Medication Errors: The Role of Societal Attributes

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Abstract

Depending on the statistics examined, medication errors are responsible for 44000 to 400000 deaths annually. This chapter examined the role of societal attributes in medication errors. Although several studies have been conducted on medication errors there is still no uniformity in the definitions which makes evaluation of medication errors difficult. Despite the non-uniformity of definitions, all the research articles reviewed agreed that enhanced oral and written communications between health care providers and patients or parents of patients was a step towards the prevention of medication errors. The health literacy level of both health care providers and consumers also contribute to medication errors.

Keywords: Health Literacy, Accreditation Council for Graduate Medical Education (ACGME), Functional Literacy, The National Council for Medication Error Reporting and Prevention, Institute of Medicine (IOM).

Introduction

This chapter would examine possible reasons for medication errors by looking at factors from the patients' side and from the prescribing doctors' side. It would also explore the path the

prescription takes from the doctor till the patient gets the medication. In addition, it would suggest ways that the errors can be prevented.

Medication errors are estimated to account for at least 7000 deaths annually in the United States (Kohn, Corrigan & Donaldson, 2000). The United States Food and Drug Administration (2009) reported that at least 1 death occurred per day and 1.3 million people were injured each year due to medication errors. The mean medical malpractice payment related to medication errors between 1990 and 2002 was $157,945 (Annual Report, National Data Bank, US DHHS, 2002).

The first and second leading causes of death in the United States in 2006 were heart disease and cancer respectively. The fifth leading cause of death was unintentional injuries or accidents. Medication errors that lead to death fall under unintentional injuries (Center for Disease Control, 2006). Adverse drug events are injuries caused by the overdose, the under dose or the stoppage of a drug or by an adverse drug reaction. If a medication is stopped before it is able to cause harm to the patient, this is known as a 'near miss' or a potential medication error.

Medication errors include prescription errors (Lewis et al, 2009; Ross, Bond, Rothnie, Thomas & Macleod, 2008). Deaths due to preventable adverse events exceed the deaths attributable to motor vehicle accidents (45,458), breast cancer (42,297) or AIDS (16,516) (National Vital Statistics Report, 2009). Out of 119.2 million emergency department visits in 2006, 1.9 million visits were for adverse effects of medical treatments including complications of medical and surgical procedures (Pitts, Niska, Xu, & Burt, 2006).

The publication of a two hundred and eighty-seven page book, To Err is Human: Building a Safer Health System was pivotal in the exposition of the magnitude and impact of

medication errors in the health care system (Kohn et al., 2002). In the book, the Institute of Medicine reported that 44000-98000 Americans die annually from medication errors in hospitals. McDonald, Weiner and Hui (2000) disagreed with the book and said that the figures were exaggerated. On the other hand, James (2013) disagreed with the figures by the Institute of Medicine suggesting that they could be as high as 400000 per year. In 1983, 2876, people died from medication errors and in 1993, 7391 died from medication errors (Kohn et al., 2000). If the estimate by James (2013) was used, then medication errors would be the third leading cause of death behind heart disease and cancer.

There has been an increase in the number of deaths from medication errors. A medication error is "a failure in the treatment process that leads to or has the potential to lead to harm to the patient" (Ferner & Aronson, 2006). Flynn (1999) asserts that pharmacists were the pioneers in studying medication errors as far back as the 1960's while testing for quality control in drug distribution systems.

"A medication error is any *preventable* event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems including prescribing; order communication; product labeling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use" (The National Coordinating Council for Medication Error Reporting and Prevention, 2001).

Ferner (2009) opined that epidemiological studies on medication errors have been made difficult because there was no agreed consensus on the definition of medication errors. However,

he was able to classify medication errors into four classes, knowledge-based medication error, rule-based medication error, action-based medication error and memory- based medication error. Further, Ross et al., (2008) agreed that there was difficulty in research on medication errors because there was no consensus on the definitions.

A systematic literature review of the prescribing errors by junior doctors in Western Europe, North America and Australasia by Ross et al. (2008) showed that the errors were due to wrong dose, wrong frequency, omitted information, wrong route, contraindications due to allergy, wrong drug, inaccurate information, other contraindication, illegibility, unclear quantity and wrong patient. Wrong dose was the most common medication error followed by wrong frequency.

According to the United States Food and Drug Administration (2009), the common causes of medication errors are poor communication, ambiguities in product names, directions for use, medical abbreviations or writing, poor procedures or techniques or patient misuses. These errors can occur during prescribing, repackaging, dispensing, administering or the monitoring process.

Bruce (2009) divided adverse drug events into three groups; wrong drug, wrong dose and wrong patient. Certain human conditions also increase the susceptibility to medication errors. These include inattention, knowledge-based errors, after hour shifts errors and treating an unfamiliar patient (Bruce, 2009).

Bruce (2009) also noted that in a study conducted in Australia, medication errors occurred shortly after handover of a patient to another team and that most errors took place when the surgeons were changing shifts and treating unfamiliar patients.

Work Schedule of Doctors and Medication Errors

In June 2003, the Accreditation Council for Graduate Medical Education (ACGME) approved an 80 hour work week as the upper limit (ACGME, 2003). This plan stemmed from a petition filed with the Occupational Safety and Health Administration by Public Citizen, the American Medical Student Association and the Committee of Interns and Residents (ACGME, 2001). Seven years after the recommendation, the ACGME admitted that there were difficulties in implementing the standard hours across all disciplines (Philibert et al., 2011). Ross et al. (2008) suggested that interventions should be made in the medical school curriculum because junior doctors were responsible for 91% of prescribing errors.

In June 2010, The ACGME released a plan to reduce the number of shift hours that the newest graduate medical doctor will have to undertake immediately upon graduation (Nasca, Day & Amis, 2010). However, the ACGME was not able to stipulate specific number of hours for the different disciplines because the members of the task force admitted that different disciplines required different levels of rigor. In 2011, ACGME released the ACGME 2011 duty hour standard, the second standard it had released since the 2003 standard (ACGME, 2011a). The Accreditation Council for Graduate Medical Education (ACGME, 2011b) recommends the 80 hour limit per week on an average over a four week period.

In a review of medication errors by Camiré, Moyen and Stelfox (2009), the researchers found out that physicians on extended work schedule made more medication errors than physicians that did not have an extended work schedule. Also in their review, they observed that the introduction of a computerized physician order entry reduced the prescription errors from 6.7% to 4.8%. Further, they observed that the participation of pharmacists in the intensive care

unit reduced the medication errors. With the participation of a pharmacist, the prescription errors decreased by 66%. Medical reconciliation of patients' discharge notes with patients' medical records prevented an average of 10 medication errors per week. Medical reconciliation involved comparing the patient's medical records with his/her discharge notes.

Further, in their review, they observed that units that followed medication standardization in compliance with the American Society of Health-System Pharmacists by comparing order sheets before and after implementation had a reduced number of medication errors. In 1993, the American Society of Health-System Pharmacists published a set of guidelines to prevent medication errors in hospitals (ASHP, 1993).

Review of Medication Errors in Health Care Facilities

A prospective cohort study of resident doctors from three large pediatric training programs to determine whether work hours and sleep hours of doctors changed after the ACGME recommendation found that there was no change in their work and sleep hours (Landrigan et al., 2008). A previous study (Landrigan et al. (2004) showed that when interns worked frequent shifts of more than 24 hours, they made more errors.

In a study done in Brazil, during a thirty-day period of observations of an adult intensive care unit, Bohomol, Ramos and D'Innocenzo (2009) found that 305 medication errors occurred in the intensive care unit with a mean of 6.9 occurrences per patient. Omission error was the most common type of error followed by "wrong time error".

In another review of medication errors over a three-year period in a pediatric cardiac intensive care unit, 12, 577 prescriptions were analyzed (Burmester, Dionne, Thiagarajan &

Laussen, 2008). The study showed that a baseline error rate of 16.9% occurred during the initial four week period. After interventions were introduced by the investigators, the error rate dropped to between 3.4% and 4.8% (Burmester et al., 2008). These interventions involved the introduction of physician education and post cardiac surgery template forms. In another review of medication errors by Lewis et al, (2009) the researchers found that most errors occurred with antimicrobial agents. Similarly, medication errors were associated with cardiovascular drugs (24%), anticoagulants (20%) and anti-infective agents (3%).

Medication Errors Arising From Consumers

Apart from medication errors attributable to doctors and other health care providers, parents of pediatric patients also make medication errors. Yin et al. (2010) observed 302 parents of pediatric patients measuring liquid oral medications. The study showed that between 30.5% to 50.2% of the parents correctly measured the liquid medications.

It has also been suggested that the variety in the measuring devices used to administer the liquid medications is a contributory factor in the errors that parents of pediatric patients make in administering liquid medication.

In a separate study on medication errors outside medical facilities; 1381 cases that reported to an Israeli national poison center during a 5 month period were examined using a self-administered questionnaire and a follow up phone call (Lavon, Ben-Zeev & Bentur, 2014). In the study, parents were responsible for 55.6 % of the cases and the errors were single incident, wrong dose due to look-alike packaging or misunderstood instructions.

A cross sectional study conducted in South Korea among 179 parents of pediatric patients and parents of children from three day care centers showed that 15.1 % of the parents reported that they were unsure of the recommended dosage they were to administer to their children and 12.3% of the children had experienced adverse drug events (You, Nam & Son, 2015).

In another study, 120 parent-child pairs participated in a study by the parents completing a questionnaire and measuring liquid medications using different measuring devices (Tanner, Wells, Scarbecz & McCann, 2014). The study showed that there were more dosing errors with measuring cups than droppers, household spoons or other measuring devices. Measuring errors from parents may be enabled by the variety of measuring devices.

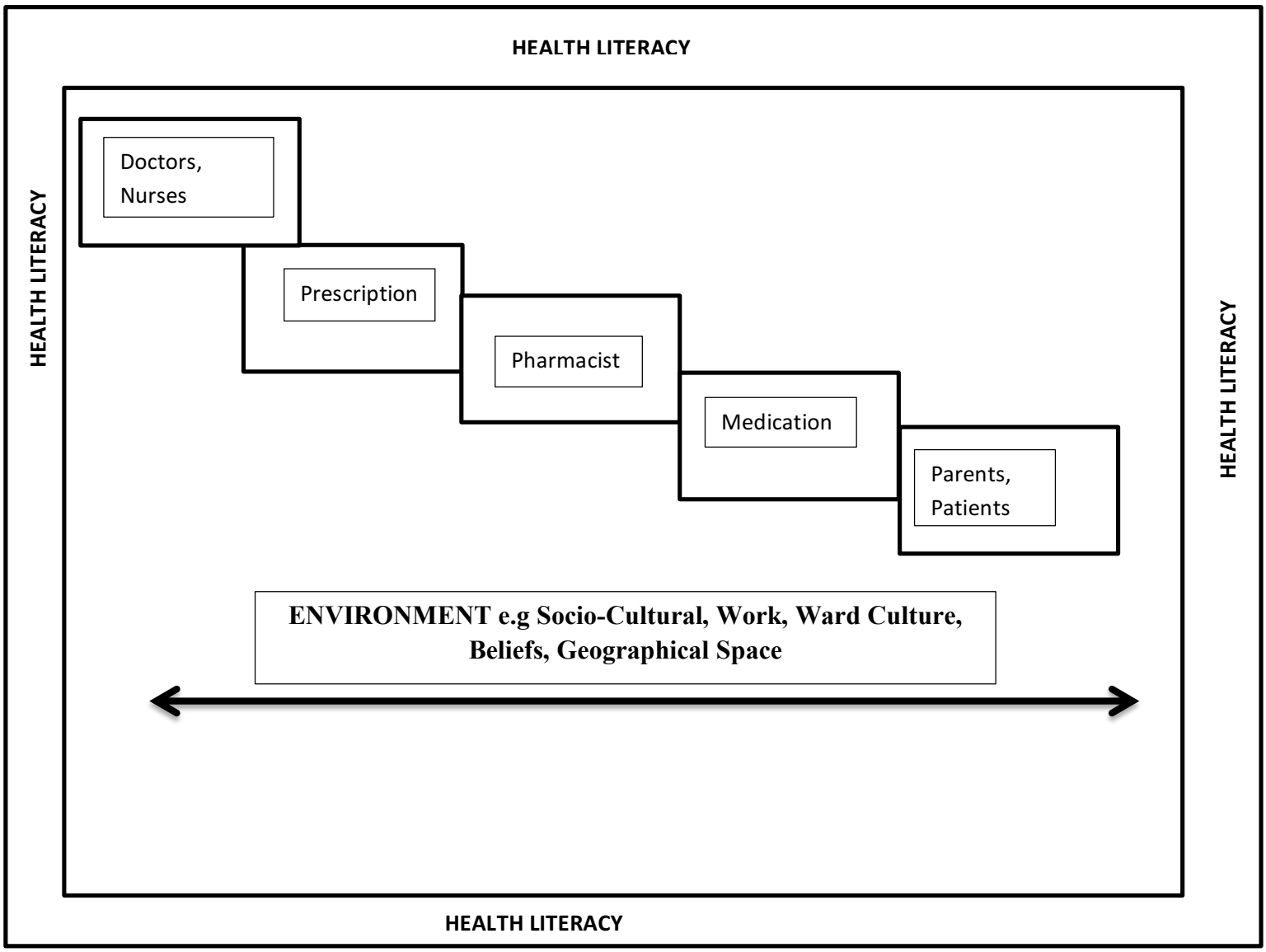
Societal Roles in Medication Errors

Is the patient responsible for some medication errors? Can the patient prevent some medication errors? Can the society prevent medication errors? The rest of this chapter would attempt to answer some of these questions and examine societal roles in medication errors.

Figure 1 illustrates the players at work in medication errors. It identifies five major points that can generate errors; the doctor or nurse, the prescription, the pharmacist, the medication and the patient or parent of the patient. All these players are enabled by the environment. At each of these points, errors can be generated. In addition, the level of health literacy of all the players has a significant role in medication errors. Medication errors can be caused by any of the players identified in Figure 1.

FIGURE 1

Figure 1. Graphic Representation of the Interconnectedness of the Players in Medication Errors



According to the Institute of Medicine's report (Institute of Medicine, 2004) Health Literacy: A Prescription to End Confusion; Health Literacy is defined as " The degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions". Health literacy is not determined by the individual alone but by the environment incorporating the health, social and cultural contexts. Further, it is not only consumers that may demonstrate a level of health literacy that can lead to medication errors. The doctors, nurses, pharmacists and all other players in the medication distribution line can demonstrate health literacy that could lead to medication errors (Nutbeam, 2008).

When the organizational context and structure of 142 acute care hospitals were examined as predictors of medication errors, units that had a higher number of nursing staff and low safety climate reported fewer medication errors (Mark et al., 2008). A review of literature by Hoff, Jameson, Hannan and Flink (2004) did not find any link between organizational structure and medication errors.

A separate study conducted by Belgen, Goode and Reed (1998) showed that units that had registered nurses had fewer medication errors but after a certain point, increase in registered nurses correlated with increase in adverse drug events. There are a myriad of definitions of health literacy (Berkman, Davis & McCormack, 2004). However, from the many definitions, the skills necessary to achieve health literacy must include the ability to read, understand written information, calculate and interpret numerical values necessary for measuring prescription medicine, make decisions based on the information obtained and the ability to relay the information as well as apply the information. The ability to effectively comprehend and relay

communicated health information is important. The adult must be able to calculate the volume of oral medication needed.

Health Literacy

In Figure 1, health literacy encompasses all the players identified in the figure because health literacy is essentially a communication skill that is associated with the health care providers, the hand written prescription or the electronically generated prescription, the pharmacist, the medication and the patient of parent of the patient.

Low literacy skills have been associated with chronic health diseases, poor use of health services and low health knowledge (Berkman et al., 2004). Low health literacy skills in patients may be due to their inability to read and some may hide this from the health professional (Parikh, Parker, Nurss, Baker & Williams, 1996). The use of pictorial aids has been shown to increase the comprehension of patients on how to use their medication (Katz, Kripalani & Weiss, 2006).

Health literacy is a functional literacy which is distinct from achievement standards in schools. “Functional literacy is the ability to use reading, writing and computational skills at a level adequate to meet the needs of everyday life situations” (Parker, Baker, William & Nurss, 1995).

Environments are influenced by ward culture, geographical space, cultural beliefs and these influences the communication (Manias, 2010). Health care providers and patients come with their biases and these can influence the medical communication. Health care providers also falsely believe that the number of years of schooling is a good measure of patients' health literacy levels and may not adequately explain the medication instruction to them.

Research has shown that most of the education materials given to patients are above the reading level of high school graduates (Obilade, 2016; Rudd, 2007). An adult literacy survey showed that 67% of adults that had high school education had below basic health literacy (National Center for Education Statistics, 2006).

Prevention of Medication Errors

The prevention lies with the health care provider and with the patient or the parent of the patient. Doctors should write their prescriptions entirely in plain English instead of writing partly in English and partly in Latin (Benjamin, 2003). Health care providers should always reconcile patients' discharge notes with patients' health records. Health care organizations should provide comprehensive guidelines on medication errors and health care providers should become familiar with these guidelines.

The patient should make sure s/he can read every prescription. Kleinschmidt, Pugach and Young (2008) have suggested that drugs that look alike or sound alike should have warnings posted on them electronically or they should be stored in different places. They also suggested that the look-alike names could be highlighted or put in bold font or that the letters could come with a different color on the computer. They suggested the use of tall letters to be used in the labeling of look alike, sound alike medications (e.g oxyBUTYnin, oxyCONTin). Health education materials including medication directions should be written at a reading level that most patients would comprehend. Pharmacists should participate in the management of patients in intensive care units.

Conclusion

A unified definition of medication errors will make evaluation of medication errors more meaningful to both patients and health care providers. Effective interventions can be achieved across board if there is a unified definition. Further research should be conducted to assess all the studies that have been done on medication errors so that a universal plan can be implemented. Health care providers should improve on their communication skills.

Medication errors are not attributable to only the health care providers; patients and parents of pediatric patients are also prone to medication errors. The environments in which all these players find themselves affect the outcomes that may lead to medication errors. Health care providers should use electronic prescribing. Health literacy plays a major role in medication errors. Health educational materials should be written at a level most adults can comprehend.

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