

# Analysis of Medication and Procedure Complications in Hospitalized Iranian Patients

Ali Mohammadi<sup>1</sup>, PhD;  
Soodeh Shahsavari<sup>1</sup>,  
PhD; Sousan Mahmoudi  
Bavandpouri<sup>2</sup>, MD; Roholah  
Mohammadi<sup>3</sup>, MSc; Masoomeh  
Nouri Tahneh<sup>1</sup>, PhD

<sup>1</sup>Department of Health Information Technology, Faculty of Paramedical Sciences, Kermanshah University of Medical Sciences, Kermanshah, Iran

<sup>2</sup>Cardiovascular Research Center, Health Institute, Imam-Ali Hospital, Kermanshah University of Medical Sciences, Kermanshah, Iran

<sup>3</sup>Department of Nursing Management, Vice Chancellor for Clinical Affairs, Kermanshah University of Medical Sciences, Kermanshah, Iran

## Correspondence:

Ali Mohammadi, PhD;

Department of Health Information Technology, Faculty of Paramedical Sciences, Kermanshah University of Medical Sciences, Kermanshah, Iran

Tel: +98 9188305876

Email: a.mohammadi@kums.ac.ir

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## Abstract

**Background:** Complications are defined as the adverse outcome of the procedures. They increase the length of stay and costs, endanger the patient's quality of life, and are associated with legal issues. This study aims to analyze the complications of drugs and surgeries in hospitalized patients.

**Methods:** This descriptive study was conducted on patients hospitalized from 2013 to 2019. Research resources included records of hospitalized patients with Y40-84 codes based on ICD-10 selected by the census. Records numbers were retrieved from HIS based on the code; records were extracted from the archive of an Iranian hospital. Data were collected using a checklist consisting of two parts. First, the characteristics of the patients and second, the cause and type of complications were extracted by studying the records. The data were analyzed using SPSS20

**Results:** 151 records with Y40-84 codes were retrieved. The records related to complications of procedures and medications were 55 and 96, respectively. 55.6% of patients were female, and 44.4% were male. The average age and length of stay were 51.95 years and 5.7 days, respectively. Post-operative infection and gastrointestinal bleeding, with 49.1% and 20.83%, were the most common complications of surgery and medication, respectively. DVT with 17.2% and cesarean section with 7.3% were the most common cause of complications. Finally, Warfarin had the most complications, with 80%.

**Conclusion:** Complications lead to increased length of stay, costs, and mortality. Therefore, to prevent them, it is necessary to evaluate the patient's condition before proceeding, training, and monitoring the treatment process.

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**Keywords:** Complication, Hospital, Inpatient, Medication, Procedure

## Introduction

Complications of procedures are one of the major health problems. They become inevitable with the appearance of new diseases, care complexity, and microbial resistance.<sup>1</sup> Complications are unwanted conditions in treating a patient's disease resulting from unexpected factors as important indicators for the results of procedures.<sup>2</sup> They are defined as adverse outcomes of procedures, increasing hospitalization time and cost, endangering

the patient's quality of life, and affecting a physician's reputation if associated with ethical issues.<sup>3-6</sup>

Surgery is a basic health care procedure in the health system. Annually, more than 234 million surgeries are performed globally and complications occur in 3% to 16% of them. Surgery complications are one of the leading causes of morbidity and mortality, imposing a significant financial burden on the patient and the health system; however, at least half of them are preventable.<sup>7</sup> Surgical site infections (SSIs) account

for about 15% of all healthcare-related infections and 37% of surgical hospital infections.<sup>8</sup> SSIs are an adverse complication of surgical procedures, resulting in mortality and morbidity. For example, a patient with a surgical wound infection is five times more likely to be readmitted to the hospital. Further, nosocomial infections may cause legal issues for the care provider or healthcare center and affect public perceptions of care provided or hospital reputation.<sup>9</sup>

In addition to surgical complications, more than two million adverse drug effects occur annually in hospitalized patients and more than a hundred thousand deadly drugs complications.<sup>10, 11</sup> Any unwanted effect that occurs after taking the drug is called drug complications.<sup>12</sup> Drug prescription is one of the most vital care stages with a unique position in medical care. Drug complications result in conditions that, in the most optimistic state, cause disease and, in severe cases, cause severe illness or death.<sup>13</sup> Drugs impact the body's biological systems, which may have complications. It is impossible to predict what complications will occur each time a drug is taken; however, based on previous experience with similar drugs, a relative judgment can be made in this regard.<sup>14</sup>

The World Health Organization defines drug complications as serious adverse reactions to usual drug doses to diagnose and treat diseases or change the body's physiological functions, leading to death, significant disability, hospitalization, or prolonged hospital stay. Drug complications account for about 10% of hospitalizations and 100,000 deaths yearly; 6% of hospitalized patients experience such problems.<sup>15, 16</sup> So pharmacotherapy is an important part of the patient care process and performing it properly and safely is a professional standard, and ignoring it can cause irreparable complications for the patient. Therefore, evaluation of drug complications is essential for care management.<sup>17</sup>

Modern medical services have improved many medical conditions, playing an increasing role in clinical practice, thus improving patients' health and quality of life. However, despite the benefits of using these services, they may cause injuries and complications in patients.<sup>9, 18-20</sup> Today, patient safety is one of the main concepts in the health system, and all patients have the right to receive health care based on standards; thus, analyzing data related to the complications of medical services helps care management.<sup>21-23</sup> Therefore, this study aims to analyze the complications of drugs and procedures in Imam Reza Hospital, affiliated with Kermanshah University of Medical Sciences, Iran.

## Materials and Methods

### *Study Design, Participants, and Procedure*

This retrospective, descriptive study was

performed in Imam Reza (AS) Hospital, affiliated with Kermanshah University of Medical Sciences, the largest multispecialty medical center in the west of Iran. The research resources were the records coded by clinical coders based on the International Classification of Diseases, 10th revision (ICD-10) of hospitalized patients discharged from 2013 to 2019 with diagnostic codes Y40 to Y84.<sup>24</sup> The records were retrieved from the hospital information system based on ICD-10 diagnostic codes. They were extracted from the archive by using record numbers. The criteria for retrieving records were: being related to hospitalized patients from 2013 to 2019, coded according to ICD-10, registered in the hospital information system (HIS), and labeled codes Y40 to Y84 from ICD-10. The emergency patient records and records that were not or incorrectly coded by ICD-10 were excluded.

### *Measures*

The data were collected by a researcher-made checklist based on the opinion of researchers, previous studies, record data, and research objectives. It consisted of two parts: the first part was related to the patient (age, sex, length of stay [LOS] in hospital, type of admission, primary diagnosis and procedure, and specialty of the physician). The second part was associated with the type and cause of complications. The content validity of the checklist was determined by six experts (health information management and physicians). The researchers collected the data related to the health information management department; then studied the records and entered them into the checklist.

### *Statistical Analysis*

Finally, the data were analyzed using SPSS version 20 with descriptive statistics (frequency, mean and standard deviation) and inferential statistics (Chi-square, Mann-Whitney, and regression)

### *Ethics*

In this study, ethical considerations for the confidentiality of information were observed, and the study was approved with the ethics code (KUMS.REC.1396.128) by the deputy for Research and Technology at Kermanshah University of Medical Sciences.

## Results

According to the study criteria, 151 records were retrieved from the hospital information system, among which 55 and 96 were procedure and drug complications, respectively. The highest and lowest numbers of complications were for 2013 with 52 and 2019 with 7 records, respectively. 91.4% of patients were admitted electively, while the remaining 8.6% were admitted

urgently. Most patients were referred to an internal medicine specialist (37.7%).

Patients with procedure complications had the most referrals to general surgery and gynecologist each with (29.1%), and drug complications had the most referrals to internal medicine specialists (55.2%). More than half (55.6%) of patients were female. In patients with complications of procedure and medication, 52.7% and 57.3 % of patients were women, respectively. There was no significant difference between gender and type of complications (P=0.35).

According to Table 1, the mean (standard deviation) age of patients was 51.95(20.73) years, and the mean (standard deviation) of LOS was 5.7 (5.33) days. There was a significant difference between age in the patients with the complications of procedure and medication (P<0.001). In contrast, there was no significant difference between LOS in patients with the procedure and drug complications (P=0.65). Discharge with personal consent was more in patients with drug complications than those with

the procedure; however, the death of patients due to procedure complications (7.3%) was higher. Finally, the highest discharge status of patients in both groups was recovery.

The mean age of patients with procedure complications for pulmonary diseases was 64.33 (7.64) years and drug complications for neurological diseases was 68.67 (13.21) that was higher than the mean age in other complications. The age of patients was significantly different in the procedure complication (P=0.016) and drug complication (P=0.039). As presented in Table 2, the highest mean number of LOS in the procedure and drug complications was related to surgical wound infection (7.37±5.67 days) and pulmonary diseases (18.33±23.12 days), respectively. The LOS of patients with procedure complications was not significantly different (P=0.256); however, it was significantly different in the case of drug complications (P=0.001). There was no significant difference between patients' gender with either procedure (P=0.281) or drug complications (P=0.269).

**Table 1:** Frequency distribution of patients by sex, age, Discharge status, and length of stay based on complication type

|                  |                  | Procedure complication |                           | Drug complication |                           | Total       |                           | P value |
|------------------|------------------|------------------------|---------------------------|-------------------|---------------------------|-------------|---------------------------|---------|
|                  |                  | Frequency              | Percentage                | Frequency         | Percentage                | Frequency   | Percentage                |         |
| Discharge status | Recovery         | 44                     | 80                        | 68                | 70.84                     | 112         | 74.2                      | -       |
|                  | Partial recovery | 3                      | 5.5                       | 6                 | 6.25                      | 9           | 6                         |         |
|                  | Personal consent | 3                      | 5.5                       | 19                | 19.79                     | 22          | 14.5                      |         |
|                  | Death            | 4                      | 7.3                       | 2                 | 2.08                      | 6           | 4                         |         |
|                  | Transfer         | 1                      | 1.8                       | 1                 | 1.04                      | 2           | 1.3                       |         |
| Sex              | Male             | 26                     | 47.3                      | 41                | 42.7                      | 67          | 44.4                      | 0.35    |
|                  | Female           | 29                     | 52.7                      | 55                | 57.3                      | 84          | 55.6                      |         |
|                  |                  | <b>Mean</b>            | <b>Standard deviation</b> | <b>Mean</b>       | <b>Standard deviation</b> | <b>Mean</b> | <b>Standard deviation</b> |         |
| Age              |                  | 41.89                  | 19.29                     | 57.72             | 19.35                     | 51.59       | 20.73                     | <0.001  |
| LOS              |                  | 5.96                   | 4.92                      | 5.55              | 5.57                      | 5.7         | 5.33                      | 0.65    |

**Table 2:** Relationship between age, length of stay, and gender with the procedure and drug complications

| Complication            |                          | Age    |       |       | P value ANOVA | LOS    |       |       | P value ANOVA | Gender Frequency (percentage) |           | P value Exact chi-square |
|-------------------------|--------------------------|--------|-------|-------|---------------|--------|-------|-------|---------------|-------------------------------|-----------|--------------------------|
|                         |                          | Number | Mean  | SD    |               | Number | Mean  | SD    |               | Female                        | Male      |                          |
|                         |                          |        |       |       |               |        |       |       |               |                               |           |                          |
| Procedure complications | Hemorrhage               | 7      | 50.43 | 18.31 | 0.016         | 7      | 4.57  | 3.36  | 0.256         | 5(17.2)                       | 2(7.7)    | 0.281                    |
|                         | Surgical wound infection | 27     | 42.78 | 15.82 |               | 27     | 7.37  | 5.67  |               | 14(48.3)                      | 13(50)    |                          |
|                         | Pulmonary diseases       | 3      | 64.33 | 7.64  |               | 3      | 4.33  | 4.93  |               | 1(3.4)                        | 2(7.7)    |                          |
|                         | Surgical complication    | 11     | 27.83 | 18.77 |               | 11     | 3.73  | 3.77  |               | 3(10.4)                       | 8(30.8)   |                          |
|                         | Other                    | 7      | 45.5  | 25.81 |               | 7      | 6.5   | 4.96  |               | 6(20.7)                       | 1(3.8)    |                          |
| Drug complications      | Hemorrhage               | 68     | 58.38 | 17.98 | 0.039         | 68     | 5.06  | 4     | <0.001        | 36(65.45)                     | 32(78.05) | 0.269                    |
|                         | Neurological diseases    | 9      | 68.67 | 13.21 |               | 9      | 4.11  | 2.42  |               | 8(14.54)                      | 1(2.43)   |                          |
|                         | Pulmonary diseases       | 3      | 66    | 19.52 |               | 3      | 18.33 | 23.12 |               | 2(3.63)                       | 1(2.43)   |                          |
|                         | Other                    | 16     | 46.8  | 24.66 |               | 16     | 6.27  | 3.99  |               | 9(16.36)                      | 7(17.07)  |                          |

Post-operative infection with 49.1% was the most common procedure complication. In complications related to drugs, hemorrhage was the most common; gastrointestinal bleeding (GIB) with 20.83% and ecchymosis with 15.62% were the most common types of bleeding (Table 3).

According to Table 4, Deep Venous Thrombosis (DVT) with 17.2% and Congestive Heart Failure (CHF) and Cerebrovascular Accident (CVA), each with 9.3%, were the most complicating diseases. The highest complication due to surgery was related to cesarean section (7.3%) and Coronary Artery Bypass Graft (4%). Finally, Warfarin, with 80% frequency, had the most common drug complications.

## Discussion

In this study, analyses related to procedures' complications and drug administration were performed in a referral hospital in the west of Iran. Complications of medical services are classified according to the ICD-10 in block Y40-Y84, entitled medical and surgical care complications. According to the codes of these blocks, the records were extracted from the hospital information system.

Wound infection after surgery with 49.1% was most common in patients with procedure complications in our study. Surgical site infections affect the patient's quality of life and are associated with mortality, increased LOS, and health care costs.<sup>25</sup> Surgical site infection is defined as an infection happening up to 30 days after surgery if a prosthesis is not implanted in the patient's body and an infection

happening up to one year after implantation. It is the third nosocomial infection, accounting for 14% to 16% of hospitalized patients and 38% of those who have undergone surgery.<sup>25</sup> In the Thombare and Joshi study at a tertiary care center, the mean age of patients with postoperative infections was 57.67 years; Some patient-related factors, including age, diet, previous infection, obesity, emergency surgery, dirty wound, long hospital stay, diabetes and procedure-related factors, such as sutures, poor surgical techniques, surgery prolongation, inadequate sterility of surgical instruments before surgery, can affect the incidence of surgical site infections.<sup>26</sup> In line with this, age was significantly associated with surgical wound infection in the present study.

Malik et al. concluded that patients with an infection stay longer after surgery than those without.<sup>27</sup> Patients with surgical site infections (SSI) are five times more likely to be hospitalized, costing the global economy billions of dollars. Furthermore, SSI may lead to litigation, affecting public perceptions of care or hospital reputation.<sup>28</sup> Other infections caused by surgery include a catheter, respiratory, or urinary tract infections.<sup>29</sup> In contrast, there was no significant difference between our cohort's LOS with the procedure and drug complications ( $P=0.650$ ). This contradictory result may be partially because different variables can affect LOS, such as teaching hospitals (versus non-teaching hospitals), increased age, emergent surgeries (versus planned or elective surgeries), and number of comorbidities.<sup>30</sup>

In the current study, gastrointestinal bleeding with 20.83 % was the most common complication of

**Table 3:** Complications due to procedure/medication

|                                | Complication   | Frequency        | Percentage        |
|--------------------------------|--|------------------|-------------------|
| Procedure complication         | Hematoma, Hematuria, Pneumonia, Vaginal bleeding   | 2 (8)            | 3.63 (14.54)      |
|                                | T81.0 (Hemorrhage complicating a procedure)  | 5                | 9.1               |
|                                | T81.4 (Infection following a procedure)  | 27               | 49.1              |
|                                | UT-Tube Complication, Gum bleeding, Rejection of a kidney transplant, Bulbar stricture, Cervical rupture, Collection bill, Decreased hemoglobin, DIC, Dyspnea, Glans adhesion, Perforation of the duodenum, Sepsis, Sutures remained in surgery, T83.5*, Tachycardia                           | 1 (15)           | 1.8 (27.27)       |
|                                | Total  | 55               | 100               |
| Drug prescription complication | <b>Complication</b>  | <b>Frequency</b> | <b>Percentage</b> |
|                                | Decreased consciousness, Hematoma, Skin itch,  | 2 (6)            | 2.08 (6.25)       |
|                                | Ecchymosis   | 15               | 15.62             |
|                                | Epistaxis  | 5                | 5.2               |
|                                | GIB (Gastrointestinal bleeding)  | 20               | 20.83             |
|                                | Hematuria  | 9                | 9.37              |
|                                | Hematemesis, Hemoptysis  | 3 (6)            | 3.12 (6.25)       |
|                                | Vaginal bleeding   | 7                | 7.29              |
|                                | Weakness   | 4                | 4.16              |
|                                | Vertigo, Aphasia, Skin lesion, T81.4, Urinary incontinence, Ataxia, COPD, Menorrhagia, Hematemesis, Eye bleeding, Mouth bleeding, Mouth ulcers, Delirium, Dyspnea, Nausea, Neck tightening, Nephrotoxicity, Pneumonia, Icterus, Loss of consciousness, Seizure, Hemiparesis, Hemiplegia, Edema | 1 (24)           | 1.04 (25)         |
|                                | Total  | 96               | 100               |

\*T83.5: Infection and inflammatory reaction due to prosthetic device, implant, and graft in the urinary system



**Table 4:** Diseases, surgeries, and medications with complications

|   |  | Frequency | Percentage  |
|---|--|-----------|-------------|
| Diseases  | RA (Rheumatoid Arthritis)  | 2         | 1.3         |
|   | CHF  | 14        | 9.3         |
|   | DVT  | 26        | 17.2        |
|   | CRF (Chronic Renal Failure)  | 3         | 2           |
|   | CVA  | 14        | 9.3         |
|   | CVT, Cholelithiasis, Colon cancer, Rheumatic heart disease, epilepsy, Cerebral vein thrombosis, Behçet, Breast cancer, DM, Pulmonary embolism, IHD, Kidney stone, AF, Alzheimer, Lung cancer, Mesenteric ischemia, MI, Valvular heart disease (Mitral valve insufficiency, Aortic valve insufficiency), Pancreatic cancer, Parkinson, Seizure, Severe cough, Spinal canal opening, Neck pain, Fx ankle, DIC, TB, Wegener’s syndrome, ASD, PHTN | 1 (31)    | 0.7 (20.53) |
|   | Surgeries  | C/S       | 11          |
| Cholecystectomy   |  | 5         | 3.3         |
| CABG  |  | 6         | 4.0         |
| Appendectomy  |  | 4         | 2.6         |
| Excision of face skin lesion, Chest tube complication, Dental extraction, Drainage pilonidal cyst, Gastrectomy, hydatid cyst surgery, Internal fixation Fx, Pancreatectomy, Hypospadias repair, Peptic ulcer repair, Myomectomy, NVD, Bartholin’s cyst surgery, Tonsillectomy, TUL, TUR, Splenectomy, PTE |  | 1 (18)    | 0.7 (11.9)  |
| Kidney transplant, Circumcision, Nephrectomy, ORIF  |  | 1 (8)     | 1.3 (5.3)   |
| MVR, prostatectomy, TAH   |  | 3 (9)     | 2 (6)       |
| Total   |  | 151       | 100.0       |
| Drug  | ASA, Azithromycin, Baclofen, Carbamazepine, Xelodopa, Methadone, NMS, Phenytoin, Plasil, Prednisolone, Pregabalin, Rifampin, Tavonex, XELODA   | 1 (14)    | 1.04 (14.6) |
|   | Methotrexate   | 2         | 2.1         |
|   | Digoxin  | 3         | 3.1         |
|   | Warfarin   | 77        | 80.2        |
|   | Total  | 96        | 100.0       |

drug administration. The most complications from the procedure were related to cesarean section (7.3%). The most complications due to surgery were cesarean section and CABG, respectively. Accurate evaluation should be performed to prevent post-operative complications.<sup>31</sup>

Cesarean section has increased maternal mortality mainly due to bleeding and placental abruption in subsequent pregnancies. The mother’s most common symptoms of severe complications of cesarean section are blood transfusion, disseminated intravascular coagulation, and hysterectomy. Three known complications after cesarean delivery are postpartum hemorrhage (PPH), surgical site infection (SSI), and venous thromboembolism (VTE). These complications lead to maternal mortality, increased health care costs, and prolonged hospital stays.<sup>32</sup> Regarding CABG surgery, Sanger et al. state that 1.7 % of sternal surgical wound infected patients were re-admitted.<sup>33</sup>

Pharmacotherapy is an integral part of the patient care process, and performing it properly and safely is a professional standard. On the other side, ignoring pharmacotherapy can cause serious or even irreversible complications for the patient. Drug complications can occur in all hospital wards.<sup>17</sup> The results showed that bleeding was the most common drug complication; DVT, CVA, and CHF were the diseases for which medication was prescribed. DVT was the most common cause of drug administration

complications, with 17.2%.

Most patients (80%) admitted with procedure complications were discharged with recovery status, and 7.3% of them also died. In patients with drug complications, 70.84% were discharged with recovery, and 2.08% died. The number of deaths was higher in surgical complications. Further, 80% of the complications were related to Warfarin, which is mostly prescribed for DVT, CVA, and CHF. Warfarin is an anticoagulant widely used in patients with venous thrombosis, pulmonary embolism, chronic atrial fibrillation, and heart valve prosthetics. Among oral anticoagulants, it has a narrow therapeutic window, many drug-drug, and drug-food interactions.<sup>34</sup> The most important complication of Warfarin is bleeding. As a result, there is a significant number of hospital admissions due to warfarin-related complications.<sup>23</sup> Teaching approaches can reduce Warfarin complications. These approaches include regular monitoring, genetic predisposition, and repetitive training.<sup>35</sup> In the outpatient settings, it has also been demonstrated that anticoagulation management services or clinics can significantly improve anticoagulation management.<sup>34</sup>

Among neurological diseases, a decreased level of consciousness (22.22%) followed by seizures was the most common complication due to medication. Seizures are a common complication of drug poisoning; Studies have shown that 6% of new seizures and up to 9% of epilepsy cases are caused

by drug poisoning.<sup>36</sup> COPD, dyspnea, and pneumonia had 33.33 % of complications that occurred equally in drug-induced respiratory diseases. Other common complications were weakness and lethargy with 26.67% and skin complications with 13.33%.

Digoxin was also used in CHF, causing weakness, nausea, headache, aphasia, and neuropsychiatric disorders. Digoxin is recommended for treating patients with CHF, ventricular arrhythmias, and atrial fibrillation; however, its use is declining among prescribers.<sup>37</sup> Despite the lack of information about the effect of digoxin on clinical outcomes, it is widely used in patients with rheumatic heart disease, causing mortality and complications such as weakness and neurological problems.<sup>38</sup> Therefore, therapeutic drug monitoring of digoxin is essential in clinical practice to improve its clinical efficacy and avoid possible toxicities.<sup>39</sup> Incomplete recording of data in the studied records and incorrect coding of diagnoses, caused limitations in the data collection of this study.

## Conclusion

Medical interventions are an important part of the care process and sometimes cause adverse patients complications. The primary consequence of complications is an increased length of hospital stay and hospital costs, which may eventually lead to the patient's death. This study showed that drug side effects are higher than surgery side effects, whereas death due to surgical side effects are more than drugs', and Warfarin is used for treatment more frequently, causing more complications for the patient. Cesarean also has the most common complication. Therefore, managing the treatment process of these patients or using prevention methods can prevent complications, reduce costs and improve the community's health. The primary consequences are complications, increased length of hospital stay, hospital costs, and mortality. To prevent complications, it is essential to carefully assess the patient's condition before taking action, or prescribing medication, educate the patient, and monitor the treatment process during the care period.

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