

Medical Errors Must Be Reduced for the Welfare of the Global Health Sector

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Abstract

After the Institute for Medicine's landmark 1999 report, medical errors are considered serious problems in healthcare, and attempts are taken globally to reduce them. Medical error is believed as the second victim to the healthcare providers. At present the medical errors become great challenges for healthcare professionals, and health policy makers. These are responsible to delay in recovery of patients' diseases, and sometimes impossible to recover. Although it is true that deaths from medical errors are the grievous for the bereaved families, some of these errors are unavoidable due to the complex healthcare systems. But most of them are avoidable and happen due to the negligence of the healthcare providers. Unfortunately, many of these errors are not disclosed to patients and their families. Reduction of these errors are necessary to maintain safe, and quality patient care for the welfare both patients and healthcare providers. Objectives of this study are to create consciousness among the patients about avoidable medical errors and to reduce the medical errors for the better treatment to the patients. If medical errors are reduced, the sufferings of the patients will be relieved and medical costs will be decreased. This article discusses aspects of medical errors and their effects on the patients and society. In this study an attempt has been taken to reduce medical errors in healthcare for the welfare of the global humanity.

Keywords

Medical Errors, Healthcare, Diagnostic Errors, Medication Errors, Nosocomial Infection, Prevention, Nursing

1. Introduction

An error is defined either as the failure of a planned action to be completed as intended, or the use of a wrong plan to achieve an aim [62]. It is considered as the failed processes of medical practice that leads to adverse outcomes which causes harm to the patients [130]. It is a major cause of negative health outcomes [119]. It is said that "To err is human". In any profession man may makes mistakes. But medical errors are serious harmful to the patients. These can be categorized as; judgmental errors, technical errors, expectation errors, and mechanical and system errors. Medication errors arise from wrong patient, wrong drug, wrong dose, wrong route of administration, wrong time, etc. [66, 125]. Sometimes the error is a preventable adverse effect of care which might result from erroneous or careless diagnosis or treatment of a disease, syndrome, injury, infection, behavior, or other ailment [49]. In 1999, in the USA medical error was the 8th most common cause of death,

but in 2015, it became alarming; 3rd (10%) leading cause of patient death [14, 74, 100]. Although it is unbelievable, it is true that the USA ranks last in health and mortality when compared with 17 other developed nations [86].

Human being must need healthcare facilities if he/she becomes sick. During the 1990s medical negligence cost in the UK has increased 7% per year, and estimated expenditure has become £400 million in 2003 [94]. Medical errors can occur at any level of healthcare, i.e., primary, secondary or tertiary levels [37]. Primary healthcare errors are found serious in 6% to 7%, and common errors are diagnostic, investigation, management, medication, and judgment errors [105].

The Institute of Medicine (IOM) released a report in 1999 which revealed that in the US hospitals there are 44,000 to 98,000 deaths each year due to medical errors. After release of this report the issue comes into the public eye globally [62]. In 2004, HealthGrades report stated that annual deaths in the USA due to medical errors may be as high as 195,000 [52]. In 2008, a report of the IOM

demonstrated that about 1 in 10 patients was harmed by a medical error during hospitalization, and estimated cost was \$19.5 billion, with 7% of these cases leading to a fatal outcome [32]. In 2015, the figures of death due to medical errors in each year in the USA are estimated to be between 210,000 and 400,000 which are about five times higher than that of 1999 [100]. It is estimated that 5 to 10 wrong medical procedures are performed daily in the USA [93]. Of these errors about one-third are unpreventable in the sense that reducing them would require advances in medical sciences [75]. Baker et al. [13] on a Canadian study has found that the total medical errors in Canada is 7.5% (in 2000, of the 2.5 million hospital admissions in Canada about 185,000 were associated with a medical error), excluding pediatric, obstetric, and psychiatric admissions. About 37% (or 70,000 cases) of these errors were potentially preventable. The most common types of errors were surgical-, drug- or fluid- related incidences [13].

Every year tens of millions of patients are suffering worldwide from disabling injuries or death due to medical errors [126]. Medical errors create serious harm to the patient, healthcare provider (physicians, nurses, pharmacists, etc.) and institution or clinic. The healthcare professionals also feel negative motive in job satisfaction, sleep, relationships with colleagues, and self-worth [45]. Doctors who make errors, become more anxious about the incidents, and feel difficulties in the concentration in future works. Most of them become serious to avoid mistakes in future [70].

Unfortunately sometimes medical errors are unavoidable in complex healthcare systems [20]. On October 2004, World Health Organization (WHO) has created the 'World Alliance for Patient Safety' [128]. Although medical errors are not fully avoidable, the health professionals need to learn from mistakes, and try to prevent or reduce these for the welfare of the patients.

2. Literature Review

Chitra Acharya, Vinaya K. C. Manchaiah, Alexis Lewis, and Harold Thimbleby have indicated that medical errors can result from a variety of activities, such as faulty medical device design, oral medication and intravenous infusion errors, poor catheter and tube feeding management, patient injuries, protocol compliance failure, and handover issues [3]. Sara Bleich has reported that five years after publication of the Institute for Medicine's landmark 1999 report, *To Err Is Human*, presented its dramatic findings of preventable death and injury in US hospitals, notable advances have been made, such as the development of performance standards, an increase in error reporting, integration of information technology, and improved safety systems [22]. Waterman et al. [121] in a survey completed by 3,171 of the 4,990 eligible physicians in internal medicine, family medicine, pediatrics, and surgery, and examined how errors are affected works and life domains. They have obtained that physicians feel anxiety about future errors, loss of confidence, reduced job

satisfaction, sleeping difficulties, and harm to their reputation following errors. World Health Organization (WHO) in a technical series provides a compendium of information on key issues that can impact safety in the provision of primary healthcare [129].

Diana R. Mager shows that medication errors from home care arises wrong dose or quantity of medications, omitting medications, or taking an unauthorized drug [80]. Naire Salmani and Bahare Fallah Tafti have investigated the frequency, type, and causes of medication errors in children's ward at hospitals in Yazd of Iran [107]. Anna-Riia Holmström has studies medication errors by enhancing medication safety through the use of medication error reporting systems in healthcare [53]. Seetal Jheeta and Bryony Dean Franklin have explored the impact of the implementation of an electronic prescribing and medication administration system (ePA) on the safety of medication administration in an inpatient hospital setting [57]. Cousins et al. [28] have stated the process steps in medication errors are; medicine administration (50%), prescribing (18%), omitted and delayed medicine (16%), and wrong dose (15%).

Paul S. Ragusa, Adam Bitterman, Brett Auerbach, and William A. Healy III have stressed to improve on the advances in implementing surgical checklists, and preventing wrong-site surgery [101]. In a contemporary review paper Tzyy-Nong Liou and Brian Nussenbaum have observed that wrong-site surgery has received high public awareness in the beginning of the 21st century [78]. Eta S. Berner and Mark L. Graber show that in a survey of 2,201 adults in the USA; 35% have experienced a medical mistake, and half of them are diagnostic errors. Of these errors, 35% resulted in permanent harm or death. They have also reviewed the literature on the effectiveness of potential strategies to reduce diagnostic errors and recommend future directions for research in this arena [21]. Arthur Elstein has studied clinical decision making for his entire career and has concluded that the diagnosis is wrong 10–15% of the time [39]. Mark Graber has discussed two major causes of diagnostic error; system-related and cognitive breakdowns, in some details. He stressed that diagnostic error is the most common situation in Emergency Departments. He estimates that globally about 10% diagnoses are wrong [48]. Robert L. Trowbridge has provided twelve tips that clinical educators may help learners to avoid diagnostic errors by employing several of the educational techniques [116]. Robert M. Wachter has indicated that adverse events have reduced systematically, but diagnostic errors, although common and often serious, have not improved [120].

Erica J. Lewis, Marianne Baernholdt, and Ann B. Hamric have illustrated the concept of nurses' experience of medical errors and the effect of them on nurses. They have also explained that the interventions of disclosure and support to nurses after medical errors are moderated by system characteristics and nurse characteristics [76]. Hassan Ahmed Khan, Fatima Kanwal Baig, and Riffat Mehboob have stressed on prevention, control and surveillance of nosocomial infections. They have determined that these

infections can be controlled by exercising infection control programs, continual check on antimicrobial use and its resistance, and adopting antibiotic control policy of the efficient surveillance system [60].

3. Objective of the Study

This study tries to discuss medical errors that are made by the physicians and other medical professionals. The main objectives of this research are the reduction and some cases prevention of these errors. Further, this study will bear the following specific objectives:

1. to identify the sources of medical errors,
2. to show the effects of medical errors on physicians, and
3. to find the types and incident of medical errors.

4. Research Methodology

The methodology of this article is to discuss causes and effects of medical errors, and to detect reduction and prevention strategies of these errors. In this study secondary data are used to perform the job efficiently. Secondary data are classified as 'internal or external' in its source. At present, a lot of secondary data are being collected and archived by researchers all over the world for research that are becoming more widespread [11]. The researchers who have limited time and resources, they can use the secondary data for their researches [90]. For the collection of secondary data; both published and unpublished data sources are used. The published data are collected from various publications, research reports, online databases (e.g., PubMed, MEDLINE, Google Scholar, etc.), magazines, newspapers, books of various authors, theses, journals, websites, and other sources of published information. The unpublished data are collected from diaries, letters, unpublished autobiographies, etc.

5. Medical Errors

In 1982, a report on medication errors from the 1960s in hospitals in the USA, the UK, and Canada was published [15]. Medical errors are defined as the mistakes performed by health professionals that result in harm instead of benefit to the patients [66]. All kinds of medical errors are unfortunately inevitable in healthcare. These errors are created by faulty systems and some of these errors are largely preventable [25]. Many medical errors are occurring in health sector, and many 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, paramedics, and administrative personnel at different stages of administration of medical care [13].

Errors may occur at any stage of the treatment process, such as an inappropriate prescription, incorrect or delayed laboratory results, improper equipment, wrong diagnosis, and improper or inadequate treatment in hospitals, physicians'

offices, clinics, surgery centers, ambulatory care, nursing homes, pharmacies, patients' homes, urgent care centers, and care delivered at home [18, 69, 79, 98]. Commonly occur medical errors are adverse drug events and improper transfusions, surgical injuries and wrong-site surgery, restraint-related injuries or death, burns, suicides, pressure ulcers, and mistaken patient identities [62]. The most common causes of medical errors are [102]; i) direction of the wrong medication, ii) wrong dose of the correct medication, iii) giving a treatment to the wrong patient or at the wrong time, and v) using the wrong route of administration.

6. Incidents of Medical Errors

One in seven medicate 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 [4]. About 40% of autopsies show that a major misdiagnosis leads to patients' deaths [46].

On 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 [30, 62]. 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 [34]. 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 [77]. It is said that about 54% of these errors are preventable [56]. 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 [17, 59]. Most of the people of the USA die as a result of medical errors than from automobile crashes (43,458), AIDS (16,516), surgery-related (32,000), breast cancer (42,297), etc. [55]. In 2015, medical errors exceeded auto accidents, strokes, Alzheimer's, diabetes, etc., besides cancer and heart diseases [100].

In the UK there is no official authority collecting data relative to medical errors occurrences. Medical error is the third most frequent cause of death in the UK after cancer and heart disease, killing up to 40,000 people in each year. In Germany, there are 400,000 deaths in 1999 due to medical errors [47, 118]. In the UK the cost of financial compensation for medical errors was estimated to be more than £400 million in 2003 [94]. In a report according to National Health Services (NHS) of the UK about 72,000 patients had died due to medical errors, whereas in Canada 24,000 patients had died because of the same reasons [50].

The Quality in Australian Health Care Study on an analysis of more than 14,000 medical records shows that 18,000 Australians die each year because of medical errors, and 50,000 suffer permanent disability [125]. Of these errors,

about 4,500 (25%) of deaths are preventable [103]. When medical errors are happened the doctors, nurses and related officers and workers feel upset, guilty, depressed, self-critical, and scared [110].

7. Types of Medical Errors

At present there is no universally accepted taxonomy of medical error. Usually there are ten categories of medical errors occur in healthcare [55, 71, 72]; i) Medication error; receive of the wrong drug, inappropriate care, error in the administering the treatment, error in the dose or method of using a drug, delay in treatment, unanticipated death of a full-term infant, incorrect dose of a medication leading to patient death, etc., ii) Surgical error; amputating the wrong limb, surgery on the wrong patient, error in the performance of an operation, procedure or test, etc., iii) Diagnostic error; incorrect choice of therapy, wrong/delay diagnostic test, misdiagnosis leading to an incorrect choice of therapy, use of outmoded tests or therapy, misinterpretation of test results, failure to do diagnostic indicated tests, failure to act on results of monitoring or testing, etc., iv) Equipment failure; defibrillators with dead batteries, intravenous pumps whose valves are easily dislodged or bumped, causing increased doses of medication over too short a period, etc., v) Preventive error; failure to provide prophylactic treatment, inadequate monitoring or follow-up of treatment, the discharge of an infant to the wrong family, etc., vi) Infections; nosocomial and post-surgical wound infections, vii) Blood transfusion related injuries; a patient receiving an incorrect blood type, taking of infected blood, etc., viii) Misinterpretation of other medical orders; failing to give a patient a salt-free meal, as ordered by a physician, ix) Avoidable delay in treatment or in responding to an abnormal test, inappropriate care, and x) Error in the administering the treatment.

7.1. Medication Errors

Medication error is among the most common medical errors of patients' safety in healthcare. There is no fixed definition of medication error. According to American Academy of Pediatrics, (AAP) medication error is defined as "*Disregarding the status of forming a damage, or risk, any avoidable incidence to occur during the process from medication request to patient monitoring.*" It can take place from human mistakes and systemic errors [1]. The United States National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) defines a medication error as "*Any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer. Such events may be related to professional practice, healthcare products, procedures, and systems, including prescribing, order communication, product labeling, packaging, and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use*" [92].

To understand drug errors, it is important to distinguish one error from another [7]. Some common medication errors are: errors of dosage, missing of doses or not completing a regimen, taking an extra dose, wrong timing, giving drugs of expired date, giving a drug to the wrong patient, preparing an incorrect dilution of a drug, failure to administer the drug, continuing to give a drug after it has been discontinued, etc. [38, 114]. Medication errors happen during prescribing incorrect diagnosis, an unauthorized drug, an extra dose, and an incorrect drug selection [40]. These also occur frequently due to deficit of patient knowledge or when a patient takes more than one medication of the same class or using oral suspension without shaking the container, or by reducing the number of doses in a day or by cutting pills in half or by sharing medications with others to save costs and avoid side effects, or incorrect use of medication boxes [64]. For example, if a tuberculosis patient misses doses or takes low doses, the disease may be drug resistance or multidrug-resistant, or extensively drug-resistant, and cure of this type of disease is difficult or some cases impossible [89]. Some medicines have different names, but these look alike, and a patient or clinician could mistake one medication for another [38]. For example, if two bottles of liquids same color and shape, one is medicine and the other is of poison, are placed side by side; a patient may mistakenly or carelessly take poison instead of medicine, and the patient may seriously injure or die.

The common types of medication errors in hospitals are 39%, 38%, 12%, and 11% at the prescription, administration, transcription and verification, and dispensing phases respectively [73]. According to Frith et al. [44], omission errors, failure to follow protocols, wrong dose, and wrong patient were the most common errors. A heavy workload, shortage of nurses, weak pharmacological knowledge, poor arithmetic skills in nurses and lack of experienced nurses per shift are the main cause of medication errors by nurses [88, 114].

Medication errors are global problems. The incidences of medication errors are higher among pediatric patients (1.48%) than the adults (0.57%) [42]. In the USA, medication errors are the most common type of medical errors that cause about 7,000 patient deaths in a year [61]. About 400,000 cases of avoidable patient injury due to medication errors happen per year in the USA, which cost of \$3.5 billion [54]. In Finland, a country of population of 5.5 million; 700 to 1,700 people die each year from medication related errors [131].

To avoid medication errors the patients can prepare a well-made chart or diagram and use medicines accordingly. They can use clear, simple, and abbreviation free words in chart or diagram. Increase of communication, collaboration, and coordination among healthcare professionals, reduction in poly-pharmacy, use of medication boxes, cooperation with social workers and pharmacists can reduce medication errors. Evaluation of the cause of skipped doses is necessary for better treatment [80].

7.2. Surgical Errors

Surgical operation is an essential and life saving component of healthcare. At present surgery is considered highly unsafe, which accounts one in every 10,000 surgical operations. But in an orthopedic trauma, the figure is observed one in every 100 cases [9]. The surgical errors arise from the surgeons, anesthetists, nurses, and other members related with operations. Errors can be reduced in surgical operations by the careful coordination of the members of the team, use of advanced technology and technical skills, avoid of contamination, proper use of anesthesia, proper nursing, and very quick procedures [87]. Every year about 234 million surgical treatments are done worldwide. About 7 million patients face serious complications, and about one million die during or soon after the surgery [122].

Despite many campaigns to prevent, wrong-site surgery (WSS) is a more common error [97]. WSS is defined as; surgery undertaken on the wrong person, the wrong organ or limb, wrong side or the wrong vertebral level, etc. [6]. The National Quality Forum and Centers for Medicare & Medicaid Services consider it as a “never event” [104]. According to the American Academy of Orthopedic Surgeons, WSS of orthopedic surgeons is 25% (40 events per week) [24]. It is a potentially destructive event to patients, families, physicians, and other individuals related to it. It is estimated that about 2,058 wrong site, wrong procedure, and wrong patient claims occur in surgical operations per year in the USA [84].

In 2007–2008, for increasing the quality and safety standards for surgical care, four steps are taken by WHO as; 1) prevention of infections at the surgical site, 2) safe anesthesia, 3) safe surgical teams, and 4) surgical care indicators [126]. In 2008, WHO published its Surgical Safety Checklist, a 19-item list designed to decrease surgical errors and adverse events, and increase teamwork and communication among operating room staff [51]. The WHO checklist could have prevented 83% of WSS incidents with actual harms, and 15% of the near misses [99].

7.3. Diagnostic Errors

Diagnosis is one of the most important activities that are performed by the primary healthcare providers [129]. Diagnostic errors are considered as failures to provide accurate and timely explanation of the patient’s health problems [108]. These are common and occur in every healthcare system. Most cases these do not have serious effects, but sometimes cause serious harm, such as disability and death [21]. Although patient safety in healthcare has increased, diagnostic error remains common. Most trainees and specialists pay little attention to the root causes of diagnostic errors and do not take them seriously to avoid them [116].

The IOM report of Kohn et al. [62] has mentioned the term medication errors 70 times, but diagnostic errors appear only twice. Even after this report more stresses are not given on diagnostic errors in many researches [120]. The diagnostic

errors in primary healthcare are common in patients with pneumonia (7%), decompensated congestive heart failure (7%), acute renal failure (5%), cancer (5%), and urinary tract infection (5%) [109].

The reduction of diagnostic errors is an essential element that is preventable. Computer-based diagnostic decision support systems can reduce a misdiagnosis. In the USA, the error rates in clinical radiology and anatomic pathology probably range from 2% to 5% [41, 67]. Sometimes X-rays are read by non-trained radiologists up to 16% of plain films, and 35% of cranial computed tomography (CT) studies are misread [65]. About 10% to 30% of breast cancers are missed diagnostic errors in radiology on mammography, and 2% or more of cancers are missed on biopsies. About 10% to 20% diagnostic errors are found in of autopsy [19, 48].

The Quality in Australian Health Care Study identified 2,351 adverse events related to hospitalization, of which 20% represented delays in diagnosis or treatment and 15.8% reflected failure to “synthesize/decide/act on” information [124]. British hospitals reported that 6% of the diagnoses are incorrect. The rate of diagnostic error in the emergency department ranges from 0.6% to 12% [26]. About 10% to 30% of breast cancers are missed diagnostic errors in radiology on mammography [19]. In a study in 1998 of New Zealand examined that 6,579 inpatients found that diagnostic errors are 8%; and 11.4% of these are regarded as preventable [31].

7.4. Blood Transfusion Errors

Blood is a biological component that passes through arteries and veins by the heart and lung. Correct transfusion of blood can save lives of patients. The right blood donation to the right patient at the right time is an essential part of healthcare [23]. Blood transfusion before World War I was an experimental, trial-and-error nature. The first blood bank was established at the Cook County Hospital in Chicago and Illinois. During the World War II there was a massive growth in blood banking to save lives of battle injuries [111].

Sometimes blood transfusions face errors. For example, delay of blood supply to an urgently needed patient, or mislabeling the blood sample, or fraction use of another patient’s blood, or transfusion-transmitted bacterial infections, or over-transfusion leading to circulatory overload, or pulmonary oedema, issuing wrong ABO, or Rh group for transfusion, or transfusion of blood of another patient [35].

In blood transfusions life-threatening conditions may occur. For example, transfusion-related acute lung injury (TRALI) is a life-threatening adverse effect of transfusion which causes acute respiratory distress and pulmonary oedema; transfusion-associated circulatory overload (TACO) that causes respiratory distress, tachycardia and increased blood pressure; and hemolytic transfusion reactions (HTR) that causes due to the transfusion of ABO-incompatible blood [106]. Transfusion-related acute lung injury (TRALI) is the leading cause of transfusion-related mortality. TRALI is considered as new acute lung injury that occurred during or

within six hours after blood product administration characterized by acute hypoxaemia, bilateral infiltrates on frontal chest radiograph and no evidence of left a trial hypertension [115].

Sometimes there arise risks of infection or reactions in the body of recipients. For example, blood supply and transfusion of HIV, hepatitis B and C, syphilis, malaria, dengue fever, west Nile virus, human T-lymphotropic virus I/II, variant Creutzfeldt-Jakob disease (vCJD), and other harmful virus infected blood (e.g., parvovirus B19, brucellosis, Epstein-Barr virus, toxoplasmosis, Chagas disease, infectious mononucleosis, and Lyme's disease) [23]. More than 30 million transfusions of blood components are performed each year in the USA [10]. In the UK over 2.5 million units of blood are transfused annually [95]. At present blood transfusions are safer than the previous periods. Because, there are advances in donor screening, improved testing of the blood supply, improvements in transfusion medicine practices, and use of emerging technology [43].

National Blood Collection and Utilization Survey (NBCUS) 50,570 adverse reactions were reported to hospital transfusion services in 2011, which is likely an underestimate of all transfusion-related adverse reactions. Out of these, approximately 21,000 were severe [27]. Cost of blood-product waste due to transfusion errors in Canada from 2005 to 2010 was 593,337 Canadian dollars [83].

7.5. Nosocomial and Post-Surgical Wound Infections

Nosocomial infections are the infection of other diseases when the patients are taking treatment of a disease during prolonged stay in intensive in healthcare, and prolonged use of antibiotics, but were not infected at hospital admission [123]. These are the most common type of complication affecting hospitalized patients. These happen 7% in developed and 10% in developing countries [29]. These infections are transmitted by bacteria and viruses through hand-mouth respiratory route, and fecal-oral route. Nosocomial infections related diseases are; sepsis, surgical site infections (SSIs) (caused by *Staphylococcus*, *Streptococcus*, and *Pseudomonas* bacteria), pneumonia, Influenza, hepatitis B and C, HIV, rotavirus, urinary tract infections, bloodstream infections, and herpes-simplex virus through unsafe injection [5, 36]. Common features of SSI are; pyrexia ($\geq 37.8^{\circ}\text{C}$), vomiting, tachycardia, leucocytosis, tachypnoea, refusal to feed/anorexia, etc. [96].

Post-surgical wound infections are major problems in the field of surgery. Prevention of them is serious but an important issue in all countries due to high morbidity and mortality among the patients which also causes severe economic burden with pains and sufferings. Most of these infections are nosocomial [82]. SSIs patients need to stay more days in hospitals and face risk of mortality due to post-surgical infections [113]. In 2011, about 31% (157,500) SSIs were faced among hospitalized patients in the USA. Diabetes is one of the most important risk factors for the development

of post-surgical wound infections [81]. Other risk factors of SSIs are: smoking, Body Mass Index (BMI), blood transfusion, video-assisted procedures, non-performance of preoperative bath, and pre-existing chronic diseases [63].

8. Financial Effects for Medical Errors

In 1985, The St. Paul Fire and Marine Company reported an average award of \$18,273 per medication error-related insurance claim between 1982 and 1985 [112]. By 2000, the median compensation award for medication errors rose to \$668,000 per award [58]. The cost of medication errors in the USA is estimated to be \$2 billion annually in terms of lost income, lost household production, disability, and healthcare costs [61].

9. Prevention and Reduction of Medical Errors

There are various ways to prevent medical errors. Habit of denial of medical errors can be avoided to reduce future errors. Accurate and complete record of treatment is necessary for the welfare of the patients [16]. Effective team works can reduce errors. Errors in healthcare may cause adverse drug effects. Knowledge management (KM) helps to reduce medical errors of the practitioners by providing a decision support [2]. Various studies reveal that KM is capable to reduce the medication case report errors as high as 55% [85]. Many patient safety-related classifications were developed all over the world [127].

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 [91, 117]. At present International Classification for Patient Safety (ICPS) tries to develop a classification system. It collects patient safety information from different sources to simplify aggregation, analysis and learning across fields, boundaries, and times [127]. Many researchers believe that medical expert systems have great potential to improve healthcare by reducing medical errors. For the reduction of medication errors policies are needed to [8]: i) develop staffing levels, skill-mix, stress, and workload, ii) nurses, doctors, pharmacists, and families of patients need close communication, iii) provide appropriate policies and guidelines as well as access to supportive technology and ongoing educational support, iv) engage ward-based clinical pharmacists, iv) computerize the reports of doctors entry period with clinical decisions, and vi) the preparation and administration of medications. Information technology (IT) can be used to reduce errors. Computerized physician order entry (CPOE) can reduce errors by 55% to 86% [33]. Implementation of CPOE has been slowed due to both financial cost and administrative structure [68]. About 10% of the US hospitals have made CPOE completely and about 7% have made partially

available to physicians [12]. Some policy proposals to reduce medical errors are as follows [118]:

1. building public awareness of medical errors,
2. continually involving the patient and family in the process of diagnosis and treatment,
3. building purchasers' awareness of the problem,
4. computerizing physician ordering entry systems combined with clinical decision support systems,
5. using clinical pharmacists in the inpatient setting,
6. taking a second opinion from an experienced specialist to confirm a diagnosis and appropriate treatment options,
7. introducing different colored syringes for IV and oral medications,
8. checking of medication orders by two nurses before dispensing medication,
9. giving best guide to the healthcare providers to improve patient safety,
10. using decision-support systems and information technologies, and
11. using standardized procedures, data integration, and checklists, and the results of human factors research.

10. Conclusion

Medical errors are unanticipated, and most of them are preventable. These increase morbidity and mortality to the patients. If basic cultures and systems in the healthcare are transformed, medical errors can be reduced. The morale of healthcare professionals must be improved to change the cultures and systems. By reducing medical errors doctors and medical institutions also can improve their financial performance. Seminars, workshops, and conferences about quality treatment can reduce the medical errors. More timely and error-free diagnoses are necessary for the accurate treatment of the patients. To reduce diagnostic errors in healthcare it is needed to use the latest technology, encourage and increase research, and develop medical teaching. When errors occur, physicians and related professionals should not hide them, and would learn and prevent them.

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