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BENEFITS OF VOLUNTARY REPORTING OF MEDICATION ERRORS IN A HOSPITAL SETTING

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ABSTRACT

Context: Medication errors remain the most common type of medical incidents reported in hospitals. Reducing medication errors significantly improves patient safety and the quality use of medicines. Identification of medication error is a main target in improving clinical practice errors, in order to prevent adverse events. The major method for detecting medication errors and associated adverse drug-related events are computerized monitoring system for order entry and reporting medication errors, patient chart review, using direct observation, incident reporting and patient monitoring. **Objective:** To evaluate the impact of reporting medications errors on patient's safety and required action plan for preventing reoccurrence. **Method:** It is a retrospective study. 1550 medication errors were collected and analyzed from government hospital in Abu-Dhabi for 2 years by using patient safety net (PSN). **Results:** The highest medication errors incidents were in quarter 4 2014 (20%) and declined to (7%) in quarter 4 2015. However some types of errors that were related to hospital system increased in 2015 like missing doses in inpatient pharmacy from 5% to 17.6%. While, all errors related to physician prescribing were dropped down from 89% in 2014 to 51.4% in 2015. Near miss an error occurred but did not reach the patient were the highest incidents among all categories, it was 95% in 2014 and slightly decreased to 88% in 2015. Event reached the patient, but no harm was evident was 3% in 2014 and slightly increased to 9% in 2015 while errors categories 4 to 9 were Zero for 2 years. **Conclusion:** Voluntary medication error reporting can provide useful information about systems contributing to errors, strategies for prevention, and evidence-based information about patient safety concepts. This information is important for hospitals to consider both when analysing medication errors and when implementing systems to improve safety.

KEYWORD: Reporting medication errors, patient safety, drug related adverse events, patient safety net and computerized monitoring system.

INTRODUCTION

Medication errors and drug-related adverse events have important implications from increased length of hospitalization, costs, disability and increased mortality (Bates et al., 1995)

Identify individual problems that lead to medication errors and analyze the systems design will significantly enhance the patient safety (Van Beuzekom et al., 2010). The frequency and severity of medication errors are not evenly distributed in the population, and there are clusters of patients, drugs, and settings that are associated with higher risks; however, these can generally be attributed to common underlying contributory factors. (Vincent etal., 2001).

PATIENTS AND METHOD

From January 2014 to December 2015, 1636 medication errors were reported by health care providers; 86 reports

were excluded from the study due to invalidity. Figure 1, total percentage of patients involved were 0.56% in 2014 and 0.34% in 2015.

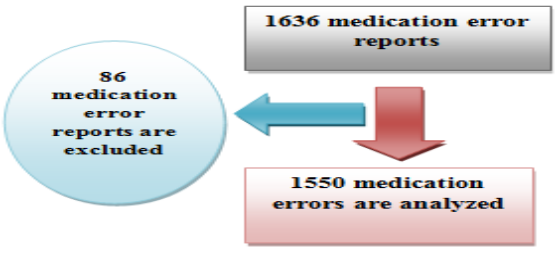

Figure1: Medication errors reports

Study Design

The study design is a retrospective study. 1550 medication errors were collected and analyzed from government hospital in Abu-Dhabi for 2 years by using patient safety net (PSN) which is comprehensive quality improvement program to make the hospital safer, more effective and more satisfying place for the patients. The inclusion criteria for report was applied as follows: first: medication errors reported by health care providers in 2014 and 2015 including physicians, pharmacists and nurses. Second: both genders female/male and all ages were included in the report: infants, pediatric and adult. However, 86 invalid medication errors reports were excluded due to wrong medical record number for the patient, thus reported error can't be analyzed and investigated, also if medication error report was missing important information and no enough details to validate the incidents, lastly, lack of enough clinical experience of reporters to evaluate the incident properly.

Sampling method

Medication errors reports were generated from PSN quarterly. Each report was evaluated, analyzed and investigated to assure validity. Valid reported medication errors were total of 1550 in 2014 and 2015 that analyzed individually, total of 943 errors were included in 2014 and 607 in 2015.Medication errors reports were filtered as per: gender, age, nationality of patient affected, type of medication errors, harm score, stage of errors, occupation of reporter, involved staff in causing the errors and source of errors. The main objectives of reports analysis were to identify medication errors and contributing factors, root cause analysis, explain the stages of medication errors identify specific examples of medication errors categories, describe the severity of different categories of medication errors, evaluating action plan and strategies used by healthcare organizations to reduce medication errors and incidents.

RESULTS

Statistical methods were used to analyse the material. Results were reported using frequencies and percentages. The highest medication errors were (20%) in Q 4 2014 and declined to (7%) in Q 4 2015. Figure 2.

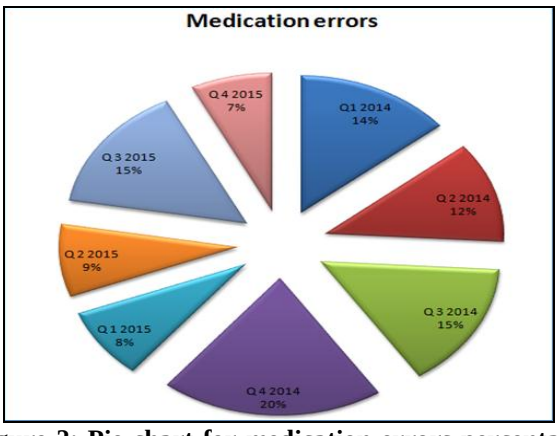

Figure 2: Pie chart for medication errors percentage per quarter in 2014 and 2015.

Demographic

In 2014 932 patients were involved in medication errors out of 166313, 0.56% and this percentage was declined to 0.34% in 2015 since 589 patients were involved out of 171173.National patients were higher 62% than Non-National 38% among this study Figure 3, Patients over 50 years were more involved in medication errors 36.42% and least percentage 0.066% was for infants 1 to 3 month, Figure 4.

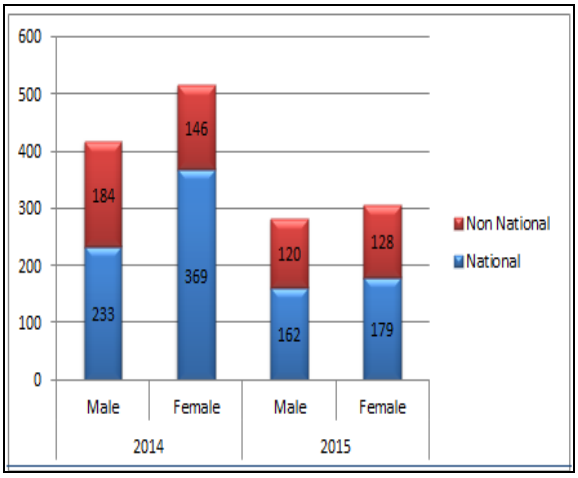

Figure 3: Column chart of National patients versus Non-National patients.

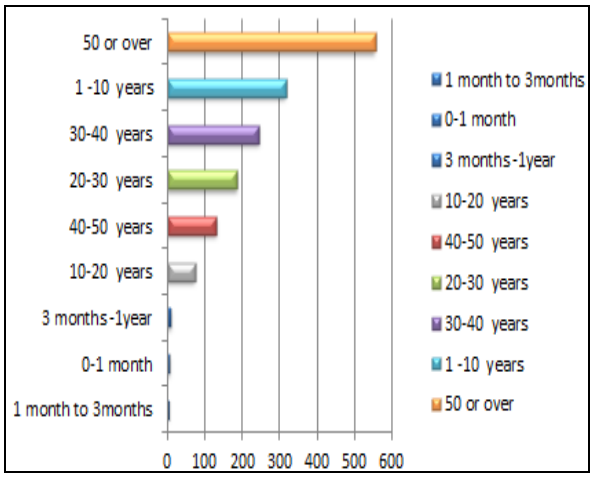

Figure 4: Bar chart of involved patient's age in medication errors.

Types of medciation erros

They were 24 types of reported medication errors, 9 types were decreased significantly, 9 types were increased from 2014 to 2015, while the remaining 6 types were almost in the same range for 2 years, Table 1:

Table 1: Types of medication errors.

Type of errors	2014 943 errors		2015 607 errors	
	N	%	N	%
In patient pharmacy Duplicate orders	145	15.4	94	15.5
Duplicate orders same prescription	80	8.4	0	0
Duplication/Overlap of orders	148	15.7	72	11.9
Improper dose	129	13.7	71	11.7
Improper frequency	8	0.8	5	0.82
Improper Duration	79	8.3	25	4.1
Therapeutic duplication	34	3.6	13	2.14
Known Allergy	20	2.12	13	2.14
No weight documented	13	1.4	2	0.32
Wrong drug	22	2.3	30	5
Wrong dosage form	36	3.8	10	1.6
Wrong route	13	1.38	6	1
Wrong diluents	2	0.2	1	0.164
Wrong Patient	7	0.74	11	1.8
No/Wrong instructions	88	9.3	11	1.8
Drug-Drug Interaction	2	0.2	1	0.164
Drug-Disease Interaction	10	1.06	2	0.32
Extra Dose	28	3	72	11.8
Missed dose	46	5.0	107	17.6
Returned medication error	1	0.1	8	1.31
Deteriorated/Expired Medication	5	0.53	8	1.31
Wrong Infusion Rate	7	0.74	13	2.14
Wrong Concentration	4	0.42	11	1.18
Delayed Delivery	8	0.84	21	3.45

The highest medication error in 2014 was duplicated orders in Inpatient and outpatient pharmacy, while in 2015 the highest error was for missing doses in inpatient pharmacy.

Source of errors

Prescribing faults and prescription errors were major problems among medication errors. They occur both in general practice and in hospital, although they were rarely fatal they can affect patients' safety and quality of healthcare. Physicians were the main source of reported medication errors, they were contributing to highest percentage comparing to other sources. Other source like pharmacists if any mistake was done during dispensing, nurses if errors happened during administration and other errors that were related to system, improper storage, delay delivery of medications and medical records problems.

All errors related to physician prescribing were dropped down from 89% in 2014 to 51.4% in 2015. Active interventions aimed at reducing prescription errors and prescribing faults were strongly recommended. These should be focused on the education and training of prescribers.

Dispensing error is a discrepancy between a prescription and the medicine that the pharmacy delivers to the patient or distributes to the ward on the basis of this prescription, including the dispensing of a medicine with inferior pharmaceutical or informational quality (Cheung et al., 2009). It was highly increased in 2 years from 6.6% to 29.3%. Other sources of medication errors like system, expired medication in the shelf, late delivery of medication to the ward, improper storage, out of stock, wrong encounter and file number due to medical record errors.

Stages of errors

Inappropriate prescribing most often derives from a wrong medical decision, because of lack of knowledge and skills of relevant rules or inadequate training, Inadequate staffing, tasks outside the routine. All these factors have been identified as conditions associated with prescribing faults. It was decreased significantly from 88% to 52.4%. In some settings, medication orders are transcribed, dispensed and then delivered for nurse administration. In certain circumstances and settings, both nurses and pharmacists are involved in transcribing, verifying, dispensing and delivering medications. Pharmacists can have an important role in intercepting and preventing prescribing/ordering errors however in this study medication errors related to dispensing were highly increased from 6.6% to 29.3%. While in transcribing they were increased by 0.5% from 1.3% to 1.8%. Pharmacy has introduced several methods and strategies to reduce dispensing errors, depending on the different workingphases of the pharmacies in the medication process and the development of information technologies.

Medication errors categories and severity

Category one which is Unsafe Condition, Potential event (AHRQ, 2012): circumstances or events that had the

capacity to cause error were almost stable 2% to 3% in 2014 and 2015. Category 2Near Miss: an error occurred but the medication did not reach the patient was the highest incidents among all categories, it was 95% in 2014 and slightly decreased to 88% in 2015.Category 3: Event reached the patient, but no harm was evident, it was 3% in 2014 and slightly increased to 9% in 2015. Categories 4 to 9 were Zero for 2 years.

DISCUSSION AND CONCLUSION

This is the first study of its kind in the UAE that monitor reporting of medication errors in government hospital and analyze each report to look for the root cause analysis and alert other health professionals of problems so that injury can be prevented to other patients from a repeat of the same problem in the future, therefore, all health professionals are encouraged to submit confidential reports so that others can learn from these experiences and serve an important public health benefit.

Prescribing errors

Pharmacists reported 830 prescribing problems (88%) in 2014 and decreased to 318 errors (52.4%) in 2015.

Figure is relatively high compared with the overall rates reported in previous study**,** including recent study in UK; the result was (0.7%) (Quinlan et al., 2002). Several issues need to be addressed when comparisons are made between studies. Firstly, the definition of prescribing problems and errors differs between studies. In particular, problems relating to errors of omission (such as indication not specified; Claesson et al., 1995) and reimbursement procedures vary substantially.

When incomplete prescriptions and other procedural problems are excluded, however, the results between various studies are fairly consistent (approximately 0.4%) (Claesson et al 1995; Caleo et al 1996; Hawksworth et al 1999; Quinlan et al 2002).

Nevertheless, the potential problem of underreporting warrants further discussion. Computerized provider/ physician order entry (CPOE) with clinical decision support (CDS) is designed to improve patient safety. However, a number of unintended consequences which include duplicate ordering have been reported in this study. (Magid et al., 2012).

The challenge of duplicate orders of same prescription became obvious shortly after CPOE implementation. It was successfully decreased from 80 errors in 2014 to zero in 2015; it was significantly declined by 8 %, while overlapping orders with duplicate orders was dropped 3.8%. The finding of this study don't differ much from study conducted in surgery hospital, they design tactics to reduce duplicate orders, using this approach, they decreased duplicate orders 84.8% ($p<0.01$). (Magid et al., 2012).

Transcribing errors: it was increased slightly by (0.5%). Most of reports were related to re-entry of manual form of Total parenteral nutrition (TPN) in electronic system. The benefits of TPN are significant, but the potential for harm is great with this high-alert medication if it is used in error. Inappropriate dosing of nutrients, order entry errors, and compounding errors have all been associated with adverse outcomes and death. Transcription error is a specific type of medication errors and is due to data entry error that is commonly made by the human operators (Fahimi et al., 2009). The result of this is relatively low (0.5%) since the hospital system is CPOEwith CDSif compared to other study which was conducted in a teaching hospital in Tehran (52%), direct observational method was used and error was defined as any deviation in transcribing medication order from the previous step, (order on the order sheet, administration nursing note and documentation of the order in the pharmacy database (Fahimi et al., 2009).

Dispensing errors: include any inconsistencies or deviations from the prescription order, such as dispensing the incorrect drug, dose, dosage form, wrong quantity, or inappropriate, incorrect, or inadequate labeling (Nair., 2010). Also, confusing or inadequate directions for use, incorrect or inappropriate preparation, packaging, or storage of medication prior to dispensing are considered to be errors (Nair., 2010). Incidents related to dispensing were increased significantly by (22.7%) from 62 to 178 errors in 2015, which was similar to result of ten years ago studies in the USA and Europe reported similar high rates of dispensing errors. In one study the rate of dispensing error was (24%); no reasons were given for this. (Allanet al., 1995).

Most studies have investigated dispensing errors in hospitals in the USA or Europe, from the perspective of the chain of pharmaceutical patient care (i.e. excluding prescribing errors and administration errors) (Cheung et al., 2009). There has been less research on community pharmacies or mail-order pharmacies. (Cheung et al., 2009). The rates of dispensing errors were low to very low. Nevertheless, it is still necessary to pay close attention to dispensing errors, because nowadays pharmacies dispense such high volumes of medications that even a low error rate can translate into a large number of errors. (Poon et al., 2006).

One more study in a UK hospital in which the researchers used semi structured interviews of pharmacy staff about self-reported dispensing errors. In all, 106 error-producing conditions were mentioned in the interviews. The most common causes mentioned were: being busy (21%), being short-staffed (12%), being subject to time constraints (11%), fatigue of healthcare providers (11%), interruptions during dispensing (9.4%), and look-alike/sound-alike medicines (8.5%). (Cheung et al., 2009).

Administration errors

Underlying systems factors have been seen to be crucial contributors to the occurrence of medication errors. By understanding the causes of these errors. (Keers, 2013). The most appropriate interventions can be designed and implemented to minimize their occurrence.

Errors in administering medicines are common and can compromise the safety of patients; in 2015 it was increased by 10%, The most common types of reported errors were wrong route, wrong dose, omission, and extra dose. All incidents were similar in rate of frequency in 2014 and 2015 except for extra dose and missed or omission doses the incidents percentage were increased up in 2015 (8.8% for extra doses and 12.6% for missed doses).

Slips and lapses were the most commonly reported unsafe acts, followed by knowledge-based mistakes and deliberate violations. Error-provoking conditions influencing administration errors included inadequate written communication (prescriptions, documentation, transcription), problems with medicines supply and storage (pharmacy dispensing errors and ward stock management), high perceived workload, problems with ward-based equipment (access, functionality), patient factors (availability, acuity), staff health status (fatigue, stress) and interruptions/distractions during drug administration. Comparing the results to other study assessed the type of Medication Administration Errors (MAEs) reported by nurses in nationwide surveys involving wrong time, omission and wrong dose accounted for (77.3%) of errors, while wrong drug and wrong patient accounted for (77.8%) of near misses. The most frequent types of medication errors were wrong time (33.6%), wrong dose (24.1%) and wrong drug (17.2%) and the three most frequent types of near misses were wrong drug (29.3%), wrong dose (21.6%) and wrong patient (19.0%). (Balas et al., 2004).

Medication monitoring errors: Performing drug monitoring in the hospital requires a multidisciplinary approach typically comprised of scientists, clinicians, nurses and pharmacists. Excellent communication among team members is necessary to ensure that best practices are achieved. The goal of drug monitoring is to manage a patient's medication and optimize outcome. (Joint commission international accreditation (JCIA), 2014)

Also as per medication management cycle monitoring medications include incidents reporting policy, near miss and monitoring the effect of medication policy (JCIA, 2014). The most frequent events reported no patient weight was documented 1.4% in 2014 and declined to 0.32% in 2015, expired stock in the shelves were increased by 0.78% in 2015. Delayed medication delivery to the patient and nursing units also increased in 2015 by 2.61%. In overall the results of drug monitoring were similar in 2 years (1.2% to 1.3%). In contrast, A study was undertaken to assess the feasibility of a near-miss reporting system in primary care practices and to describe initial reports and practice responses to them.

The most common medication monitoring errors was filing errors with 38%, it judged by external coders to be high risk for an adverse event. Electronic medical records were the primary or secondary cause of the error in 7.8% and 14.4% of reported cases, respectively. The pattern of near-miss events across these diverse practices was similar as well. (Crane et al., 2015).

Medication Storage incidents: A well-organized drug-storage system can reduce the risk of medication errors, however, events reported to the Pennsylvania Patient Safety Authority describe how breakdowns in the storage of medications have contributed to drug product mix-ups. More than 200 events have been reported to the Authority from June 2004 through October 2009 that indicates drug storage as a contributing factor to the event. Analysis reveals that nearly 73% of the events reached the patient. The most frequently reported event type was wrong drug 99 [46%] of the events reported). Events occurred in more than 50 different units, indicating that drug storage issues can and do occur throughout a facility (Pennsylvania patient safety advisory, 2010).

Look alike sound like drugs (LASA)

Medication names that either look or sound similar often cause confusion and can cause errors which can harm patients or even cause death. Over 1,400 commonly used medications were involved in such errors according to results from the United States Pharmacopoeia (USP) in January 2008.

In this study only 2 incidents were reported of wrong drug prescribed due to similarity in drug names, they were hydrALAZINE -hydrOXYzine and metoPROLOL - metoCLOPRAMIDE. The 4 drugs were modified in CPOE to include “tall man” letters to ease the identification of these drugs and prevent such error in the future; also they were added to the Look Alike Sound Alike drugs list of the hospital.

High alert drugs

A medication error involving a high-alert medication can have tragic consequences. High-alert medications are medications that are most likely to cause significant harm to the patient, even when used as intended (Institute for Healthcare Improvement, 2015).

Although any medication used improperly can cause harm, high-alert medications cause harm more commonly and the harm they produce is likely to be more serious and leads to patient suffering and additional costs associated with care of these patients. Although it is important to improve management of all of these medications, some of them have been associated more frequently with harm, such as anticoagulants, narcotics and opiates, insulin and sedatives. The most common

types of harm associated with these medications include hypotension, bleeding, hypoglycemia, delirium, lethargy, and bradycardia. (Institute for Healthcare Improvement, 2015).

In 2014 137 incidents out of 943 were reported that involved high alert medications 14.3%. Most of incidents were harm score one and two which are unsafe condition, Potential event: any circumstance that increases the probability of a patient safety event, all of them didn't reach the patient, example: wrong preparation of TPN which had sodium but the physician order didn't contain sodium, one more example was late delivery (2 hours) of potassium chloride to intensive care unit (ICU) although it was STAT order.

Three medication errors were reach the patient but no harm, the score was 3,they were wrong infusion rate of insulin, Unnecessary order of fentanyl patch 12mcg/hr was made by physician due to copy order option in the system and last one was duplicate orders of KCL infusion & Potassium phosphate IV infusion. In 2015 reported medication errors of high alert were dropped to 8.7% and all of reports were near miss with harm score of 1and 2 only due to improper storage and labeling in the wards, they didn't reach the patient. Starting from 2nd Q 2014 the high alert drugs view in CPOE was modified to make it more noticeable to physicians by: All high alert drugs order sentences in CPOE were modified to be in red font so physicians can notice them if they don`t memorize the list of high alert drugs in the hospital and order comment was added in CPOE to each high alert drugs to remind users that this is a high alert drug and it should be double checked.

Results of this study were similar to the result of descriptive, quantitative study whose population was composed of the documents that registered the occurrences of medication errors. The number of medications involved in the occurrences was (12.1%) events involving high-alert medication classes were identified. These drug types are frequently used at hospital and should be accurately monitored, as they can cause further damage when incorrectly used (Massaroli et al., 2014).

CONCLUSION

Medication errors have continually been reported as one of the most common types of healthcare errors. Medication list errors and medication order errors during hospitalization may adversely affect the patient's cares well as puts patients at risk post-discharge for a wide variety of medication-related issues. The data presented here shows medication list errors and medication order orders are prevalent at government hospital in United Arab Emirates (UAE), which is consistent with data from a multitude of different studies from sites around the world.

In addition to that appropriate increases in the use of information technology in health care especially the introduction of clinical decision support and better linkages in and among systems and further improvement in the design of CPOE and clinical decision support systems, resulting in process simplification could result in substantial improvement in patient safety.

Lastly, using this data, a model for predicting medication order errors was generated that could potentially identify and target those patients with the highest risk for a medication error occurrence. This and similar research could potentially have profound outcomes with regard to error prevention during a hospitalized patient's transition of care.

RECOMMENDATION

Patient safety event reporting systems are ubiquitous in hospitals and are a mainstay of efforts to detect patient safety events and quality problems. Incident reporting is frequently used as a general term for all voluntary patient safety event reporting systems, which rely on those involved in events to provide detailed information. Initial reports often come from the frontline personnel directly involved in an event or the actions leading up to it (e.g., the nurse, pharmacist, or physician caring for a patient when a medication error occurred), rather than management or patient safety professionals. Voluntary event reporting is therefore a passive form of surveillance for near misses or unsafe conditions.

From the perspective of pharmacy organization and quality assurance, pharmacists should intensify their checking of prescriptions, in order to reduce prescription errors and should implement strategies to communicate adequately with patients, in order to prevent administration errors.

All hospitals are required to maintain a confidential event reporting system, existing voluntary reporting systems have a shared interest in developing ways to compare and benchmark safety data. Under the mandatory reporting system, state governments will be required to collect standardized information about adverse medical events and medication errors that result in death and serious harm. Hospitals should be required to begin reporting first, and eventually reporting should be required by all health care organizations. This system will ensure a response to specific reports of serious injury, hold health care organizations and providers accountable for maintaining safety provide incentives to organizations to implement internal safety systems that reduce the likelihood of errors occurring and respond to the public's right to know about patient safety.

Healthcare professionals increasingly work as part of multidisciplinary teams where effective communication is essential. Good communication with patients, including how to recognize and act on AE and keeping good-quality records are essential.

Information technology has the potential to reduce prescribing errors. However, implementing electronic system in healthcare is challenging. Information technology is changing the nature of the clinical task from the clinician as the holder of information to have the skills to critically appraise the evidence. Patients and the public now have access to the same information as their prescriber.

Much research is needed about medication errors in inpatient and outpatient settings. Errors that arise outside the hospitals can come from psychiatric care, administering of medications in schools, use of Over The Counter (OTC) products, complementary medications and alternative medications. Research should concentrate on the patient's role, healthcare provider and pharmaceutical companies (manufacturing and marketing).

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