

## Risk Factors for Readmission after Appendectomy in Hospital

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### ABSTRACT

**Background:** The readmission of a patient to the intensive care unit means a patient's return to the hospital for a certain period of time after discharge for planned or unplanned reasons. Therefore, this study aimed to investigate the risk factors for readmission after appendectomy in hospital.

**Methods:** In this retrospective study, the records of patients who underwent appendicitis in hospitals were reviewed. In order to identify readmissions, a list of patients with a history of readmission was extracted from the hospital's Health Information Technology Unit. Then, the researchers studied the patients' clinical records and extracted data using a researcher-made checklist. To analyze the data, first the data were entered into SPSS version 16 software and then analyzed using descriptive and analytical statistical tests.

**Results:** According to the findings, the mean (SD) age of the patients in the readmitted group was 14.1 (2.8) years, and in the non-readmitted group was 13.9 (2.1) years. In the readmitted patient's group, 52.4% of the patients were male, 19% of the patients had underlying diabetes, 9.5% had asthma and allergies, and 100% of the surgeries were performed by a specialist. Also, the results showed the reasons for readmission of patients were 4.8% due to intra-abdominal abscess, 42.9% due to wound infection, 14.3% due to abdominal pain, 23.8% due to paralysis/ileus, and 14.3% due to other causes.

**Conclusion:** Given that patient readmission has various complications for the patient, the patient's family, and the healthcare system, it is necessary to take necessary preventive measures regarding the factors affecting it.

### Introduction

The primary mission of the health system is to improve overall public health and address the needs of individuals and society. In this context, hospitals play a crucial role in delivering healthcare services and ensuring equitable access to care. Hospitals, as the service provider arm, must be responsive to the systems codified in the country's health system and take the necessary measures to improve the health of the community at all levels of prevention, diagnosis, treatment, and rehabilitation. In fact, the hospital must be

able to provide appropriate services to improve the health of patients in addition to reducing medical costs. One of the issues that leads to an increase in health and medical costs and endangers the health of patients is the length of hospital stay (LOS) and patient readmission in the hospital. In fact, the demand for patient readmission in the hospital leads to an increase in health and medical services, resource constraints and the use of various specialties, and staggering costs due to the lack of proper use of hospital facilities and resources [1-7].

Patient readmission refers to a patient returning to the same hospital after discharge, whether for planned or unplanned reasons. This definition encompasses cases

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where the readmission is for the same initial diagnosis, although the duration of the stay is unspecified. In general, readmission can occur 7 days, 15 days, or between 1 and 12 months after discharge. In other definitions, readmission is defined as more than one admission within 90 days, more than one admission within 3 years, 3 or more admissions within 30 months, and more than one admission within 6 months [8-11].

The most common time for a patient to be readmitted to the hospital is 30 days after discharge. Also, according to the comprehensive guide to the National Hospital Accreditation Standard of Iran, readmission is an unplanned readmission of a patient for any reason within one month after the last discharge. Also, the cause or diagnosis at the time of readmission can be related or unrelated to the final diagnosis at the time of the patient's last discharge [12-15].

Rehospitalization after surgery is an indicator of hospital and health quality, and rehospitalization of patients leads to morbidity and mortality in patients. Appendicitis is one of the surgical procedures that may cause various complications in the patient, including rehospitalization. Appendicitis is one of the most common causes of acute abdominal pain and is considered a medical emergency, with surgery being the primary treatment. In the absence of appropriate treatment or delay in the treatment of appendicitis, the patient may be readmission due to the complications caused, and many complications may occur for the patient [16-20].

### Aim

Therefore, this study aimed to investigate the risk factors for readmission after appendectomy in hospital.

### Methods

In this retrospective study, the records of patients with a surgical diagnosis of appendicitis in hospitals in Ilam were reviewed. The inclusion criteria for the study included completeness of patient file information according to the researcher-made checklist, patient age

range between 6-18 years, and readmission within 30 days after discharge. The records of patients with incomplete information or whose readmission was not approved according to the National Comprehensive Guide to Iranian Hospital Accreditation Standards were excluded from the study.

According to the National Comprehensive Guide to Iranian Hospital Accreditation Standards, the readmission index means the number of readmissions as defined by the number of discharges in a specific time period. Also, patients who referred with a previous plan to continue treatment were not included in readmission. In order to identify readmissions of patients, a list of patients with a history of readmission was extracted from the hospital's Health Information Technology Unit. Then, the researchers studied the patients' clinical records. Then, if the study entry and exit criteria were met, data extraction was performed.

The researcher-made checklist included questions on age, gender, BMI, comorbidities (including diabetes, smoking history, asthma and allergies, others, and no comorbidities), reasons for readmission (malignancy, intra-abdominal abscess, wound infection, abdominal pain, paralysis/ileus, and others), and surgical experience (specialist, resident).

To analyze the data, first the data were entered into SPSS version 16 software and then analyzed using descriptive and analytical statistical tests.

### Results

According to the findings, the mean (SD) age of the patients in the readmitted group was 14.1 (2.8) years, and in the non-readmitted group was 13.9 (2.1) years. In the readmitted patient's group, 52.4% of the patients were male, 19% of the patients had underlying diabetes, 9.5% had asthma and allergies, and 100% of the surgeries were performed by a specialist (Table 1). Also, results showed the reasons for readmission of patients were 4.8% due to intra-abdominal abscess, 42.9% due to wound infection, 14.3% due to abdominal pain, 23.8% due to paralysis/ileus, and 14.3% due to other causes (Table 2).

**Table 1- Demographic characteristics of patients**

Variable		Non-readmitted patients (N=612)	Readmitted patients (N=21)	P value
Gender	Male	388(63.4%)	11(52.4%)	0.3
	Female	224(36.6%)	10(47.6%)	
BMI	Normal	538(87.9%)	13(61.9%)	0.000
	Abnormal	74(12.1%)	8(38.1%)	
Comorbidities	Diabetes	11(1.8%)	4(19%)	0.81
	Smoking history	2(0.3%)	0(0)	
	Asthma and allergies	5(0.8%)	2(9.5%)	
	Others	3(0.5%)	1(4.8%)	
	No Comorbidities	591(96.6%)	14(66.7%)	
Surgical experience	Specialist	612(100)	21(100%)	-
	Resident	0(0)	0(0)	

**Table 2- Reasons for patient readmission to Intensive care units**

Variable	Readmitted patients, (N=21)	
	N	%
Malignancy	0	0
Intra-abdominal abscess	1	4.8
Wound infection	9	42.9
Abdominal pain	3	14.3
Paralysis/ileus	5	23.8
Others	3	14.3

## Discussion

Childhood and adolescence are critical periods of life when individuals at this age may experience various diseases, including infectious, viral, surgical, and other diseases [21]. According to the findings, out of 612 cases reviewed, 21 patients had a history of readmission. In a study by Rice-Townsend et al., over a 5-year period with 52,054 patients in 38 children's hospitals, the readmission rate of patients was 8.7% [22], while in a meta-analysis study by Bailey et al., it was 4.3% [23].

According to the findings, the patients studied were in the age range of 18-6 years, and most of the patients with a history of readmission were male, which was not statistically significant ( $P>0.05$ ). In the study of Angeramo et al. (2006-2009), 1506 patients in the age range of 14-85 years were studied, of which 48% were female. The patients had been referred for laparoscopic appendectomy (LA) surgery, of which 1480 patients were without readmission and 26 patients were with readmission. Of the 26 patients with a history of readmission, 11 (42%) were female, 10 (38%) had an age of  $>50$  years, 4 (15%) had a BMI of  $>30$  kg/m<sup>2</sup>, 1 (4%) had hypertension, 3 (12%) had smoking, and 12 (46%) had mild peritonitis [24]. Also, in the study by Bancke Laverde et al. (2010-2020), 1638 patients with M(SD) were 39 (17) years old. Among the patients, 1471 patients had no morbidity, 99 patients had morbidity, and 30 patients had a history of readmission. Of the 30 patients with a history of readmission, the M(SD) status was 41 (17), 16 (53%) were female, BMI was  $27.1\pm6.1$ , 6 (22%) had a history of smoking, and 2 (7%) had a history of diabetes [25].

According to the findings, BMI can be mentioned as a factor affecting readmission. In the study by Millien et al., out of 86 patients studied, 14 patients had a history of readmission, and open surgery and longer appendectomy surgery were among the factors affecting readmission [26]. In the study by Walędziak et al., which included 4618 patients, factors such as postoperative morbidity and complicated appendicitis were effective on the LOS of patients [27]. In the meta-analysis study by Bailey et al., factors such as diabetes, open surgical technique, and complicated appendicitis were effective on readmission. On the other hand, factors such as obesity and gender

were not related to the readmission of patients [23]. Also, in the study by Shin et al. (2018-2020) of 497 patients, 7.4% of patients were in the LOS group, and their average LOS was 9.3 days. According to the findings, factors such as age, CRP, and surgical duration were among the factors affecting LOS, with shorter surgical time being reported as an important variable in reducing patients' LOS [28].

## Conclusion

Given that patient readmission has various complications for the patient, the patient's family, and the healthcare system, it is necessary to take necessary preventive measures regarding the factors affecting it.

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