

Nurses' Compliance with Medication Safety Standard in Enaya Specialized Care Centre, Doha, Qatar

Article by Christianah Mojirade Adeola, Oyinloye
RN-MSN in Nursing, Texila American University, Nigeria
E-mail: oyinrade@gmail.com

Introduction

Background

One of the most fundamental components of health care quality is the patient safety (World Alliance for Patient Safety, 2004). Patient safety is a priority for every health care system that follows specified standards by ensuring and improving the quality of health care services as one of the main concerns of managers of health care systems (Westat, Sorra, Famolaro, et al., 2010; Stratton, Blegen, Pepper et al., 2004; Bahadori, Ravangard, Aghili et al., 2013).

Patient safety is an essential and vital component of quality nursing care. However, most nations' health care system is prone to errors, and can be detrimental to safe patient care, as a result of basic systems flaws. A variety of stakeholders (society in general; patients; individual nurses; nursing educators, administrators, and researchers; physicians; governments and legislative bodies; professional associations; and accrediting agencies) are responsible for ensuring that patient care is safely delivered and that no harm occurs to patients (Ballard, 2003).

Most hospitals across the U.S. put ever-changing compliance and quality improvement standards toward the top of their list of organizational priorities. This is important for not only providing a safe environment for the delivery of patient care, but also for assuring that operations are aligned with standards set forth by the Joint Commission on Accreditation of Healthcare Organizations (TJC) and the Centers for Medicare & Medicaid Services (CMS) (Reigle, 2013).

In Qatar, safety is a fundamental principle of patient care and an important component of quality management. Its improvement demands a complex system-wide effort, involving a wide range of actions in performance improvement, environmental safety and risk management. Patient safety involves nearly all health care disciplines and sectors, therefore it requires a comprehensive multifaceted approach to identifying and managing actual and potential risks and finding broad long-term solutions for the health care system (Qatar Supreme Council of Health, 2015).

As part of efforts towards achieving quality patient care in Hamad Medical Corporation, the Best Care Always campaign was launched in October 2013. This marked an important milestone in Hamad's journey to achieve the safest, most effective and most compassionate care for its patients. The campaign's rationale is a systematic, coordinated and focused approach to institutional quality improvement, designed in partnership with the Institute for Healthcare Improvement (IHI) - the world leader in the science and practice of healthcare improvement (Hamad Medical Corporation 2013/2014 Annual Report).

In the first year, forty multi-disciplinary teams from wards, critical care units and operating theaters in all eight hospitals have started to test and measure selected changes, with the aim of identifying and implementing evidence-based system improvements that can be applied across the organization. Best Care Always initiative is designed to encourage a culture of transparency and openness to report where new safety measures can be introduced and care can be improved, and provide staff with the know-how to respond (Hamad Medical Corporation 2013/2014 Annual Report).

Statement of problem

Patient safety aims to prevent harm and negative outcomes of care. Quality management systems are an important factor in promoting patient safety and reducing the risk of adverse events and medical errors in health care organizations (Tutuncu, 2008). A key aim of nursing is to ensure patient safety and at the very least do the patient no harm (Smith, 2005). However, patients are often harmed unnecessarily through drug errors by medical and nursing staff (Cleary-Holdforth and Leufer, 2013).

Almost all patients admitted to a clinical setting receive medication as part of their treatment (Esi Owusu Agyemang and While, 2010). In drug administration, the nurse is the last person in the process to rectify and defend against errors, and needs to know the effect, rationale and compatibilities of the drug, and be able to calculate the correct dose for patients (Rainboth and DeMasi, 2006).

Most medication errors occur at the time of administration (Miller and Emanuel, 2010). Many are caused by inadequate prescribing, dispensing, updating of prescriptions and administering of drugs (Royal Pharmaceutical Society, 2009). Errors in administering medicines are common and can compromise the safety of patients. Safe practice in medicine administration is crucial, yet errors by nurses are compromising patient care. Errors can happen at different stages of the administration process, and nurses play a key role in checking the medication is correctly prescribed, signed and dated by the prescriber before administration, and that it is administered as prescribed, following the correct protocols (Ofusu and Jarret, 2015).

Objectives of study

1. To review the current medication safety standards as specified in the International Patient Safety Goals according to the Joint Commission International for Long-term facilities.
2. To highlight existing mechanisms implemented for prevention of errors and adverse events during care of residents in the Enaya specialized care centre in Rumailah hospital.
3. To evaluate level of nurses' compliance with the guidelines of medication policy in Enaya specialized care centre in Rumailah hospital.
4. To provide recommendations for improvement in medication safety practices and continuous compliance with specified standards of the Joint Commission International in Enaya specialized care centre in Rumailah hospital.

Purpose of the study

Keeping an organization compliant and abreast of continuously evolving standards, regulations and requirements can be a cumbersome task, requiring a full-time commitment of dedicated nurses, quality assurance managers or team; depending on the size of your organization and scope of clinical services offered (Reigle, 2013). Hence, involvement of nurses is essential to any significant healthcare improvement initiative (Bosagnano, 2010).

Ongoing monitoring and identification of opportunities for improvement help to maintain optimal compliance with quality assurance standards, develop patient safety culture among workforce and promote the chance of future accreditation by surveyors from The Joint Commission (TJC). No department, unit or staff member is "exempt" from this process, so it is important that everyone working for the organization is up-to-date on quality standards and protocols, at all times (Reigle, 2013).

Therefore, the purpose of this project is to review the current medication safety standards for long-term facility as specified by the Joint Commission International in order to discover areas for improvement. Moreover, the level of nurses' compliance with medication safety policy through practical mechanisms for prevention of errors and adverse medical events as a way of achieving guaranteed safety will be critically examined.

Relevance of the study

High rates of medication errors have been reported in many hospitals across the world, despite implementation of medication safety standards and policies as required by regulatory agencies. Considering the chronic conditions of residents which often necessitate multiple prescriptions and constant drug reviews for recovery and positive outcomes, there is need to pay extra attention to compliance with established standards for prevention of medication errors in long-term facilities.

Ensuring compliance with patient safety standards, most especially towards prevention of medication errors is a vital and indispensable part of everyday practice expected from Joint Commission International (JCI) accredited healthcare organizations like Enaya specialized care centre. Moreover, the consequences of adverse medical events due to negligent practices can be fatal, sometimes leading to loss of lives and ligations. Hence, findings of this study will help to examine the level of compliance with medication safety standards among nurses with suggestions for improvement.

Study setting-enaya specialized care centre, rumailah hospital, hamad medical corporation

Enaya specialized care centre is located within Rumailah hospital which is the only long-term facility in Qatar. Rumailah Hospital was opened in 1957 as a 200-bed general hospital with ambulance services and a large outpatient facility. Following the opening of Hamad General Hospital in 1982, Rumailah Hospital became a rehabilitation center for disabled adults, elderly people and handicapped children. A complete renovation program of Rumailah Hospital in 1997 by the Hamad Medical Corporation (HMC) transformed Qatar's oldest healthcare facility into a modern yet quiet hospital offering a 306-bed facility with a spacious, clean and restful environment (Rumailah Hospital Website, 2015).

The Enaya long-term facility achieved Joint Commission International certification in 2009 and was reaccredited successfully in 2012. In 2015, Rumailah Hospital has successfully achieved JCI Triennial Hospital Reaccreditation as well as JCI accreditation for Long Term Care Standards. So far, Rumailah Hospital of the Hamad Medical Corporation is the first hospital in the Gulf Coast Countries (GCC region) to be granted this prestigious status (Rumailah Hospital Website, 2015). The JCI certification was achieved in Rumailah Hospital Unit of Hamad Medical Corporation in 2006 with reaccreditation in 2009 and 2012 respectively. Rumailah Hospital Unit delivers healthcare services for both acute and long-term rehabilitation patients. The long-term skilled nursing care facility offers skilled nursing care, rehabilitative services, social services and personal care to residents who are fully dependent or partially dependent.

Hamad Medical Corporation is the largest nonprofit healthcare provider in Qatar, providing around 90 percent of acute services in the country. The vision of the multi-unit healthcare facility is to provide the safest, most effective and most compassionate care to each and every patient. As evidence of the organization's commitment to quality care and patient safety; Hamad General Hospital received JCI certification in 2006 with subsequent reaccreditation in 2009 and 2012 consecutively.

Literature review

Patient safety in healthcare facilities

Patient safety forms the foundation of healthcare delivery just as biological, physiological, and safety needs form the foundation of Maslow's hierarchy. Little else can be accomplished if the patient does not feel safe or is, in fact, not safe. But the healthcare system is extremely complex, and ensuring patient safety requires the ongoing, focused efforts of every member of the healthcare team (Ulrich and Kear, 2014). Patient safety moved to the fore-front in health care with the release in 1999 of the Institute of Medicine (IOM) landmark report, *To Err is Human: Building a Safer Health System*, which estimated that annually in the United

States, up to one million people were injured and 98,000 died as a result of medical errors (IOM, 2000). The report caught the attention of the media, and there were headlines across the nation about the safety (or lack of safety) for patients in healthcare organizations (Ulrich and Kear, 2014).

Subsequently, patient safety became one of the main components of health services quality with emphasis on ways of avoiding any kind of injury to patient during health care delivery (Nash and Goldfarb, 2006). Examples of patient safety issues include medicinal failures, wrong surgical procedures, diagnoses failures, machinery and equipment failures, etc.; leading to misdiagnosis and other events such as hospital infections, patient falls and bedsores (Frankel et al, 2008; Mazhari, Hessam, Arabloo, et al., 2014).

These unsafe services have unpleasant consequences for patient and his/her family, with psychological pressure on health system staff and relatives as well as huge economic burden on health care system and society at large (Rockville, 2008). Research studies have shown that, on average, about 10% of all hospitalized cases are at risk of errors with patients being affected to different degrees. Also, about 75% of these errors are preventable (Battlesl and Lilford, 2003; Mazhari, et al., 2014).

In response to the urgent need to develop interventions related to patient safety, the Joint Commission International established the International Patient Safety Goals as the first goal of accreditation standards. Consequently, during accreditation of hospitals, patient safety is one of the basic aspects under monitoring (Alahmadi, 2010). Therefore, the realization of these standards provides assurance that patient safety is recognized as a necessary priority and every accredited hospital has the best performance in this regard. (Karen, 2011; Mazhari, et al., 2014).

International patient safety goals in long term care facilities

The purpose of International Patient Safety Goals is to improve certain reforms in patient safety. The specified goals highlighted the problematic areas in health care and define solutions based on expertise and evidence. In addition, implementation of the International Patient Safety Goals is to improve patient safety through constant monitoring and evaluation methods (Karen, 2011). Hence, the ultimate goal of evaluation is to improve patient safety in hospitals and create situations that lead to safer services and subsequently protecting the society from avoidable damages and reducing unwanted adverse events in the hospital setting (Gezairy, 2011; Mazhari et al., 2014).

The guideline for International Patient Safety Goals (IPSG) was issued by the Joint Commission International (JCI) under the International Standards for Long Term Care with compulsory implementation by all accredited long term care organizations as of 1st July, 2012. The purpose of the IPSG is to promote specific improvements in patient and resident safety (Joint Commission International, 2012).

As summarized by the Joint Commission International (2012), the goals include the following:

- IPSG.1: Identify Residents Correctly
- IPSG.2: Improve Effective Communication
- IPSG.3: Improve the Safety of High-Alert Medications
- IPSG.4: Ensure Correct-Site, Correct-Procedure, Correct-Resident Surgery
- IPSG.5: Reduce the Risk of Health Care–Associated Infections
- IPSG.6: Reduce the Risk of Resident Harm Resulting from Falls

The goals highlight problematic areas in health care and describe evidence- and expert-based consensus solutions to these problems. Recognizing that sound system design is intrinsic to the delivery of safe, high-quality health care, the goals generally focus on system-wide solutions, wherever possible (Joint Commission International, 2012).

The goals are structured in the same manner as the other standards, including a standard (goal statement), an intent statement, and measurable elements. The goals are scored similar

to other standards as “met,” “partially met,” or “not met.” The accreditation decision rules include compliance with the IPSPG as a separate decision rule. Some International Patient Safety Goals may not be applicable to the long term care organization (Joint Commission International, 2012).

Resident medication management in joint commission accredited long term Facilities

1. Resident Medication Management (RMM) Standards, Intents, and Measurable Elements

Standard (RMM.1)

Medication use in the long term care organization is efficiently organized and compliant with applicable laws and regulations (Joint Commission International, 2012).

Intent of RMM.1

Medications are frequently used for treating illness and moderating symptoms. As an important resource, medication use must be organized effectively and efficiently within the long term care setting. Medication management is the responsibility of those providing pharmaceutical services as well as clinical care and service providers. How this responsibility is shared depends on the long term care organization’s scope of service and staffing (Joint Commission International, 2012).

Residents may receive their medications from a variety of sources. In some cases, the long term care organization providing services may have pharmacy services available, and in other cases, the pharmacy may be a part of the community setting.

Applicable laws and regulations are incorporated into the operations of the long term care organization and the medication management system used in the long term care organization (Joint Commission International, 2012).

Measurable elements of RMM.1

- (1) There is a plan or policy or other written document in place that identifies how medication use is organized and managed throughout the long term care organization.
- (2) All settings, services, and individuals who manage medication processes are included in the long term care organization medication management process.

Management and use of medications in long term care facilities

RMM.1:- Medication use in the long term care organization is efficiently organized and compliant with applicable laws and regulations.

RMM.1.1:- Policies and procedures govern a resident’s use of medications in the home setting and the control of medication samples.

RMM.1.2:- A selection of medications, for prescribing or ordering, based on the organization’s mission, resident needs, and types of services provided, is stocked or readily available.

Preparation, dispensing, and storage of medications in long term care facilities

RMM.2:- Policies and procedures govern the safe preparation, dispensing, and storage of medications.

RMM.2.1:- A system is used to dispense medications in the right dose to the right resident at the right time.

RMM.2.1.1:- Policies and procedures govern the storage, distribution, handling, and dispensing of chemotherapeutic, investigational, radioactive, or other hazardous medications.

RMM.2.2:- Emergency medications are available, monitored, and safe when stored out of the pharmacy.

RMM.2.3:- The long term care organization has a medication recall system.

Ordering and transcribing of medications in long term care facilities

RMM.3:- Prescribing, ordering, and transcribing are guided by policies and procedures.

RMM.3.1:- The organization defines the elements of a complete order or prescription and the types of orders that are acceptable for use.

RMM.3.2:- The organization identifies those qualified individuals permitted to prescribe or to order medications.

RMM.3.3:- Medications prescribed and administered are written in the resident's record.

Administration of medications in long term care facilities

RMM.4:- The long term care organization identifies those qualified individuals permitted to administer medications.

RMM.4.1:- Medication administration performed by the long term care organization's staff includes a process to verify the medication is correct based on the medication order and verify the correct resident before administering the medication.

RMM.4.2:- Medications prescribed and administered by long term care staff are documented.

Monitoring of medications in long term care facilities

RMM.5:- Medication effects on residents are monitored, including adverse effects.

RMM.5.1:- Medication errors, including near misses, are reported through a process and time frame defined by the long term care organization.

Prevalence of medication errors in healthcare facilities

Medication or drug administration forms a major part of the clinical roles and responsibilities of nurses. Medication administration by the nurse is only one part of a process which also involves doctors and pharmacists. In giving medications, some untoward incident may happen and medication errors may occur (Galicinao, 2011).

According to Aronson (2009); "Medication error is failure in drug treatment process that leads to or has the potential to harm the patient." Many studies use this definition, often in tandem with Franklin et al's (2005): "Any error in prescribing, dispensing or administering medication" (Ofusu and Jarret, 2015). Also, medication error is defined as any type of error in the prescription, transcription, dispensing and administration process which could bring about serious consequences or not. These events are not infrequent. Medication errors represent the largest single cause of errors in the hospital setting. The Institute of Medicine reports 44,000 to 98,000 people die in hospitals annually as a result of medical errors that could have been prevented (Kohn, Corrigan and Donaldson, 2000). Medication errors accounted for 7,391 deaths in 1993, compared to 2,876 deaths in 1983 (Kohn et al., 2000).

Ten to 18% of all reported hospital injuries have been attributed to medication errors (Hume, 1999). Hospital medication error rates can be as high as 1.9 per patient per day (Fontan, Maneglier, Nguyen, Loirat, and Brion, 2003). United States of America data from 1993 indicates that 7,391 patients died from medication errors. Patient stays associated with medication errors also increased by 4.6 days, with a resulting cost increase of \$4,685 per patient (Hume, 1999; Galicinao, 2011).

Approximately 2% of all patients admitted to hospitals in the United States experience a medication error (Barber and Dean, 1998; Dean, Schachter, Vincent and Barber, 2002). Medication errors may have devastating, far-reaching consequences, not limited solely to patients and their families. Other individuals affected by medication errors include prescribing physicians, nurses administering the medication, and pharmacists filling and evaluating prescription orders. Many medication errors result from prescribing errors, which have an increased potential for serious complications (Leap, Bates, Cullen, et al., 1995; Bates, Cullen, Laird, et al., 1995; Lesar, Briceland, DeCoure, et al., 1990; Vincer, Murray, Yuill, et al., 1989; Warholak, et al., 2011).

After a comparative study of medication errors in a hospital in the United States and a hospital in the United Kingdom; Dean, Allan, Barber et al., (1995) reported that the medication error rate in the U.S. hospital was 6.9% (95% CI, 5.2% to 8.5%), significantly higher than the 3.0% rate observed in the U.K. hospital (95% CI, 2.4% to 3.7%). Hence, medication errors remain one of the most common causes of unintended harm to patients, even in advanced countries. They contribute to adverse events that compromise patient safety and result in a large financial burden to the health service (Cloete, 2015).

Therefore, the prevention of medication errors, which can happen at every stage of the medication preparation and distribution process, is essential to maintain a safe healthcare system. One third of the errors that harm patients occur during the nurse administration phase: administering medication to patients is therefore a high-risk activity (Cloete, 2015). Previous studies have identified medication errors in preparing and administering intravenous medicines of 13-84% in hospitals in individual countries (Cousins, Sabatier, Begue et al., 2005).

Preventable adverse events include errors of commission, errors of omission, errors of communication, errors of context, and diagnostic errors (James, 2013). When using medical records to identify adverse events, however, conservative estimates result because this method primarily targets errors of commission and are less likely to find other types of errors (Parry, Cline and Goldmann, 2012). As a result of the review, James (2013) estimated the number of premature deaths associated with preventable harm to patients to be more than 400,000 per year and that serious harm appeared to be 10 to 20 times more common than deaths (Ulrich and Kear, 2014).

Causes and types of medication errors in hospitals

Medication errors constitute a considerable concern for the patients and healthcare professionals. Therefore, in recent years there have been remarkable efforts through research papers to assess the etiology of medication errors (Karavasiliadou and Athanasakis, 2014). There is no specific definition of drug error, as it often depends on the type or classification of mistake (O'Shea, 1999). This can cause confusion and prevent reporting of mistakes and near misses (Ofusu and Jarret, 2015).

Omitted doses and incorrect doses were the most common types of errors in the U.K. hospital; incorrect doses and unordered doses were the most common types in the U.S. hospital. An American hospital with a unit dose distribution system had a significantly higher medication error rate than a British hospital with a ward-based supply system (Dean, Allan, Barber et al., 1995).

Understanding the types of errors and contributing factors to prescribing errors provides opportunities for error prevention at the earliest point of the medication process (Warholak, Queiruga, Roush, et al., 2011). Prescribing errors are classified into different categories based on knowledge, rules, action, and memory. Knowledge-based errors reflect lack of experience or understanding about certain medications. Rule-based errors reflect lack of application of fundamental rules. Action-based errors are those that are not intended (e.g., misspelling or mistaken drug name). Memory-based errors involve forgotten information (e.g., patient allergy) (Aronson, 2009).

One study found that most prescribing errors were attributed to: (1) lack of information about the patient; (2) specific drug therapy (e.g., narrow therapeutic index medications); or (3) inability to incorporate patient-specific factors (e.g., declining renal function) to appropriate selection and dosing of drug therapy. Other errors result from miscalculations, improper use of decimal points, unit or rate expressions, and nomenclature (Lessar, Briceland and Stein, 1997; Warholak, Queiruga, Roush, et al., 2011).

Nurses' responsibilities in medication management

Medication management requires the collaborative efforts of many healthcare providers. Medications may be prescribed by a physician, dentist, or other authorized prescriber such as

advanced practice registered nurses as determined by individual state licensing bodies. Pharmacists are licensed to prepare and dispense medications. Nurses are responsible for administering medications. Dietitians are often involved in identifying possible food and drug interactions (Delaune and Ladner, 2002; Galicinao, 2011).

Nurses play an essential role in the administration of, education about, and evaluation of the effectiveness of prescribed medications. The nurse's role changes with the setting of the client. In the home or community setting, referred to as primary care, clients take their own medication as prescribed by the health care practitioner. Nurses are responsible for educating the client about his or her medications and its possible side effects as well as for evaluating the outcome of the prescribed therapy in restoring and maintaining the client's health (Delaune and Ladner, 2002; Galicinao, 2011).

In the acute care setting, nurses spend a great deal of time administering medications and evaluating their effectiveness. Nurses are responsible for teaching clients how to take their medications safely when they are discharged. Medication administration requires specialized knowledge, judgment, and nursing skill based on the principles of pharmacology (Galicinao, 2011).

The goal of the medication management standards is to provide a framework for an effective and safe medication management system. Effective and safe medication management is dependent on carefully implementing medication management processes based on the care, treatment, and services provided by the long term care organization. Planning provides the groundwork for the following critical areas of performance outlined as follows:

- Managing high-alert and hazardous medications
- Selecting and procuring medications
- Storing medications
- Managing emergency medications
- Controlling medications brought into the long term care organization by patients/residents, their families, or licensed independent practitioners
- Managing medication orders
- Preparing medications
- Labeling medications
- Dispensing medications
- Retrieving recalled or discontinued medications
- Administering medications
- Managing investigational medications
- Monitoring patients'/residents' reactions to medications
- Responding to real or potential adverse drug events, adverse drug reactions, and medication errors (Long Term Care Accreditation Unit, Joint Commission, 2009)

Fundamental rights of drug administration

The responsibility for administering medication safely is one which nurses take seriously, and to assist in this procedure the five Rights (5 Rs) of drug administration have been devised as follows by Workmann and Bennett (2003).

Right patient: Check the identity of the patient with his identification band, using hospital number or date of birth as additional verification. If patients are long-stay residents, identification may be by photograph, rather than an impersonal name band (Williams 1996). In the home setting you should satisfy yourself that you have identified the right patient for medication by asking them their full name or date of birth to verify against the prescription.

Right drug: Drug names can be complex, and have similarities between names. Check for clearly written prescriptions, matching the name on the medication container. In hospital, drugs are prescribed by their generic names, and patients may be confused and think that they are having a new medication. If in doubt, consult the BNF for the generic and trade name of the drug. Check three times during the procedure: when you take the drug from the cupboard

or trolley, before you pour it into the medication receiver, matching it to the drug name on the prescription sheet, as you return it to the cupboard or trolley.

Right dose: This should be clearly written on the prescription sheet. If the dose is very small, then micrograms should be written out in full (BNF). Calculate the dose carefully and check to see if there is a drug with the same name but dispensed in different strengths.

Right time: Most drugs are designed to be given with an interval of several hours apart to provide a consistent therapeutic blood level. If given haphazardly, then the medication will be less effective or may cause the patient to develop unwanted side effects. Therefore, it is essential to give doses at prescribed intervals and to record the actual time of administration.

Right route: Medications are given in specific routes of administration. It is possible to give medication by the wrong route, for example, an intramuscular injection may be given intravenously if sited in the wrong place.

Factors affecting nurses compliance with medication safety standards

Ford, Killebrew, Fugitt, et al., (2006), revealed that there is significant reduction in reported Medication Administration Errors (MAE) rates on the ward (0.04% of drug administrations and 0.03 MAEs per patient admission) in a Community Hospital due to application of current safety guidelines. Hence, an emphasis on studying MAEs at individual institutions is likely to result in meaningful process changes, improved efficiency of MAE reporting, and other benefits (Galicinao, 2011).

However, Bailey, Engel, Luescher, and Taylor, (2008) discovered in a study of relationship between nurses' educational status and incidence of medication errors that there is a direct relationship between education and medication errors, rather than an inverse relationship, wherein as education increased number of errors decreased. The study showed that Licensed Practical Nurses (LPN) made the least number of medication errors followed by Registered Nurses with Associate Degrees, with BSN Registered Nurses having the highest incidence of medication errors.

The results indicate that as the education level increased so did the number of medication errors. Also, the study showed that nurses made the most medication errors either in their first five years of nursing experience or after twenty years of nursing. The study indicated that giving medication at the wrong time was the most common type of medication error made by the participants. The shift that reported having the most medication errors was 7 am - 7 pm, when most medications are administered. The most common route for medication errors was Per Oral or "by mouth" (Galicinao, 2011).

Furthermore, Davis, Ware, et al., (2011) affirmed that double checking the patient, double checking the drug and checking the legality of the prescription were the three strongest predictors of nurses' actions regarding medication administration. Also, policy factors, and not contextual factors, drive nurses' judgement in most situations.

Moreover, colour branding is commonly used to distinguish one product from others within the same class. Colour may also be used to identify a particular manufacturer, rather than emphasizing a particular drug or dosage, but this practice can contribute to picking errors. Colour-coding is the systematic, standardized application of a colour system to classify and identify products, generally within the same pharmacologic class (Fasting and Gisvold, 2000). Colour matching uses colour to safely match one item to another. Use of such a tool was associated with a significant reduction in deviation from recommended standards (Shah, Frush, Luo and Wears, 2003).

Colour differentiation involves the use of colour to enhance features on labels and packaging, to help users discriminate one drug or product strength from another. Use of this colour technique enhances the noticeability of a label by increasing the speed and accuracy of label identification and the perceived readability of labels (American Medical Association, 2008). In addition, label colour has been demonstrated to influence compliance levels, with higher levels of compliance being associated with red labels than with either black or green ones (American Medical Association, 2008; Filiatrault and Hyland, 2009). However, the

practice of colour-coding is controversial among patient safety groups because of insufficient evidence demonstrating that it is effective in reducing medication errors, the numerous problems that have been reported with the use of colour-code systems, and the availability of technology (bar-coding) that minimizes the human element in the final check during drug administration (American Medical Association, 2008; Fasting and Gisvold, 2000; International Safe Medication Practices, 2008; Wildsmith, 2002; McKoy, 2005; Filiatrault and Hyland, 2009).

Although the use of colour is often endorsed, inconsistent application of colour schemes can cause confusion and has contributed to medication misadventures. Despite these limitations, colour is used in various areas of medicine, and the following descriptions highlight some of the most common colour techniques (National Patient Safety Agency, 2008; Venkatraman and Durai, 2008; Cohen, 1999; Filiatrault and Hyland, 2009). Anecdotal examples describe the successful use of colour differentiation to reduce other types of medication errors (Cohen, 1999).

In summary, the available literature favours the judicious use of two colour techniques: colour differentiation and colour matching. However, the effectiveness of any colour used on drug labels and packaging should be validated before it is adopted for that purpose (American Psychological Association, 2008). Colour-coding has not been tested as a way to prevent medication errors, and evidence exists that it may actually contribute to some errors (ISMP, 2008). Hence, it should be used with extreme caution only after international standardization (Filiatrault and Hyland, 2009).

Data collection and analysis

Data collection procedure

The following systematic data collection procedure was followed with measures adopted to avoid bias, violation of laws and confidentiality policies in the Enaya Skilled Nursing Facility, Rumailah Hospital, Doha.

- (i) Official Application for brief facility inspection was granted by the authority through appropriate management personnel.
- (ii) The structured Medication Safety Standard Checklist was submitted for screening by designated nurse managers before distribution among 50 nurses using incidental random sampling method.

Instrument for data collection

The structured Medication Safety Standard Checklist has the following sections:

- Awareness and Compliance with Medication Safety Policies
- Preparation, Dispensing, and Storage of Medications in the facility
- Ordering and Transcribing of Medications in the facility
- Administration of Medications in the facility
- Monitoring of Medications in the facility
- Suggestions for Effective control of Medication Errors in the facility

Nurses' assessment of medication safety in the facility

Table 3.3.1. Awareness and compliance with medication safety policies

S/N	Statements	Agree N (%)	Disagree N (%)	Not Sure N (%)	Total N (%)
1	There is a written policy guideline for medication administration in this facility	50 (100%)	Nil	Nil	50 (100%)
2	Medication use is efficiently organized and monitored in your ward or facility in compliance with the institutional policies, laws and regulations.	45 (90%)	2 (4%)	3 (6%)	50 (100%)
3	Medications are frequently used for treating illness and moderating symptoms only after appropriate tests or investigations have been done.	38 (76%)	7 (14%)	5 (10%)	50 (100%)
4	The roles and responsibilities of all professionals (i.e Doctors, Pharmacists and Nurses) involved in medication management and pharmaceutical services are clearly specified in the medication policy.	50 (100%)	Nil	Nil	50 (100%)
5	Each professional is expected to take full responsibility for any form of medication or drug as prescribed, dispensed and finally administered to residents in your facility.	50 (100%)	Nil	Nil	50 (100%)
6	Drugs and medications are readily stocked in your ward under strict monitoring and stock control processes to ensure availability for residents' use always.	45 (90%)	2 (4%)	3 (6%)	50 (100%)
7	Residents only receive their medications from Nurses during medication rounds only.	45 (90%)	2 (4%)	3 (6%)	50 (100%)
8	High alert medications are administered after thorough scrutiny by nurse managers and doctors in your facility.	50 (100%)	Nil	Nil	50 (100%)

In the table above, all the Nurses involved in this survey 50 (100%) affirmed that there is a written policy guideline for medication administration in the facility. They all emphasized that the roles and responsibilities of all professionals involved in medication management were fully specified in the policy. Also, all the Nurses that participated in the Medication Safety survey agreed that each professional takes full responsibility for any form of medication prescribed, dispensed or administered to residents in the facility. Moreover, all high alert medications are administered to residents after thorough scrutiny by nurse managers and doctors in the facility.

Nonetheless, only 38 (76%) agreed that medications are frequently used for treating illness and moderating symptoms only after appropriate tests or investigations have been done. This may be a very important area for improvement in ensuring evidence-based prescriptions in the facility.

Table 3.3.2. Preparation, Dispensing, and Storage of Medications in the facility

S/N	Statements	Agree N (%)	Disagree N (%)	Not Sure N (%)	Total N (%)
9	Policies and procedures govern the safe preparation, dispensing, and storage of medications in your facility.	50 (100%)	Nil	Nil	50 (100%)
10	A system is used to dispense medications in the right dose to the right resident at the right time in your facility.	50 (100%)	Nil	Nil	50 (100%)
11	Policies and procedures govern the storage, distribution, handling, and dispensing of chemotherapeutic, investigational, radioactive, or other hazardous medications in your facility.	50 (100%)	Nil	Nil	50 (100%)
12	Emergency medications are always available, monitored, and safe when stored out of the pharmacy in your facility.	50 (100%)	Nil	Nil	50 (100%)
13	There is a medication recall system in your facility.	20 (40%)	5 (10%)	25 (50%)	50 (100%)

In table 3.3.2 above, all the 50 nurses (100%) that participated in the survey agreed that clear policies and procedures govern the safe preparation, dispensing and storage of medications in the facility. They also affirmed that there is an established system being used to dispense medications in the right dose to the right resident at the right time in the facility. Moreover, emergency medications are always available, monitored and safely stored out of the pharmacy for easy access and guaranteed potency when used.

In contrast, half of the participants 25 (50%) were not sure of any medication recall system, while 20 (40%) claimed there is one in the facility.

Table 3.3.3. Ordering and Transcribing of Medications in the facility

S/N	Statements	Agree N (%)	Disagree N (%)	Not Sure N (%)	Total N (%)
14	Prescribing, ordering, and transcribing are guided by policies and procedures in your facility.	50 (100%)	Nil	Nil	50 (100%)
15	There is a well defined pattern for a complete order or prescription and the types of orders that are acceptable for use in your facility.	50 (100%)	Nil	Nil	50 (100%)
16	Individuals permitted to prescribe or to order medications are clearly specified in your facility	50 (100%)	Nil	Nil	50 (100%)
17	Medications prescribed and administered are written in the resident's record using a clear format in your facility.	50 (100%)	Nil	Nil	50 (100%)

All Nurses that participated in this survey agreed that prescribing, ordering, transcribing and recording of medications in the facility are done using established guidelines and specified format for clarity and avoidance of errors.

Table 3.3.4. Administration of Medications in the facility

S/N	Statements	Agree N (%)	Disagree N (%)	Not Sure N (%)	Total N (%)
18	Your facility clearly identifies the qualified individuals permitted to administer medications	50 (100%)	Nil	Nil	50 (100%)
19	Medication administration performed by the nursing staff includes a process to verify the medication is correct based on the medication order and verify the correct resident before administering the medication in your facility.	50 (100%)	Nil	Nil	50 (100%)
20	Medications prescribed and administered by healthcare professionals are documented and verified in your facility.	50 (100%)	Nil	Nil	50 (100%)

100% of Nurses that participated in the survey agreed that only qualified individuals that can be identified or tracked are permitted to administer medications in the facility. Also they all agreed that medications prescribed and administered are documented and verified.

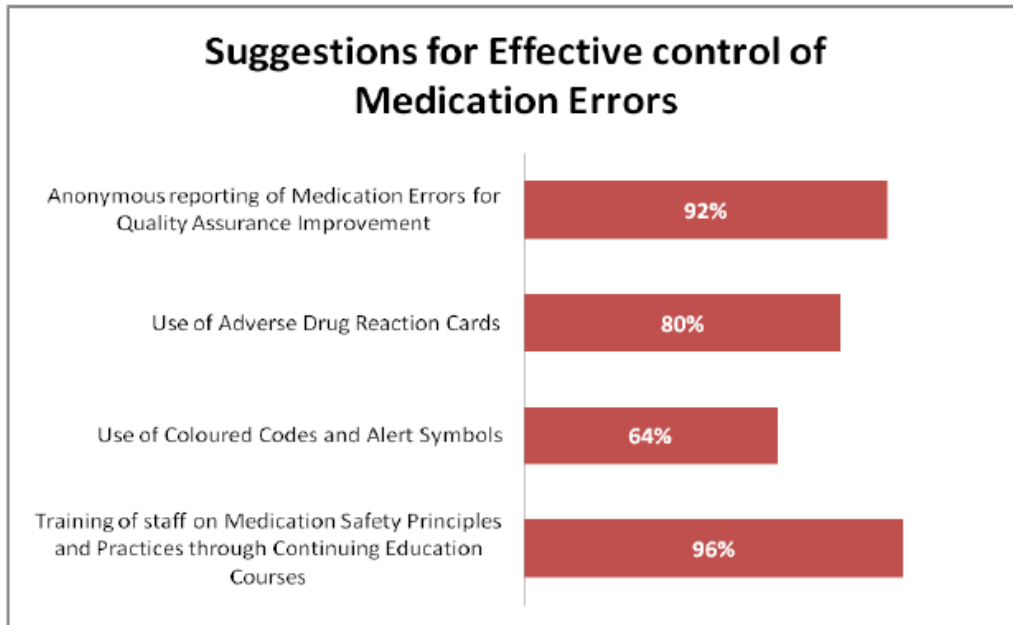
Table 3.3.5. Monitoring of Medications in the facility

S/N	Statements	Agree N (%)	Disagree N (%)	Not Sure N (%)	Total N (%)
21	Medication effects on residents are monitored, including adverse effects in your facility.	45 (90%)	2 (4%)	3 (6%)	50 (100%)
22	Medication errors, including near misses, are reported through a defined process and time frame in your facility.	18 (36%)	5 (10%)	27 (54%)	50 (100%)

As shown in Table 3.3.5 above, a significant majority of nurses 27 (54%) claimed they are not sure if medication errors are reported through a defined process and time frame in the facility. However, 45 (90%) of nurses agreed that adverse effects of medication on residents are monitored in the facility.

Table 3.3.6. Suggestions for Effective control of Medication Errors in the facility

S/N	Suggestions	Frequency	Percentage
1	Training of staff on Medication Safety Principles and Practices through Continuing Education Courses	48	96%
2	Use of Coloured Codes and Alert Symbols	32	64%
3	Use of Adverse Drug Reaction Cards	40	80%
4	Anonymous reporting of Medication Errors for Quality Assurance Improvement	46	92%



Qualitative Data:- Pictorial survey of medication management processes in the facility

1: Color Coded Medication Trolley with Individual Resident's Label and Central Lock



2: Medication Cabinet for Storing Intravenous Fluids with Central Lock



3. Transparent Medicine Storage Refrigerator with Automatic Cooling and Central Lock



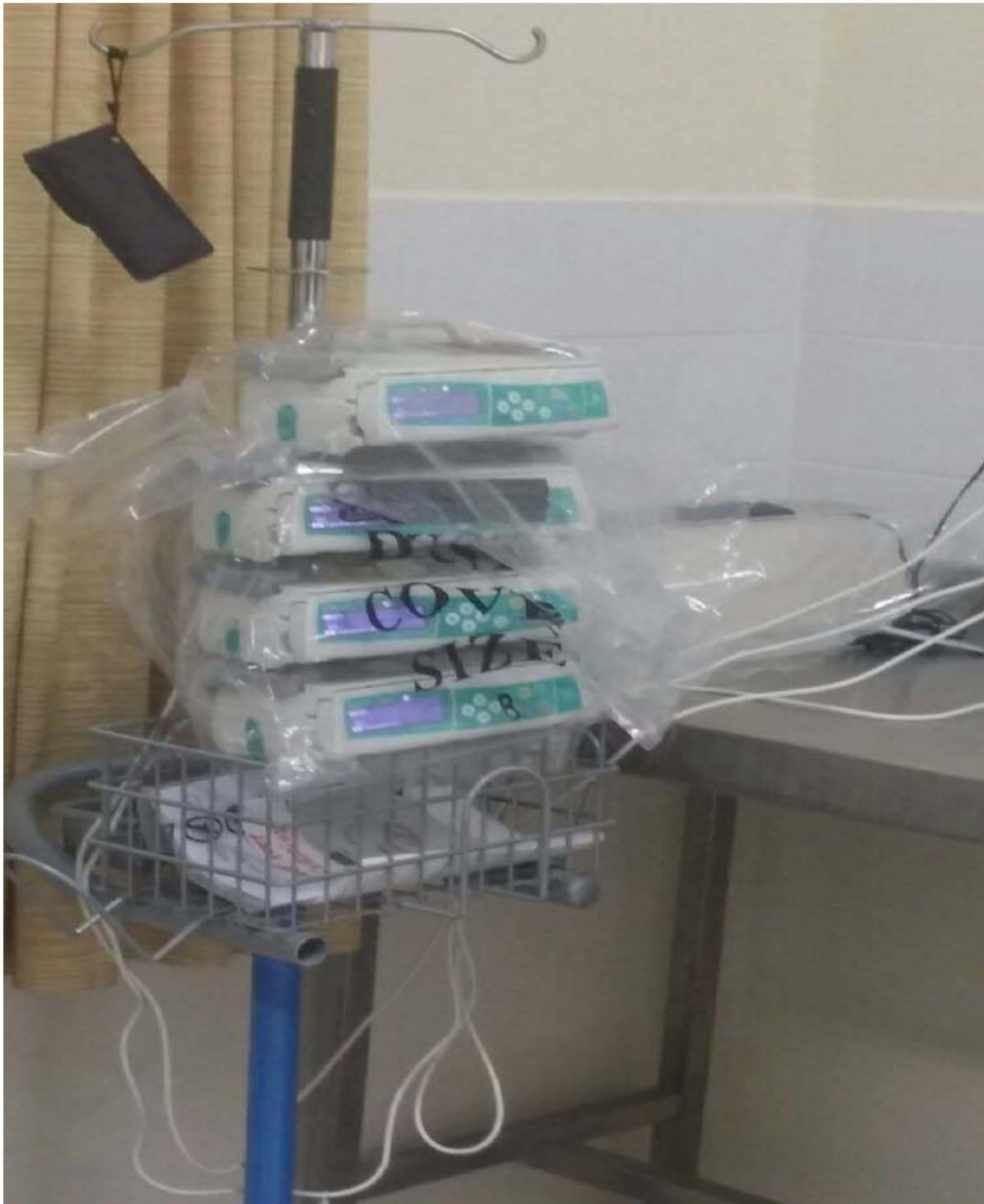
4. High Risk Medication Safety Box with Automatic Sensor and Central Lock



5. Bedside System for Documentation and Monitoring Adverse Drug Reactions of Residents



6. Bedside Drug Control Pump for Automatic Dosage Control during Medication



6. Resident's Bedside Identification Tags



7. Color coded Safety Box for Sharps



8. Labelled Stock Control Cabinet for Continuous Supply of Medication and Consumables



9. Labelled Stock Control Cabinet for Continuous Supply of Medication and Consumables



Discussion of findings

Awareness and compliance with medication safety policies

As shown in Table 3.3.1, all the Nurses involved in this survey 50 (100%) affirmed that there is a written policy guideline for medication administration in the facility. They all emphasized that the roles and responsibilities of all professionals involved in medication management were fully specified in the policy. Also, they all agreed that each professional takes full responsibility for any form of medication prescribed, dispensed or administered to residents in the facility. Moreover, all high alert medications are administered to residents after thorough scrutiny by nurse managers and doctors in the facility.

This revealed that the Enaya facility is fully compliant with the Standards and Intents of the Joint Commission International Standards for Resident Medication Management. Nonetheless, only 38 (76%) agreed that medications are frequently used for treating illness and moderating symptoms only after appropriate tests or investigations have been done.

This also corresponds with findings of the study conducted by Lessar, Briceland and Stein (1997) and Warholak, Queiruga, Roush, et al., (2011) with emphasis that most prescribing errors were attributed to: (1) lack of information about the patient; (2) specific drug therapy (e.g., narrow therapeutic index medications); or (3) inability to incorporate patient-specific factors (e.g., declining renal function) to appropriate selection and dosing of drug therapy.

Therefore, it may be a very important area for the policy makers in the facility to further review the medication policy toward ensuring evidence-based prescriptions and prevention of adverse drug events in the facility.

Preparation, dispensing, and storage of medications in the facility

All nurses (100%) that participated in the survey agreed that clear policies and procedures govern the safe preparation, dispensing and storage of medications in the facility. They also affirmed that there is an established system being used to dispense medications in the right dose to the right resident at the right time in the facility. Moreover, emergency medications are always available, monitored and safely stored out of the pharmacy for easy access and guaranteed potency when used.

Furthermore, this finding is supported by the pictorial evidence shown above. However, half of the participants 25 (50%) were not sure of any medication recall system, while 20 (40%) claimed there is one in the facility. This clearly supported the submission of James (2013) which emphasized that “Preventable adverse events include errors of commission, errors of omission, errors of communication, errors of context, and diagnostic errors. Also, Parry, Cline and Goldmann, (2012) further affirmed that “When using medical records to identify adverse events, however, conservative estimates result because this method primarily targets errors of commission and are less likely to find other types of errors”. Hence, there is need to institute mechanism for monitoring expiry dates of drugs or consumables stocked in the facility so as to avoid medication error and adverse drug reaction due to unsuspected use of expired products. The use of bar code scanning method can help to digitally discover such errors and prevent them from occurring.

Ordering and transcribing of medications in the facility

All Nurses that participated in this survey agreed that prescribing, ordering, transcribing and recording of medications in the facility are done using established guidelines and specified format for clarity and avoidance of errors. This is a vital component in the measurable elements of the Joint Commission International Standards for Resident Medication Management. Hence, it should be encouraged and continuously maintained for guaranteed medication safety in the facility.

Administration of medications in the facility

All nurses that participated in the survey agreed that only qualified individuals that can be identified or tracked are permitted to administer medications in the facility. Also they all agreed that medications prescribed and administered are documented and verified. This is a very important area of interest, since majority of medication errors have been reported to commonly occur during administration. This was emphasized by Delaune and Ladner (2002) and Galicinao (2011).

Moreover, ensuring that only professionals administer drugs or medications will further guarantee strict adherence to the fundamental Rights of Medication Administration as documented by Workmann and Bennet (2003).

Monitoring of medications in the facility

A significant majority of nurses 27 (54%) claimed they are not sure if medication errors are reported through a defined process and time frame in the facility. However, 45 (90%) of nurses agreed that adverse effects of medication on residents are monitored in the facility. This clearly supports the findings of several authors who noted that many nurses do not feel confident to report medication errors for quality assurance and process improvement due to fear of consequences or official queries, legal liability, etc. Unfortunately, this has become a limitation to practical feedback and in-depth system reviews for policy makers toward ensuring continuous improvement of medication management system in many facilities worldwide.

Suggestions for effective control of medication errors in the facility

Majority of nurses 48 (96%) that participated in the survey emphasized the need for training of healthcare staff on Medication Safety Principles and Practices through Continuing Education Courses in the facility. Also, 46 (92%) suggested the use of an anonymous reporting system for medication errors.

This is expected to remove the barrier of fear of negative consequences and improved feedback. Use of Adverse Drug Reaction Cards 40 and Use of Coloured Codes and Alert Symbols were also emphasized.

Recommendations for Improved Medication Safety in the facility

- (1) Review the medication policy toward ensuring evidence-based prescriptions and prevention of adverse drug events in the facility.
- (2) Institute a medication recall system especially for monitoring expiry dates, efficacy and reliability of drugs or consumables stocked in the facility.
- (3) Use of bar code scanning method to digitally verify product specifications (e.g. drug name, category, dosage and expiry date) thereby preventing errors and avoidable harms due to adverse drug reactions.
- (4) Training of all healthcare staff on Medication Safety Principles and Practices through Continuing Education Courses or periodic seminar/workshops.
- (5) Anonymous reporting of Medication Errors for Quality Assurance Improvement.
- (6) Use of Adverse Drug Reaction Cards especially for vulnerable residents e.g. elderly or residents with multiple cases of chronic illnesses.
- (7) Use of Coloured Codes and Alert Symbols

Summary and Conclusion

The findings of this study revealed that the facility is highly compliant with the Joint Commission International (JCI) International Patient Safety Goals especially in area of Medication Safety and Residents Medication Management for Long term facilities. However, there are areas for improvement that requires the attention of nurse managers and quality assurance officers.

In conclusion, implementation of the recommendations stated above is expected to improve the quality of medication safety standard and prevent adverse drug events in Enaya specialized care centre in Rumailah Hospital, Doha, Qatar.

Acknowledgements

All glory to God for His guidance and sustenance upon my life. Every project big or small is successful largely due to the effort of a number of wonderful people who have always been there to support me at one time or the other.

Therefore, I specially appreciate the effort of Vanitha (student coordinator) and all the faculty members of Texilla American University. Also, I am very grateful to all my colleagues in Hamad Medical Corporation. You are all wonderful. Moreover, I humbly acknowledge the efforts and contribution of all officials of Enaya Specialized Care Centre

towards the completion of this project. I am indeed grateful to all the nurses that voluntarily agreed to participate in the Medication Safety Survey. May the Almighty God reward you all abundantly.

Finally, I place a deep sense of gratitude to my husband and my precious children for all their encouragement and support.

Thanks a million times.

References

- [1]. Alahmadi, H., (2010). Assessment of patient safety culture in Saudi Arabian hospitals, *Quality Safety HealthCare*: 19(3); 1-5.
- [2]. Aronson J.K. (2009). Medication errors: definitions and classification. *British Journal of Clinical Pharmacology* 67(6):599–604.
- [3]. American Psychological Association (2008) APA statement on the use of colour coding. Washington (DC):. Available from: <http://www.apa.org/ppo/issues/apacolorcoding.pdf>
- [4]. American Medical Association; Council on Scientific Affairs (2008). The role of color coding in medication error reduction. Chicago (IL): [Full text Report 5 (A-04)]. Available from: www.ama-assn.org/ama/pub/category/print/13662.html
- [5]. Ballard, K. (September 30, 2003). "Patient Safety: A Shared Responsibility". *Online Journal of Issues in Nursing*. Vol.8 No.3
- [6]. Bahadori M., Ravangard R., Aghili A., Sadeghifar J., GharsiManshadi M., and Smaeilnejad J. (2013). The Factors Affecting the Refusal of Reporting on Medication Errors from the Nurses' Viewpoints: A Case Study in a Hospital in Iran. *ISRN Nursing*, Hindawi Publishing Corporation. <http://dx.doi.org/10.1155/2013/876563>.
- [7]. Aronson J.K. (2009) Medication: errors: definitions and classifications. *British Journal of Clinical Pharmacology*; 67: 6, 599-604.
- [8]. Bennett J. et al (2010) Effect of interruptions to nurses during medication administration. *Nursing Management*; 16: 9, 22-23.
- [9]. Biron A. et al (2009) Work interruption and their contribution to medication administration errors: an evidence review. *Worldview on Evidence-Based Nursing*; 6: 2, 70-86.
- [10]. Battlesl, J. B., and Lilford, R. J, (2003). Organizing patient safety research to identify risk and hazards. *Journal of Quality and Safety in Health Care*: 12(2); 2-7.
- [11]. Barber N.D. and Dean B.S. (1998). The incidence of medication errors and ways to reduce them. *Clinical Risk*. 4:103–106.
- [12]. Bates D.W., Cullen D.J., Laird N., et al. (1995) Incidence of adverse drug events and potential adverse drug events: implications for prevention. *JAMA*. 274(1):29–34.
- [13]. Choo, J. et al (2014) Effectiveness of an electronic inpatient medication record in reducing medication errors in Singapore. *Nursing and Health Sciences*. 16; 2, 245-254.
- [14]. Cleary-Holdforth JC, Leufer T (2013) The strategic role of education in the prevention of medication errors in nursing. *Nurse Education in Practice*; 13: 3, 217-220.
- [15]. Cousins D.H., Sabatier B., Begue D., Schmitt C. and Hoppe-Tichy T. (2005). Medication errors in intravenous drug preparation and administration: a multicentre audit in the UK, Germany and France. *Journal of Quality Safe Health Care*, 14(3):190-195.
- [16]. Cloete L. (2015). Reducing medication errors in nursing practice. *Nursing Standard*, 29 (20) pp 50-59. <http://dx.doi.org/10.7748/ns.29.20.50.e9507>.
- [17]. Cohen M.R. (1999). The role of drug packaging and labeling in medication errors. In: Cohen M.R. (editor). *Medication errors*. Washington (DC) American Pharmaceutical Association; pp 13.1-13.22.
- [18]. Dougherty L. et al (2011). Decision-making process used by nurses during intravenous drug preparation and administration. *Journal of Advanced Nursing*; 68: 6, 1302-1311.
- [19]. Dean B.S., Allan E.L., Barber N.D. and Baker K.N. (1995). Comparison of Medication errors in an American and a British hospital. *American Journal of Health-System Pharmacy*. 52(22) pp 2543-2549.

- [20]. Dean B., Schachter M., Vincent C., Barber N. (2002). Prescribing errors in hospital inpatients: their incidence and clinical significance. *Quality and Safe Health Care*. 11(4):340–344.
- [21]. DeLaune, S.C. and Ladner, P.K. (2002). *Fundamentals of Nursing: Standards and Practice*, 2nd Ed. United States of America: Thomson Learning, Inc.
- [22]. Esi Owusu Agyemang R. and While A (2010) Medication errors: types, causes and impact on nursing practice. *British Journal of Nursing*; 19: 6, 380-385.
- [23]. Fleming S. et al., (2014) An evaluation of the drug calculation skills of registered nurses. *Nurse Education in Practice*; 14:1, 55-61
- [24]. Fowler J. (2011) Supporting self and others: from staff nurse to nurse consultant. Part 3: preceptorship. *British Journal of Nursing*; 20: 11, 698.
- [25]. Franklin B.D. et al (2005). The incidence of prescribing errors in hospital inpatients: an overview of the research methods. *Drug Safety*; 28: 10, 891-900
- [26]. Fry M.M. and Dacey C. (2007). Factors contributing to incidents in medicine administration. Part 2. *British Journal of Nursing*; 16: 11, 676-681.
- [27]. Fleming, M., Wentzell, N., (2008). Patient safety culture improvement and guidelines for use. *Healthcare Quarterly*, Special Issue: 10-19.
- [28]. Fontan, J., Maneglier, V., Nguyen, V.X., Loirat, C., and Brion, F. (2003) Medication errors in hospitals: computerized unit drug dispensing systems versus ward stock distribution system. *Pharmacy World Science*. 25(3):112–117. 25
- [29]. Frankel, A., et al, (2008). Revealing and Resolving Patient Safety Defects: The Impact of Leadership Walk Rounds on Frontline Caregiver Assessments of Patient Safety. *Health Service Research*: 43(6), 2050–2066.
- [30]. Filiatrault P. and Hyland P. (2009)., Does Colour-Coded Labelling Reduce the Risk of Medication Errors? *CJHP – Vol. 62, No. 2 – March–April*.
- [31]. Fasting S. and Gisvold S.E. (2000). Adverse drug errors in anesthesia, and the impact of coloured syringe labels. *Canadian Journal of Anesthesiology* 47(11):1060-1067.
- [32]. Fasting S, Gisvold SE. Adverse drug errors in anesthesia, and the impact of coloured syringe labels. *Can J Anaesth* 2000; 47(11):1060-1067.
- [33]. Gezairy, H., (2011). Patient safety assessment manual. Egypt: World Health Organization. Regional Office for the Eastern Mediterranean.
- [34]. Galicinao R. D. (2011). Staff nurses' perception of medication errors, perceived causes, and reporting behaviors. A Research Paper Submitted City In partial fulfillment of the requirements in Research Methods in Nursing. Superable Graduate School, Misamis University, Ozamiz.
- [35]. Hemingway S et al (2011) Student experiences of medicines management training and education. *British Journal of Nursing*; 20: 5, 291-298.
- [36]. Hume, M. (1999) Changing hospital culture, systems reduce drug errors. *Excellent Solution Healthcare Management*. 2(4): 4–9.
- [37]. International Safe Medication Practices (2008). Colour-coded syringes for anesthesia drugs: use with care. *ISMP Medicine Safety Alert*;13(25):1-2.
- [38]. Institute of Medicine (IOM). (2000). *To err is human: Building a safer health system*. Washington, DC: National Academy Press. Retrieved from <http://www.iom.edu/Reports/1999/To-Err-is-Human-Building-A-Safer-Health-System.aspx>
- [39]. Joint Commission International (2012). *Accreditation Standards for Long Term Care*. 1st Edition. Effective from 1st July, 2012.
- [40]. Kelly J. and Wright D. (2011) Medicine administration errors and their severity in secondary care older persons' ward: a multi-centre observational study. *Journal of Clinical Nursing*; 21: 13-14, 1806-1815.
- [41]. Kelly et al (2011) Medicine administration errors in patients with dysphagia in secondary care: a multi-centre observational study. *Journal of Advanced Nursing*; 67: 12, 2615-2627
- [42]. Kreckler S et al (2008). Interruptions during drug rounds: an observational study. *British Journal of Nursing*; 17: 21, 1326-1330.
- [43]. Karen, H., (2011). *Accreditation Hospital Survey Process Guide*. 4th Edition, USA: Joint Commission International.

- [44]. Kohn, L.T., Corrigan, J.M., and Donaldson, M.S. (Eds.). (2000). To err is human: Building a safer health system. Washington, DC: National Academy Press.
- [45]. Karavasiliadou S. and Athanasakis E. (2014). An inside look into the factors contributing to medication errors in the clinical nursing practice. *HEALTH SCIENCE JOURNAL VOLUME 8, ISSUE 1* pg 32-44.
- [46]. Leap L.L., Bates D.W., Cullen D.J., et al. (1995) Systems analysis of adverse drug events. *JAMA*. 274(1):35-43.
- [47]. Lessar T.S., Briceland L. and Stein D.S. (1997). Factors related to errors in medication prescribing. *JAMA*. 277(4):312-317.
- [48]. Lesar T.S., Briceland L.L., DelCoure K., Paralee J.C., Masta-Gornic V. and Pohl H. (1990) Medication prescribing errors in a teaching hospital. *JAMA*. 263(17):2329-2334.
- [49]. Linda, T., Janet M., Molla, S., (2000). To Err Is Human: building a safer health system. Washington: Institute of Medicine.
- [50]. McMullan M. et al (2010) Patient safety: numerical skills and drug calculation abilities of nursing students and registered nurses. *Journal of Advanced Nursing*; 66: 4, 891-899.
- [51]. Miller M.P., Emanuel V (2010) Ongoing education would boost competency in drug calculations. *Nursing Times*; 106: 34, 8.
- [52]. Morgan A. et al (2012) Implementing structured preceptorship in an acute hospital. *Nursing Standard*; 26: 28, 35-39.
- [53]. McKoy L.K. (2005). Look-alike, sound-alike drugs review: include look-alike packaging as an additional safety check. *Jt Comm J Qual Patient Saf* ; 31(1):47-53.
- [54]. Mazhari Z., Hessam S., Arabloo J., Zarnaq R. K. and Zhirafar M. (2014). The Compliance Rate of Patient Safety Standards in Hospital: A Compare and Analysis at Tehran Hospitals. *Journal of Applied Environmental and Biological Sciences*; 4(4) pp 12-17. ISSN: 2090-4274
- [55]. Nursing and Midwifery Council (2008) *Standards for Medicines Management*. [Bit.ly/NMCMedsManagement](http://bit.ly/NMCMedsManagement)
- [56]. Nash, D. and Goldfarb, N., (2006). The quality solution: The Stakeholder's Guide to Improving Health Care. First edition, UK: Jones & Bartlett.
- [57]. National Patient Safety Agency (UK), Patient Safety Division (2008). Design for patient safety: A guide to labeling and packaging of injectable medicines. Available from: [http://www.lyftingsmo.no/labelling/regulations%20and%20guidelines/0592_Injectables_book_V9_Web\[1\].pdf](http://www.lyftingsmo.no/labelling/regulations%20and%20guidelines/0592_Injectables_book_V9_Web[1].pdf)
- [58]. National Patient Safety Agency (2007) *Safety in Doses: Medication Safety Incidents in the NHS*. [Bit.ly/NPSAMedicationError](http://bit.ly/NPSAMedicationError)
- [59]. Ofusu R. and Jarrett P. (2015). Reducing nurse medicine administration errors. *Nursing Times*; 111: 20, 12-14
- [60]. O'Shea E. (1999) Factors contributing to medication errors: a literature review. *Journal of Clinical Nursing*; 8: 5, 496-504.
- [61]. Qatar Supreme Council Of Health (2015). Qatar Patient Safety Week. Available at <http://eservices.sch.gov.qa/qpsw/home.jsp> [Accessed on 9th October, 2015].
- [62]. Rainboth L, DeMasi C (2006) Nursing students' mathematic calculation skills. *Nurse Education Today*; 26: 8, 655-661.
- [63]. Royal Pharmaceutical Society (2009) The Contribution of Pharmacy to Making Britain a Safer Place to Take Medicines. [Bit.ly/RCPharmMedSafety](http://bit.ly/RCPharmMedSafety)
- [64]. Reigle V. (2013). 5 Steps to Improving Regulatory Compliance and Quality at Your Hospital. *Clinical Colleagues, Incorporated*. www.ClinicalColleagues.com.
- [65]. Rumailah Hospital Website (2015). Joint Commission International (JCI) Triennial Hospital Reaccreditation. Hamad Medical Corporation by Corporate Communications Dept. <https://www.hamad.qa/EN/Hospitals-and-services/Rumailah-hospital/About/Pages/default.aspx>
- [66]. Rockville, M., (2008). Reducing errors in health care: transferring research to practice. AHRQ, <www.ahrq.gov/qual/errors (Accessed on September. 14, 2015).
- [67]. 9. Report 5 of the Council on Scientific Affairs. The role of colour coding in medication error reduction. Chicago (IL): American Medical Association; 2004 Jun.

- [68]. Stratton K. M., Blegen M. A., Pepper G., and Vaughn T. (2004). "Reporting of medication errors by pediatric nurses," *Journal of Pediatric Nursing*, Vol. 19, No. 6, pp. 385–392.
- [69]. Smith CM (2005) Origin and uses of primum non nocere – above all, do no harm! *Journal of Clinical Pharmacology*; 45: 4, 371-377.
- [70]. Shah AN, Frush K, Luo X and Wears RL. (2003). Effect of an intervention standardization system on pediatric dosing and equipment size determination: a crossover trial involving simulated resuscitation events. *Archives of Pediatrics and Adolescent Medicine*; 157(9):229-236.
- [71]. Ulrich, B., & Kear, T. (2014). Patient safety and patient safety culture: Foundations of excellent health care delivery. *Nephrology Nursing Journal*, 41 (5), 447-456, 505.
- [72]. Venkatraman R. and Durai R. (2008). Errors in medicine administration: how can they be minimized? *Journal of Perioperative Practice*; 18(6):249-253.
- [73]. Vaismoradi M. et al (2014) Nursing students' perspectives of the cause of medication errors. *Nurse Education Today*; 34: 3, 434-440.
- [74]. Vincer M.J., Murray J.M., Yuill A., Allen A.C., Evans J.R., Stinson D.A. (1989) Drug errors and incidents in a neonatal care unit: a quality assurance activity. *Am J Dis Child*. 143(6):737–740.
- [75]. World Alliance for Patient Safety (2004). Forward Programme, "2008", Geneva, Switzerland. <http://www.who.int/patient-safety/en>.
- [76]. Westat R, Sorra J., Famolaro T., Dyer M. P.S.N., Khanna K., and Nelson D. (2010). *Hospital Survey on Patient Safety Culture. User Comparative Database Report*.
- [77]. Warburton P (2010) Poor numeracy skills must be tackled to cut medication errors. *Nursing Times*, 106: 9, 13.
- [78]. Wright K (2006) Barriers to accurate drug calculations. *Nursing Standard*; 20: 28, 41-45.
- [79]. Wright K (2013) The role of nurses in medication administration errors. *Nursing Standard*; 27: 44, 35.
- [80]. Warholak T.L., Queiruga C., Roush R., Phan H. (2011). Medication Error Identification Rates by Pharmacy, Medical, and Nursing Students. *American Journal of Pharmacy Education*; 75(2):1-6
- [81]. Wildsmith JAW (2002). Doctors must read drug labels, not whinge about them. *British Medical Journal*; 324(7330):170.