

Original Article

Medication Errors Related to the Clinical Use of Medications Used by Cardiovascular Surgery Patients before Admission to Hospital: A Cross-Sectional Study

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Abstract

Background: Medication errors are the most common type of error that has an impact on patients' well being. These errors are usually made in medications used by patients prior to hospitalisation.

Objective: The objective of this study was to investigate medications with errors and the presence and type of these errors in medications taken before admission by patients who will have cardiovascular surgery.

Methodology: The type of this study was cross sectional. It was interviewed with 113 patients of cardiovascular surgery who used medications before admission to university hospital. Medication histories of patients were obtained and compared with physician orders.

Results: The mean number of medications used before admission to hospital was four. 34.5% of the patients had errors in medications used before admission. All errors in physician orders related to omitted medications. The number of medications in which error occurred in physician orders was 116. Oral antidiabetic medications and insulins and drugs acting on the cardiovascular system comprised 25.2% and 32.2% of these medications respectively.

Conclusions: Having a high number of medication errors was a result of acquiring incomplete and inaccurate medication histories. Physicians and nurses should acquire detailed medication histories from patients and in order to have accurate histories they should obtain information from patients's families and personal records. Error-prevention strategies that will provide adequate and accurate information about patients' medication histories should be developed by using electronic data records.

Keyword: Medication errors, Medication reconciliation, Patient admission, Patient safety.

Introduction

Medication error is the most common type of error that has an impact on patients' well being. These errors occur most commonly at hospital admissions, discharge and transfer of patients from one clinic to another (Barnsteiner 2008;

Mekonnen et al. 2016). Medication error at hospital admission means stopping the use or changing the dose and/or frequency of medications used by patients before admission to hospital. It also means another type of error that occurs when patients continue to use their

medications without informing health personnels in advance. AbuYassin et al. showed in their study that there was an error in medications of 37% of the patients who had been taking these medications regularly before admission to hospital (Abuyassin et al. 2011). They also stated that 35% of these errors related to omitted medications and another 35% was the result of incorrect dosage of the medications (Abuyassin et al. 2011). Many problems may arise when patients, while hospitalized, misuse the medications that they took before admission to hospital. Changing the dosage and frequency of medications which have been used by patients before admission may change the expected results of these medications in patients' treatments. Multi-medication interactions may occur when patients continue to use their medications after admission to hospital without informing health personnel in advance. Multi-medication interactions may not only affect patients' well-being but may also delay ongoing treatment plan or may cause serious life threatening problems.

There may be many factors causing errors related to medications used by patients before admission to hospital. One of the most important factor is inadequacy of physician-acquired medication history. Studies showed that at least one medication used by the patients before admission to hospital was inaccurate in 25% to 80% of newly hospitalized patients' physician orders (Buckley et al. 2013; Cornu et al. 2012; Pascual et al. 2015; Stone et al. 2010). Medication errors resulting from obtaining inaccurate medication history during hospitalization may cause serious results. Stones et al. determined in their study that 21.4% of physician orders at the time of admission to hospital was inaccurate and 53.8% of these inaccurate orders were potential adverse drug events (Stone et al. 2010). Vira et al. found in their study that medication errors occurring during hospitalization caused important clinical problems in 18% of patients (Vira et al. 2006). However, in the Turkish literature there was no study evaluating errors related to medications used by patients before admission to hospital.

Problems caused by medication errors lead to overstay of patients, complications and extra costs. World Health Organisation stated in 2007 and 2014 that all medications used by patients needed to be recorded accurately and adequately in order to prevent life threatening medication errors (World Health Organization 2014; Leotsakos et al. 2014). Medication errors occur more often in surgical service (Buckley et al. 2013). Patients of cardiovascular surgery have a higher rate of comorbid and a higher use of risky medications. The determine of medication errors is important.

Aim of the Research: The purpose of this study was determine types of medication errors and medication errors related to the clinical use of medications used by cardiovascular surgery patients before admission to hospital.

Methodology: The type of this study was descriptive and cross sectional. This study was conducted in cardiovascular surgery clinic of an university hospital that is located in the west of Turkey. Nurses see their patients at the admission to the clinic. Physicians see their patients and records their medical histories. Physician order is created electronically. Nurse then makes the treatment plan according to the physician order.

Patient characteristics: The study population was formed by patients who were aged 18 years or older, were hospitalised within 24 hours, used medications before admission to hospital, could communicate verbally, had conscious and did not receive chemotherapy. Between January and March 2016, 469 patients were admitted to cardiovascular surgery clinic of an university hospital. Among these patients, 60 were infants, 23 were transferred from another service (e.g. emergency, cardiology), 140 had daily surgeries (e.g. port surgery, varicose vein surgery), 20 had recurrent hospitalisation, 8 could not communicate verbally, 105 did not use medication before admission to hospital, excluded as they did not match sample criteria. Therefore the study population was formed by 113 volunteered patients who met the sample criteria (**Figure 1**).

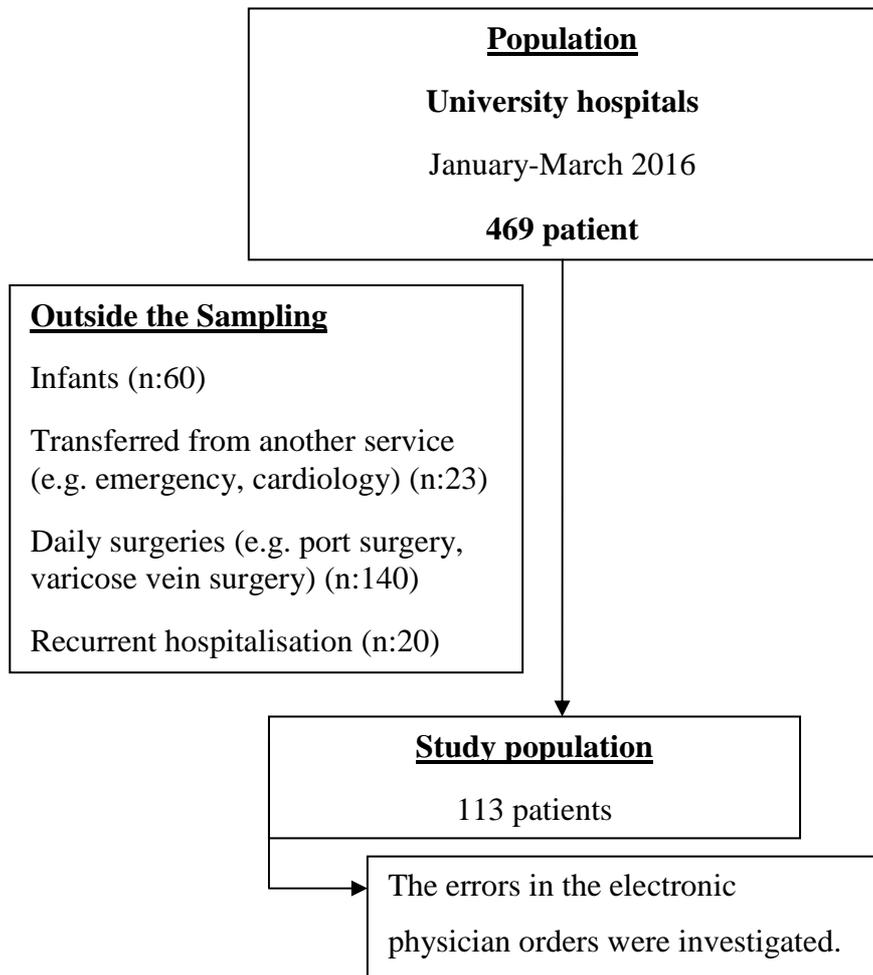
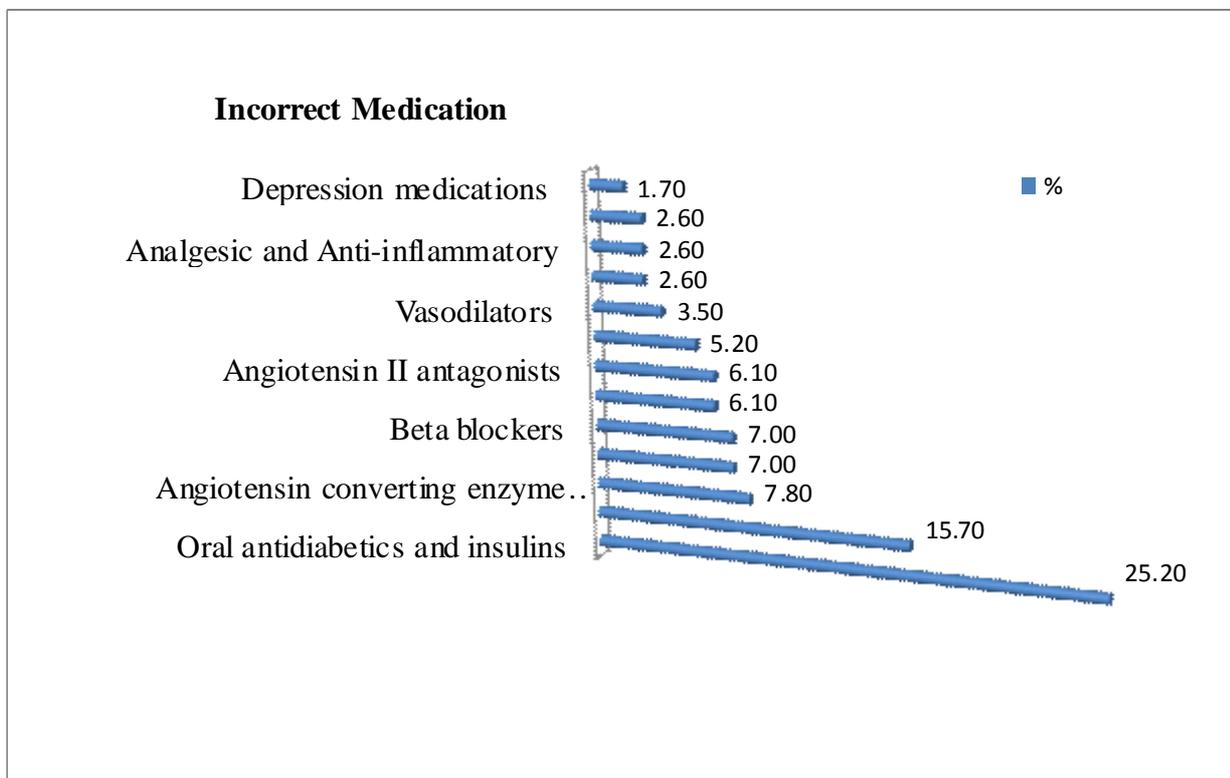


Figure 1. Study population

Table 1. Errors in electronic physician orders related to medications used by patients before hospital admission (n: 113)

Electronic physician orders medication errors	n	%
Yes	39	34.5
No	74	65.5
Total	113	100



Data collection

Patient identification form and medication error identification form were used in this study. Patient identification form was comprised of 12 questions. This form had questions about patient’s medication history, how medications were used, continuation of medications, changes in use of medications used before admission and reasons to discontinue medications. Patient

identification forms were filled by conducting face to face interviews with patients. It took about 10 minutes to interview a patient.

In medication error identification form, medications used by patients prior to hospitalisation were compared with those in the electronic physician orders. It was checked if the medications that the patients stated to use were in the electronic physician orders. The medication

discrepancies and errors were documented in the medication error identification form.

Medications were also compared according to parameters like dose and frequency of use. Identified changes or deficiencies were noted. The discrepancies were reviewed for verification and the details were brought to the notice of the concerned physician who was in charge of patient's treatment. It was not recorded as an error when the medications used by patients prior to hospitalisation were stopped, changed or administered at a different dose or a frequency due to medical conditions of patients. For this study, The discrepancies were classified. A change in the patient's medication or discontinuation of the use of the medication was considered a conscious change. Although the patient's medication was not in the electronic physician orders, the patient's use of the medication was defined as error.

The Ethical Principles of the Study

Institutional permission to conduct the research was obtained from Dokuz Eylul university hospital. Ethical approval was obtained from the ethics committee of an Dokuz Eylul University (no:2016/05-17). Before data were collected, all patients were informed about the aim of the research. Verbal and written informed consent were obtained from each patient.

Statistical analysis

Data was analysed with Statistical Package for Social Sciences 15.0 (SPSS, Inc., Chicago, IL, USA) software. Statistical difference between age and number of medications of patients with or without medication errors was evaluated by t test of independent groups.

Results

The study population consisted of 29% females and 71% males with a mean age of 63.64 ± 12.71 years (minimum: 18, maximum: 84). Patients admitted to clinic for coronary heart disease (22%), peripheral artery disease (20%), valvular heart disease (20%), aortic aneurysm (8%), deep-vein thrombosis (7%), surgical wound infection (7%) and carotid artery stenosis (5%). Among the patients, 39% had hypertension, 27% had diabetes mellitus, 13% had both hypertension and diabetes mellitus and 12% had chronic heart failure. Patients had minimum one and maximum 14 medications. The mean number of

medications used before admission to hospital was four.

It was investigated the electronic physician orders related to the used medications before hospital admission of 113 patients admitted to cardiovascular surgery clinic. It was observed medication errors between medications taking before admission hospital and medications listed in their physician orders of 39 patients. The physician orders of 34.5 % of the patients were error. (Table 1). All of the errors that occurred in medications used by patients before admission to clinic were omitted medications. In omitted medications, patients continue to take their medications that they used before admission to service even though these medications are not included in electronic physician orders.

There was no significant difference between the mean age (t: 1.372, P: 0.173) and number of medications (t: 1.280, P: 0.203) of the patients with and without medication error (P > 0.05). There was no significant difference between the gender of the patients with and without medication error (X^2 : 0.948, P: 0.562).

The number of incorrect medication was 115 in electronic physician orders. These incorrect medications were distributed as follows: oral antidiabetics and insulins (25.2%, n: 29), antitrombotic medications (15.7%, n: 18), angiotensin converting enzyme (ACE) inhibitors (7.8%, n: 9), diuretics (7.0%, n: 8), beta blockers (7.0%, n: 8), medications affecting lipid metabolism (6.1%, n: 7), angiotensin II antagonists (6.1%, n: 7), calcium channel blockers (5.2%, n: 6), vasodilators (3.5%, n: 4), other cardiac medications like antiischemic and cardiac glycosides (2.6%, n: 3), analgesic and anti-inflammatory (2.6%, n: 3), medications for peptic ulcer and gastroesophageal reflux disease (2.6%, n: 3) and depression medications (1.7%, n: 2). In General, medications that affect the cardiovascular system (ACE inhibitors, beta blockers, angiotensin II antagonists, calcium channel blockers, vasodilators and other heart medications) were 32.2% of the incorrect medications. Medications of oral antidiabetics and insulins were 25.2% of the incorrect medications (Graphic 1).

Discussion

There were medication errors in 34.5% of the medications used by patients before admission to cardiovascular surgery clinic. Studies showed

that, in 25% to 49% of newly hospitalised patients' physician orders, medication errors occurred in at least one of the medications used before admission (Buckley et al. 2013; Pascual et al. 2015; Gleason et al. 2010; Salanitro et al. 2012). We had similar results in our study. Having high number of medication errors was a result of acquiring incomplete and inaccurate medication history. The most common type of error in our study was the omitted medications which were used by patients before admission and were continued to be used after admission. In other studies, the percentages of omitted medications were between 37% and 80% (Buckley et al. 2013; Gleason et al. 2010; Tschantz Unroe et al. 2010; Lee et al. 2010). The percentage of omitted medications in our study was found to be high and there were multiple reasons for it. The first reason might be health personnels' inadequate evaluations of medications used by patients prior to hospitalisation. The second reason might be due to not being able to gather medication information of patients, who can not express themselves properly and do not have adequate information about their medications, from a single database. Health personnels should spare adequate time to their patients in order to obtain adequate and accurate information from them. Health information systems should be used to obtain medical records of patients.

There was no significant difference between the age and number of medications of patients with or without medication errors. It was found in a study that age and number of medications used had no effect on the result (Abuyassin et al. 2011). However, it was found in other studies that being 65 years old or over and multiple medication (eight or above) use had an effect on the medication errors (Pascual et al. 2015; Gleason et al. 2010). We may have different results since mean age in our study was below 65 years and mean number of medications used was four.

In our study, one third of medication errors occurred in cardiovascular medications affecting heart and arteries while one fourth of them occurred in oral antidiabetics and insulin. It was also shown in other studies that errors were more common in cardiovascular medications (Pascual et al. 2015; Gleason et al. 2010; Tschantz Unroe et al. 2010; Van Den Bemt et al. 2009; Climente-Martí et al. 2010). The predominance of errors in cardiovascular medications can lead to serious

medication error incidents. Taking a lower dose of cardiovascular medications can cause hypertension and tachycardia which could increase oxygen consumption of myocard whereas taking a higher dose can cause hypotension which could affect coronary perfusion negatively (Gümüş et al. 2013). In the end, they both affect treatment process negatively. No study was found on diabetes medication errors. However we determined diabetes medication errors in our study. There is the risk of hyperglycemia or hypoglycemia when patients don't take their diabetes medications or when they continue to take them without informing health personnels in advance.

It is necessary to regulate blood glucose levels and avoid hyper- or hypoglycemia in order not to cause problems related to health conditions of patients before cardiovascular surgery (Gümüş et al. 2013). However patients come face to face with these problems when diabetes medication errors occur. Acquiring inadequate medication history and not sparing adequate time to patients are the root of these problems. Errors occurred in medications that could affect patients' health. It was shown in a study that more than 34.5% of errors occurred in medications used before admission had an impact on patients' health (Lee et al. 2010; Knez et al. 2011). However, this study did not evaluate whether or not the errors determined had an impact on patients' health. Physicians and nurses have the responsibility to carry out treatment successfully and it is important for them to evaluate patients adequately in order to prevent serious problems specifically related to medications. It is necessary for physicians and nurses to acquire detailed medication histories from patients and also obtain information from patients' family and medical records. Health personnels should share, first, informations about medications used by patients before admission and second, informations related to factors that could have an impact on treatment. Medication reconciliation forms, electronic data records and joint database should be used as suggested in the literature (Gleason et al. 2012).

Conclusions

As a result, errors occur in clinical use of medications used by patients before admission to hospitalisation. These errors can cause serious medical problems. Therefore medication history should be obtained, by using good

communication skills, soon after patient is admitted to clinic. When available, informations should be obtained from reliable sources (patients' relatives, medical records etc.). National common patient database should be developed. It is advised to study a larger number of patients to determine medication errors and evaluate problems created by these errors. The result of strategies implemented to prevent errors should also be evaluated.

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