- Public funds for healthcare will be devoted solely to NHS patients.
- It will work together with others to ensure a seamless service for patients.
- It will help to keep people healthy and work to reduce health inequalities.
- It will respect the confidentiality of individual patients and provide open access to information about services, treatment and performance.

## ii. Private Healthcare Providers

Most private expenditure is for over-the-counter drugs and other medical products and private hospital care, including both insured and uninsured costs. Popular private health insurance companies in the UK are as follows [116]:

**BUPA** (the British United Provident Association) Health Insurance: BUPA is a leading and experienced health insurer, providing a variety of products and services to residents of Latin America and the Caribbean. It began as a provident association in the UK in 1947 with just 38,000 members. It looks after the health and wellbeing of more than 13 million people from more than 190 countries around the world. It is the single largest British private healthcare insurance company (more than 42% of the market) in the UK, which is affiliated with more than 400 accredited hospitals. It makes an alternative to the tax-funded coverage provided to all residents by the NHS. It provides extensive coverage for a wide variety of medical expenses, such as, in cancer, heart and dental treatments. Its revenue is £9.8 billion and net income is £637.8 million and number of employees is 84,000 [29].

**Aviva**: It is founded in 2000. It is a British multinational insurance company headquartered in London. It is the sixth largest insurance company in the world, based in Great Britain, with more than 53 million customers in 28 countries. It is recognized as one of the leading health insurance company in the UK. In the UK, it is the largest general insurer and a leading life and pension provider. It covers all the major types of medical expenses and allows access to the best treatment, hospitals, pharmaceutical medicines and medical specialists. Its revenue is £23.728 billion and net income is £1.079 billion and number of employees is 28,000 [13].

**AXA**: It is a French insurance company, known as AXA PPP Healthcare, which provides health, life, and other forms of insurances [18].

**Medicare International**: With more than 20 years of experience it is known as one of the best health insurance companies in the UK. It offers full coverage for chronic conditions such as asthma, diabetes, and comprehensive check-up procedures like X-rays, general visits and specialist's fees [35].

**Freedom Health Insurance**: Perhaps the best provider of medical, sexual and aesthetic healthcare in the UK, it offers a wide range of services, including access to

private GUM clinics, syphilis tests and treatment, Chlamydia tests and treatment, HIV tests, Hepatitis A, B & C tests, Mycoplasma & Ureaplasma testing, and full sexually transmitted disease (STD) screening for all enrolled males and females [35].

### 7.2.2. Free Treatment in the UK

Prescription drug copayments in free are given the following UK people of various categories [83]:

- children under the age of 16,
- fulltime education ages 16–18,
- people age 60 or older,
- people with low income,
- pregnant women and those who have had a baby in the past 12 months,
- people with cancer, certain other long-term conditions, and/or disabilities,
- young people, students, pregnant and recently pregnant women, prisoners,
- those with low incomes are not liable for dental copayments,
- sight tests are free for young people, those over 60, and people with low incomes, and financial support is available to young people and those with low incomes to meet the cost of corrective lenses, and
- patients who need a large number of prescription drugs can buy prepayment certificates costing £29.10 for a period of three months and £104 for 12 months and they no need further charges for the duration of the certificate, regardless of how many prescriptions they need.

### 7.2.3. Prevention Strategy in the UK

Specialist public health practitioners may be required to create expertise for environmental health, disease prevention and health promotion, health psychology, statistics, economics, medical sociology and social policy, biology, nursing and medicine [53].

The Department of Health stressed for the national public health development in the UK on the reduction of alcohol, smoking, childhood obesity, health inequalities, infant mortality, sexual violence, sexual health, teenage pregnancy and tobacco control. It is also careful for vaccination and immunization, and children and young peoples' psychological well-being and mental health [55].

### 7.2.4. The UK vs. the USA in Healthcare

The USA has the highest healthcare spending country in the world. Of the 18% of GDP the USA spends on healthcare annually (about \$2.6 trillion); around 50% is spent by the government (about \$1.1 trillion) [142]. By contrast, in 2012, the UK spends only around 9.3% of its GDP on healthcare. The UK NHS cares for 58 million people (100% of the population of England), where the US public healthcare currently covers about 83 million (around 28% of the US population). Also, US healthcare sets age and income requirements (Medicaid or Medicare) on public healthcare coverage, whereas UK made public healthcare accessible to all the UK permanent residents

by making it free at the point of need [154].

### 7.2.5. Disadvantages of UK Healthcare System

As the UK government participates in the healthcare system, weakens the functionality of market mechanisms. The tight control undertaken in regards to medical expenses has resulted in a lack of medical resources, such as, equipment, doctors and nurses in public hospitals. The free medical services provided to all citizens, the public tend to make extensive and even excessive use of these medical services. For example, it is common to encounter long lines in public hospitals of the UK [17, 127].

### 7.3. Healthcare in France

The French Republic is a country whose metropolitan territory is located in Western Europe, covers an area of about 545,000 km<sup>2</sup>. France is further made up of a collection of overseas islands and territories located on other continents. Metropolitan France extends from the Rhine River to the Atlantic Ocean and from the Mediterranean Sea to the English Channel and North Sea. It is composed of 26 regions that cover 100 departments, which include 36,679 municipalities. In 2008, its population was 65.5 million (15% or 10 million ethnic origin) [37].

French healthcare is insurance-based. Healthcare in France are covered by a mix of mandatory Social Health Insurance (SHI) (75.5%), private complementary schemes (13.7%), direct household spending (9.6%), and sales and others (1.2%), while benefit packages are comprehensive, uniform and of good quality [59]. The three major statutory insurance schemes cover more than 95% of the population. The largest one, the Régime Général, insures wage and salary earners and their dependents covers about 85% of the compulsorily insured population. The self-employed, universal coverage fund, farmers and agricultural employees cover 14% of the population. Additionally, 16 small schemes, including miners, the clergy, employees of SNCF (the national rail company) and the central bank cover 1% of the population [21]. For the majority of patients, medical goods and services are not free at the point of use. But universal access is guaranteed by schemes for those on low incomes and/or chronic conditions [33].

In 2013, services coverage under SHI in France are as follows [10]:

- Hospital care and treatment in public or private institutions providing healthcare, rehabilitation, or physiotherapy.
- Diagnostic services and care prescribed by doctors and carried out by laboratories and paramedical professionals (including nurses, physiotherapists, and speech therapists).
- Outpatient care provided by GPs, specialists, dentists, and midwives.
- Pharmaceutical products, medical appliances, and prostheses prescribed and included in the positive

lists of products eligible for reimbursement.

- Prescribed healthcare related transport.

After World War II, in 1945, a general insurance scheme was adopted under the Social Health Insurance Act to provide a compulsory system guaranteeing uniform rights, initially for salaried workers in five areas: illness, maternity, disability, old age and death [21].

France is a high-income country where health coverage is in effect universal. On June 20, 2000, of 191 nations, the WHO ranked France in top in healthcare systems [190]. In 2008, total expenditure on health in France was estimated at €208 billion (11.6%) of GDP €1950 billion. France also ranks above the OECD average on health spending per capita at \$4,118 (in 2011 parity purchasing power dollars), compared with the OECD average of \$3,339 [153].

Average life expectancy at birth is 81.5 years, (78.2 years for males and 84.8 years for females). Infant mortality is 3.5 per 1,000 live births and maternal mortality rate is 8.5 per 100,000 live births [152]. The main causes of death in France are cancer (27.7% of deaths), cardiovascular diseases (31.1%), accidents (8.3%) and diseases of the respiratory system (8.1%) [167].

Patients are seen promptly and admitted to hospital without waiting and ask to see a specialist without having to be referred by a GP, and they can change doctors easily. Public and private hospitals compete with one another for patients, nurses work independently and laboratories in the High Streets offer all kinds of tests [151].

There are about 200,000 physicians in France: 92,000 primary care physicians and 108,000 specialists. Most physicians are self-employed (46% exclusively and 10% in mixed employment), although more GPs are self-employed (59%) than specialists (36%) [40]. The French has 500,000 beds, and 3 doctors, 8.4 hospital beds per 1,000 populations [163]. Hospitals fall into three categories: public, private for-profit and private not-for-profit. The public hospitals are better equipped and cover 65% of all hospital beds [78].

#### 7.4. Healthcare in China

People's Republic of China is situated in the Eastern Asia on the western shores of the Pacific Ocean. Its area is 9,640,821 km<sup>2</sup> and it is considered as the 3<sup>rd</sup> largest country (after Russia and Canada) in the world. In 2010, its population became about 1.339 billion which is in the 1<sup>st</sup> position in the world (20% of the world's total) [137]. China continues to face great challenges in meeting the health needs of its large population by using existing resources more efficiently, more effectively, and more equitably. There are three main challenges in Chinese healthcare: i) the lack of access to affordable healthcare, ii) inefficient use of healthcare resources, and iii) a lack of high-quality patient care [86].

During the Maoist era (1949–1978), China has developed the largest public medical institutions network

and the largest healthcare workforce in the world [89]. Since 1949 the Chinese government has had an extensive program to improve the health conditions of the Chinese people. By the late 1970s, *bare-foot doctors* and clinics were set up in almost all the villages of China. In the late 1980s the Chinese government launched a major reform of the social insurance system, including reforms of pension and healthcare schemes and abandoned its free universal healthcare system and privatized it. In this system many people lost their access to healthcare, especially those without employers and farmers in rural China [61].

Recent Chinese economic growth is very high, but the current Chinese healthcare system fails to meet the population's basic needs [70]. On June 20, 2000, of 191 nations, the WHO ranked China in 144 in healthcare systems. Hence, healthcare in China is not satisfactory [190].

In China, healthcare providers focus on providing profitable, rather than cost-effective health services, overcharging, overdiagnosis, and the prescription of unnecessary medicines [91]. China's current healthcare system displays considerable inequities in utilization and outcomes between rural and urban areas [176].

In 2003, China has 5.2 million health professionals, including 1.8 million physicians with various levels of training (about 1.5 physicians per 1,000 people) and 1.2 million nurses. It has about 17,844 hospitals with about 3.1 million hospital beds and about 8,200 urban community health centers and 46,000 rural township health centers and 213,000 clinics. By 2002, the number of private medical practitioners was more than 200,000 [133].

In 2003, China launched a new health insurance program, aimed at covering the whole rural population, which is called New Rural Cooperative Medical System (NRCMS). This fund comprises of central government subsidy, county government contributions and individual contributions [62].

At present number of hospital beds in China for every 1,000 people is 4.55 in public hospitals and 0.52 in private hospitals and it is projected to 6 in public hospitals and 1.5 in private hospitals by 2020 [148]. Number of outpatients and inpatients in various medical institutions in China in 2007 were 28.42 billion and 98.27 million respectively [136].

China's healthcare sector continues to develop at an astonishing rate. In 2004, total health expenditure in China was \$111 billion (5.55 % of GDP) [134] and in 2007 was \$124 billion (5.6% of GDP) [136]. The Central Committee of the Communist Party of China and the State Council jointly announced a new wave of health reform in April 2009, which ambitiously aims to achieve universal provision of free or low-cost healthcare to the entire population by 2020. To implement it the Chinese government increases annual healthcare spending from \$357 billion in 2011 to \$1 trillion in 2020 [57, 80].

Rapid development of mobile infrastructure and the

changing disease patterns strengthen the tremendous potential for mobile health (mHealth) in China. “We Doctor, Chunyuisheng and Xingren” are three mHealth market leaders in China. We Doctor is founded in 2010, raised more than \$500 million in venture capital. It is creating mobile platform to promote a tiered health system where lead specialists can develop their own practice group. Chunyuisheng is founded in 2011, which has 88 million subscribers including 380,000 physician users. Xingren has 300,000 certified physicians [129].

China recently announced a new five year road-map (2015–2020) for reform of its healthcare sector. The new reforms introduced by the Government targets three main areas: i) infrastructure development, ii) reduction of costs, and iii) new investment. These reforms will have a substantial impact on stakeholders and industry players including international medical device firms, drug makers, hospital operators and insurance companies [148].

The top ten policies in China’s new healthcare reform over the next five years (2015–2020) are as follows [148]:

- Opening access for private investors to develop private hospitals.
- Increasing the number of hospital beds across all medical institutions to alleviate burden on public hospitals.
- Standardizing training for medical professionals and improving allocation of resources.
- Continued development of medical facilities at grass-root level and in rural areas.
- Encouraging development of private senior care facilities and home care service.
- Reducing patients’ out-of-pocket expenses through restrained use of medical devices, and if medical devices are required to be used, using locally manufactured devices.
- Developing comprehensive medical insurance with better coverage.
- Expanding the scope of practitioners’ insurance and establishing a dispute resolution mechanism.
- Establishing traditional Chinese medicine hospitals at the county and municipal level.
- Investing in technology for online healthcare products and information sharing on cloud systems.

From 1952 to 1982, the life expectancy of Chinese people rises from 35 years to 68 years and the infant mortality drops from 240 to 40 deaths per 1,000 births [132]. Life expectancy becomes 72.5 year for men and 76.8 year for women in 2010 [130]. In the 21<sup>st</sup> century, China has entered the aging society. In 2005, 11% of Chinese population (144 million) is older than 60 years of age [135].

The typical Western diet, dominated by dairy products, cereals, refined sugars, vegetable oils and processed foods, may predispose modern populations to diseases associated with insulin resistance such as obesity, diabetes, coronary heart disease, hypertension and dyslipidemia. This Western diet consuming is increased in

China. A national survey of China in 2005 revealed that obesity among adults is 27–31% [45]. Non-communicable diseases (NCDs) now account for 80% of China’s burden of diseases, with the top three causes of premature morbidity and mortality in 2010 being stroke, ischemic heart disease and chronic obstructive pulmonary disease [129].

## 8. Healthcare Cost

The rising global healthcare cost is one of the most unexpected problems. Healthcare is very expensive in 34 developed countries than that of developing countries. Healthcare spending satisfies fundamental individual and social demands for services that bring improved health, opportunities for all people to live better and healthier and longer lives. It provides a major source of employment and highly skilled health workers [172].

### 8.1. Causes of Healthcare Costs

Main causes of healthcare costs are: higher prices for healthcare services, inappropriate utilization of advanced medical technology, excessive administrative costs, consumer price insensitivity, medical errors and inefficiency, medical malpractice and defensive medicine, lack of patient involvement in decision-making, payment system distortions that encourage over-use, lack of productivity growth, declining health status, a healthcare workforce that is not aligned with national needs, medical liability and defensive medicine, declining health status and chronic disease, and increase in elderly persons [75].

### 8.2.Reduction of Medical Cost

Knowledge sharing in health can provide treatment efficiently and hence it reduces medical cost. If medical errors are reduced, intuitively health cost reduces. Reduction of adverse drug effects also reduces medical cost.

About 64% of the US population has private health insurance, which pays for one-third of healthcare spending and about 27.8% of people has covered by government health insurance programs [44]. Public programs covered about 34% of residents; Medicare covered 16%, Medicaid 17% and military healthcare insurance covered 5% [183]. Most Americans obtain their health insurance through their employers and some others coverage through public programs, such as, Medicare and Medicaid or through the individual insurance market. Many are unable to get coverage because they do not qualify for public programs and cannot find affordable individual policies due to various medical conditions. When an employee loses his job, any employer-provided health insurance is also lost [25]. It is estimated that in 2007 there were more than 45.7 million (15.3%) and in 2013 there were 42 million uninsured people in the USA [182]. In the USA the uninsured were estimated to receive 20% less treatment than the privately insured after serious accidents. Also mortality rate is 1.5% higher among the

uninsured US citizens. About 18,000 unnecessary deaths occur every year in the USA due to lack of health insurance [141].

At present the US healthcare system delivers 65% of all care in outpatient settings, well above the comparative average of 52% in the Organization for Economic Cooperation and Development (OECD) countries. In this outpatient service the stress in inpatient service has decreased and the USA saves \$100 billion to \$120 billion a year [141].

The US healthcare cost can be reduced by applying the following [75]:

- Reduce costs from medical malpractice and defensive medicine.
- Ensure accurate pricing of services.
- Reduce unnecessary administrative costs.
- Reduce avoidable, ineffective, and duplicate use of services.
- Pay appropriately for healthcare services, and encourage adoption of innovative models of healthcare delivery.
- The introduction of technology to improve the efficiency of healthcare record keeping.
- Reduce the cost of care including improvements in efficiency and individual health status, as well as focusing on wellness.

## 9. Knowledge Sharing in Healthcare

Knowledge sharing can be defined as team members sharing task-relevant ideas (skills, experience, and understanding), information, and suggestions among researchers, policymakers, service providers, and common publics. The sharing of knowledge is necessary for adapting, extending and creating new knowledge and innovation [87]. Knowledge in healthcare is considered as an essential asset to achieve better results for transferring and generating knowledge within a healthcare organization [31]. In modern healthcare environments, efficient healthcare referral services are indispensable for the provision of high quality, patient centered healthcare services [50].

Healthcare organizations depend on employees' knowledge sharing behavior to increase their competitive advantage and value [26]. Health information sharing between patients and their healthcare providers may improve diagnoses, increase patient education and promote self-care [162].

Healthcare organizations have recently realized that medical knowledge not only needs to be managed but also shared among professionals and patients, as a result medical errors can be reduced. A healthcare organization is a knowledge rich community which deals with patients' lives and wellness [175].

B. Lin and C. T. Hsieh [123] in their study expressed that delivering safe and high quality services to patients is highly dependent on sharing four types of knowledge: i)

medical knowledge, ii) scientific knowledge, iii) incident knowledge, and iv) experience knowledge.

*Medical knowledge:* It is the required information for diagnosis and treatment [14].

*Scientific knowledge:* It is about applying research findings in practice [88].

*Incident knowledge:* It is to learn from medical errors [170].

*Experience knowledge:* It is to experienced healthcare providers educate less experienced practitioners about the best practice procedures [173].

Knowledge sharing is a systematically planned and managed activity involving a group of like-minded individuals engaged in sharing their knowledge resources, insights and experiences for a defined objective [2]. The aim of healthcare knowledge sharing practices can be characterized as [2, 193]:

- To provide efficient and focused access to evidence based knowledge 'resources' (contact persons, websites, domain experts, discussions forums, knowledge artifacts, etc.), either by guiding the user to the knowledge 'artifacts' (a research paper, a practice guideline, a document) or by providing peer recommendations to help to find the relevant knowledge artifacts.
- To share the 'unpublished' intrinsic experiential know-how, insights, judgments, and problem-solving strategies of decision-makers to complement evidence-based knowledge.
- To establish a culture for collaboration between like-minded decision-makers in order to stimulate collaborative learning, atypical problem solving, practice evaluation, critical appraisal of evidence, practices and outcomes, leveraging peer experiences and knowledge.

It is universally accepted that appropriate knowledge sharing processes by the practices of knowledge creation, storage, transfer and utilization can dramatically improve the quality of healthcare services [2].

Healthcare professionals need to share the following three types of patient knowledge through healthcare referral services [195]:

*Technical knowledge:* It is to identify the patient conditions and problems, reasons and objectives for patient care, patient background, treatment agreement strategy, and explicit patient requirements and needs [171].

*Social and behavioral knowledge:* It concerns anticipating how others will behave and the perception of patients' implicit requirements, behaviors, reactions and expectations [65].

*Ethical and emotional knowledge:* It ethically deals with patients' feelings, emotions, and psychological statuses. It communicates to influence and manage individual patients and maintains trusting and collaborative professional patient relationships [65].

Among the three types of patient knowledge, technical knowledge is usually explicit and easier to share using

information systems, delivering patient records and any other relevant documents. But the other two are tacit knowledge and more difficult to share. Sharing them is invaluable for patient centered practice [195].

Many scholars consider information and communication technology (ICT) as a valuable means for facilitating different aspects of knowledge sharing and communication, as it reduces time and distance [66]. Knowledge sharing is considered as a function between three elements: i) healthcare knowledge, ii) knowledge sharing context, and iii) a knowledge sharing medium [4].

It has been unanimously agreed that appropriate knowledge sharing processes, based on good practices of knowledge creation, storage, transfer and utilization, are fundamental to resolve daily medical problems challenging healthcare professionals and more importantly, can dramatically improve the quality of healthcare services [3, 195].

## 10. Conclusion

In this study we have discussed KM strategy in healthcare. The KM in health sector became a discipline during the 1980s and can be used to improve service provision in the healthcare at present and future. We have discussed telemedicine and information technology to modernize the healthcare. Nursing contributes an important role to improve the quality of healthcare. So, KM is an essential issue in nursing profession. We have stressed on the cooperation among different healthcare providers. At present medical errors are great problems in health sector. We have emphasized on the reduction of medical errors. Fake medical centers, doctors and nurses can be identified and must be punished which are killing the patients by giving them wrong treatment. We have briefly discussed the KM strategy in health sector of four countries; The USA, The UK, France and China. The rising global healthcare cost is one of the most unexpected situations in the 21<sup>st</sup> century. We have highlighted to the reduction of healthcare cost. We hope that knowledge sharing can develop the health sector and we have tried to give a brief guide on knowledge sharing.

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