Analysis of unplanned revisits and readmissions: results of the General Surgery clinic in a private hospital

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ABSTRACT

Objectives: In recent years, the rate of readmission (RA) within the first thirty days of discharge has been an important parameter for cost and quality standards. It is therefore extremely important for each center to analyze its own results and determine the factors affecting the RA rates in order to organize the measures to be taken. Another important issue, especially for centers focusing on specific areas of expertise, is unplanned revisit (RV) after discharge. Determination of these rates and reasons is of importance for every hospital and/or clinic to decrease these rates, thus increasing patient satisfaction and reducing costs. The aim of this study was to analyze RA and RV patients operated in the general surgery clinic of our hospital for a period of two years as well as factors affecting these rates.
Methods: The study included patients who were operated in the general surgery clinic of Bursa Private Medicabil Hospital between 1 January 2018 and 31 December 2019 and who revisited and were readmitted within the first thirty days of discharge. The reasons for RA/RV and time to RA/RV, and patients' treatments were investigated by comparing RA/RV patients with those who were not readmitted (NA) for demographic results at initial admission to determine the differences between these patient groups. Univariate and multivariate analyses were carried out using the SPSS software. The level of significance was set at $p < 0.05$.
Results: Of the 890 patients who were operated in our clinic throughout the study period and met the study inclusion criteria, 52 (5.8%) were included in the unplanned RA group and 107 (12%) in the unplanned RV group. The mean time to RA was 10.5 ± 7.0 days for the RV group and 8.8 ± 6.7 days for the RA group ($p = 0.17$). Thirty-two (61.5%) of the RA patients and 41 (38.3%) of the RV patients were readmitted within the first 7 days of discharge ($p = 0.003$). The multivariate analysis revealed that prolonged length of hospital stay, emergency surgery, abnormal WBC, electrolyte imbalance, and abnormal hemoglobin level were significant risk factors for RV, while the development of complications, prolonged length of hospital stay, and advanced age were significant risk factors for RA.
Conclusions: This study analyzing the RA and RV patients operated in the general surgery clinic of a private hospital demonstrated that the most important reasons for RA were nonspecific and preventable. Patients who developed complications, had prolonged length of hospital stay, and were at an advanced age had a higher rate of RA, while patients who had prolonged length of hospital stay, underwent emergency surgery, and had biochemical problems at initial admission had a higher rate of RV. Focusing on these patients during and after discharge and increasing home care facilities can solve the problems of many patients without admitting them to the hospital. This will be a factor that would improve patient satisfaction while reducing costs.
Keywords: Unplanned readmission, unplanned revisit, predictive factors, surgery

In 2009, the post-discharge 30-day readmission (RA) rates for selected diseases were reported by the Centers for Medicare and Medicaid Services (CMS) in the United States (US) [1]. Since a significant portion of readmissions is preventable and costly, financial penalties have been initiated for hospitals with an above-average RA rate in the USA as of 2012. Hospitals were first penalized for readmissions of patients with acute myocardial infarction, heart failure, and pneumonia, and patients with chronic obstructive pulmonary disease and knee-hip arthroplasty were then included in this approach. This program is planned to be expanded to include all surgical procedures in the near future [2, 3]. Reducing these rates with in-hospital and external organizations based on the determined risk factors has become an important target for the centers. Today, these rates are also considered an important parameter reflecting the quality of care of hospitals [4].

Classical RA is defined as readmission to any center for any reason within the first thirty days after a primary disease or surgery. This rate can be affected by many parameters, including the biology of the disease, patient's condition, surgical factors, social factors, patient care, and the healthcare system. The infrastructure of each center, patient and disease groups have differences [5, 6]. It is therefore extremely important for each center to analyze its own results and determine the factors affecting the RA rates in order to organize the measures to be taken. Another important issue, especially for centers focusing on specific areas of expertise, is unplanned revisit (RV) after discharge. Many patients present both to emergency departments and outpatient clinics with various complaints other than their routine follow-ups and undergo various diagnostic and therapeutic interventions. Although this is not considered as important as RA, it appears to be an important issue when considered from the point of patient satisfaction, labor loss, and the stress it creates on the patient and physician. The issue of RV has been a subject of interest for ambulatory surgery clinics, especially plastic surgery and ear-nose-throat clinics [7, 8]. In this respect, there was only one study investigating RA and RV following short-stay thyroidectomy [9]. There is no study on RV including all surgical cases. Moreover, there was no Turkey-based study on unplanned RA.

The aim of this study was to analyze patients with unplanned RA and unplanned RV to the general surgery clinic of our hospital within the first 30 days of discharge for a period of 2 years as well as factors affecting these rates.

METHODS

Study Groups and Demographic Data

Patients operated in the General Surgery Clinic of Bursa Private Medicabil Hospital between 2018 and 2019 were retrospectively analyzed. Our hospital has been accredited twice by JCI and has a bed capacity of 100 and level 3 intensive care facilities. The approval for the study was obtained from the hospital ethics committee (Ethics committee approval date and number: 01.04.2019/11113). The study included patients who only spent the night after surgery (index surgery) in the hospital. Day-case procedures and endoscopic procedures were excluded. Furthermore, patients who died at the hospital after the first operation, patients who were included in the routine chemotherapy program in this period and admitted for this reason, and those whose RA reason could not be fully determined and file data could not be accessed for data analysis were not included in the study.

The patients were divided into three groups: 1) No admitted (NA): Those who were not admitted within the first 30 days of discharge after surgery, except for their routine follow-ups. 2) Revisited (RV): Patients who underwent surgery and revisited the emergency department or an outpatient clinic with any complaints other than their routine follow-up appointment within the first 30 days of discharge but were not hospitalized. 3) Readmission (RA) group included patients who underwent surgery, readmitted to the hospital with any complaints other than their routine follow-up appointment within the first 30 days of discharge, and were treated as an inpatient due to this admission.

The distribution of the patients between the two groups is shown in Fig. 1. The patients' demographic data, American Society of Anesthesiologists (ASA) scores, comorbidities, emergency-elective surgery, wound condition, fluid-electrolyte imbalance, hemoglobin level, abnormal White Blood Cell (WBC) level (< 4000 or > 11.000 per microliter) at initial admission, presence of malnutrition, anatomical location of surgery (gastrointestinal surgery, breast-thyroid sur-
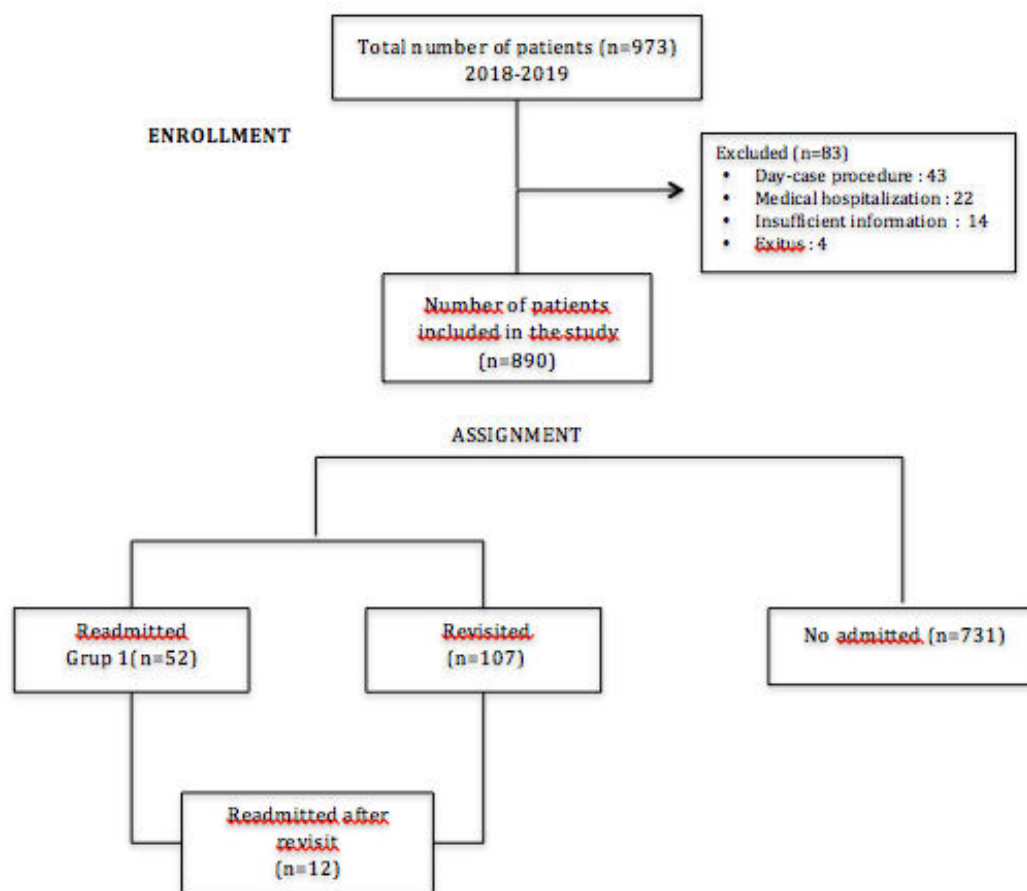
Fig. 1. Analysis of patients and distribution of study groups.

gery, extra-abdominal surgery), laparoscopic surgery, length of hospital stay, complications developed during the first operation, time to readmission and reasons for readmission were recorded. A complication was defined as any morbidity that developed intraoperatively and postoperatively during the hospitalization period, and the Clavien-Dindo classification was used to rank a complication [10]. The definition of malnutrition was made based on the NRS-2002 assessment [11]. Patients with a score of 3 points and above in this assessment were included in this group. The presence of electrolyte imbalance was considered an abnormality in any electrolyte level in the routine biochemistry evaluation prior to the first surgery. Patients with normal values and not requiring biochemical analysis were included in the group without electrolyte imbalance. A low hemoglobin level was defined as a concentration below 10 g/dL. The Centers for Disease Control and Prevention (CDC) surgical wound classification system was used for wound classification, and the cases were grouped as clean, clean/contaminated,

contaminated, and dirty [12]. Reasons for readmission and interventions performed at readmission were recorded. The records were reviewed by the coordinating nurse of the study (NS). Patients who revisited and were readmitted within the first thirty days of discharge (RV or RA) were identified from the hospital electronic system. These patients were reevaluated by the team that performed the surgery (HO, MN, EC) and were grouped by reevaluating whether they had planned or unplanned readmission within the scope of the routine appointment schedule. Patients with incomplete information in their records were reached by phone.

Statistical Analysis

The patient groups were compared by univariate and multivariate analyses for the analyzed factors. The SPSS version 2.0 software was used for the statistical analysis. Categorical values were presented as percentage frequency, while quantitative values were given as arithmetic mean ± standard deviation. Pear-

son's chi-squared test and the t-test were used for the univariate analysis. The level of statistical significance level was set at $p < 0.05$ bidirectionally. Factors with significant or nearly significant values in the univariate analysis were included in the multivariate logistic regression analysis to determine independent factors. Before including quantitative values in the multivariate analysis, cut-off values were calculated by ROC analysis and converted into categorical values. In the RV group, these values were calculated as a cut-off value of 50.5 (Area Under the Curve [AUC]: 0.565, 95% CI: 0.51-0.61, $p = 0.01$) for age and 9 days (AUC: 0.68, 95% CI: 0.63-0.73, $p < 0.001$) for the length of stay. In the readmission group, the same val-

ues were determined as a cut-off value of 51.5 (AUC: 0.706, 95% CI: 0.624-0.787, $p < 0.001$) for age and 10.5 days (AUC: 0.639, 95% CI: 0.54-0.73, $p = 0.004$) for the length of stay.

RESULTS

Demographic Results

Of the 890 patients who were operated in our clinic throughout the study period and met the study inclusion criteria, 52 (5.8%) were included in the RA group and 107 (12%) in the RV group. The main reasons for readmission were gastrointestinal complaints

Table 1. Reasons of revisited and readmitted patients for admission and diagnostic/therapeutic interventions performed

Revisited (n = 107)		Readmitted (n = 52)	
Reasons, n (%)		**Reasons, n (%)**	
Gastrointestinal problems (Nausea, vomiting, dehydration)	23 (21.5%)	Gastrointestinal problems (Nausea, vomiting, dehydration)	14 (26.9%)
Wound complications (Seroma, wound infections)	26 (24.3%)	Wound complications (deep wound infections)	11 (21.1%)
Pain (wound, abdominal)	27 (25.3%)	Organ space infection	9 (17%)
Nonspecific symptoms	9 (8.4%)	Ileus	9 (17%)
Cardiac	7 (6.5%)	Nutrition	5 (9.6%)
Pulmonary	7 (6.5%)	Pain (wound, abdominal)	4 (7.6%)
Urinary tract infection	3 (2.8%	Bleeding	4 (7.6%)
Neurological	2 (1.3%)	Missed pathology	2 (3.8%)
Hypothyroidism	2 (1.3%)	Cardiac	1 (1.9%)
Fever (catheter-related)	1 (0.9%	Pulmonary	1 (1.9%)
		Neurological	1 (1.9%)
Interventions performed*, n (%)		**Interventions performed, n (%)**	
Short-term observation	52 (48.5%)	Medical treatment (Intravenous fluid-drug-antibiotic therapy-analgesia-nutrition)	22 (42.3%)
Radiological diagnostic procedure	38 (35.5%)	Secondary surgery	13 (25%)
Prescription or recommendation only	33 (30.8%)	Wound care	11 (21.1%)
Wound care	27 (25.2%)	Percutaneous or endoscopic intervention	6 (11.5%)
Consultation	21 (19.6%)		

*Some patients underwent more than one intervention

Table 2. **Univariate analysis results of the comparison of demographics and operative characteristics associated with readmission**

Factor	No admitted (n = 731)	Revisited (n = 107)	Readmitted (n = 52)	*p* value
Age (years)[α]	47.3 ± 16.7	51.4±17.2	59.6 ±15.1	**0.005***
	(18-89.45)	(18-88.50)	(28-88.60)	**< 0.001**[&]
				< 0.001[ϕ]
Length of stay (days)[α]	1.68 ± 1.7	3.97 ± 4.71	5.7 ± 6.4	**0.005***
	(1-21.1)	(1-20.1)	(1-30.3)	**0.000**[&]
				0.001[ϕ]
Comorbidity	81 (11%)	18 (17.6%)	11 (21%)	0.089*
				0.024[&]
				0.47[ϕ]
Time to readmission (days)	-	10.5 ± 7.0	8.8 ± 6.7	0.17
		(1-30.10)	(1-29.7)	
Wound				
Clean	268 (36.6%)	13 (12.1%)	10 (19.2%)	**< 0.001***
Clean/contam.	269 (36.7%)	32 (30%)	9 (17.3%)	**< 0.001**[&]
Contaminated	124 (16.9%)	41 (38.3%)	28 (53.9%)	0.068[ϕ]
Dirty	70 (9.5%)	20 (18.7%)	5 (9.6%)	
ASA score				0.06*
1-2	704 (96%)	99 (92.5%)	40 (77%)	**< 0.001**[&]
3-4	27 (4%)	8 (7.5%)	12 (23%)	**0.005**[ϕ]
Malnutrition	23 (3.1%)	11 (10.2%)	12 (23%)	**< 0.001***
				< 0.001[&]
				0.031[ϕ]
Abnormal Hemoglobin	21 (2.8%)	12 (11.2%)	13 (25%)	**< 0.001***
				< 0.001[&]
				0.015[ϕ]
Electrolyte imbalance	35 (4.7%)	20 (18.7%)	5 (9.6%)	**< 0.001***
				0.13[&]
				0.129[ϕ]
Abnormal WBC	94 (12.8%)	24 (22.4%)	25 (48%)	**0.007***
				< 0.001[&]
				0.001[ϕ]
Emergency surgery	62 (8.4%)	24 (22.4%)	19 (36.5%)	**< 0.001***
				< 0.001[&]
				0.06[ϕ]
Type of surgery				
GIS	412 (56.4%)	115 (72.3%)	40 (77%)	**0.0003***
Extra-abdominal Perianal	215 (29.4%)	24 (15.1%)	8 (15.3%)	**0.014**[&]
	104 (14.2%)	20 (12.6%)	4 (7.7%)	0.62[ϕ]
Laparoscopic surgery	317 (43.3%)	48 (44.8%)	9 (17%)	0.77*
				0.0002[&]
				0.0006[ϕ]
Complication (+)	31 (4.2%)	4 (3.9%)	17 (32.6%)	
1	17	1	2	0.82*
2	12	2	7	**0.001**[&]
3	2	1	6	**0.001**[ϕ]
4	-	-	2	

α = values in parenthesis are given as median and range, * = revisited vs. no admitted, & =readmitted vs. no admitted, ϕ = revisited vs. readmitted, WBC = White Blood Cell Count, contam = Contaminated, GIS = Gastrointestinal Surgery

(RV:21.5% vs. RA: 26.9%) and wound problems (RV:24.3% vs. RA:26.9%) in both groups. The pain was a significant factor in the RV group (25.3%). Twelve (11.2%) patients in the RV group were admitted to the hospital for the second time and hospitalized. The reasons for readmission and interventions performed in both groups are shown in Table 1. Three of the patients in the RA group (5.7%, 3/52) died after their second hospitalization. One of these patients was operated for sepsis after an anastomotic leak, one patient for cardiac problem, and the other was urgently operated for strangulated hernia and died due to developing decompensated cirrhosis after discharge.

Results of Univariate and Multivariate Analyses

The results of the univariate analysis are shown in Table 2. It was found that the RA group patients were older, had a longer length of hospital stay, and had more systemic problems than both the NA and RV patients. Electrolyte imbalance was a more common reason for readmission in the RV group. The rates of RV and RA were higher in patients who underwent gastrointestinal surgery, but there was no difference between these two groups. While the rate of RA was lower in patients who underwent laparoscopic surgery, it was higher in those who developed complications.

Table 3. Independent risk factors associated with unplanned revisit for patients undergoing surgery

Factors	OR	95% CI	p value
Longer length of stay > 9 day	2.2	1.61-3.02	< 0.001
Emergency surgery	1.44	1.22-1.69	< 0.001
Abnormal WBC	1.36	1.20-1.54	0.009
Presence of electrolyte imbalance	1.19	1.12-1.25	0.001
Abnormal hemoglobin level	1.84	1.34-2.52	0.001

Table 4. Independent risk factors associated with unplanned readmission for patients undergoing surgery

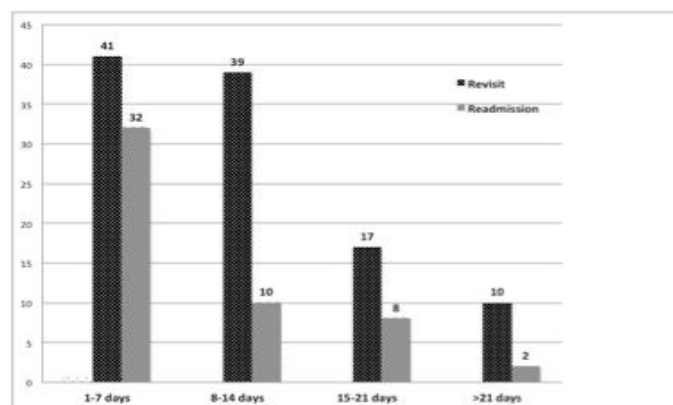| Factors	OR	95% CI	p value
Complication (+)	12.04	3.79-38.1	<0.001
Longer length of stay (> 11 day)	6.67	2.01-22.1	0.013
Advanced age (> 51.5 years)	3.1	1.54-6.21	0.01

Fig. 2. Correlation between time and revisited and readmitted patients. Forty-one (38%) of the revisited patients and 32 (61.5%) of the readmitted patients were readmitted within the first week of discharge. This difference was statistically significant (chi-square: 8.88, p = 0.030).

The multivariate analysis revealed that prolonged length of stay, emergency surgery, abnormal WBC, electrolyte imbalance, and abnormal hemoglobin level were significant risk factors for RV, while the development of a complication, prolonged length of stay, and advanced age were significant risk factors for RA (Tables 3 and 4).

Time to Readmission

The mean time to readmission was 10.5 ± 7.0 days for the RV group and 8.8 ± 6.7 days for the RA group (p = 0.17). Although the mean time to readmission was not statistically significant, 32 (61.5%) of the RA patients and 41 (38.3%) of the RV patients were readmitted within the first 7 days of discharge (p = 0.003). The readmission times are presented on the basis of weekly periods in Fig. 2.

DISCUSSION

Statement of Principal Findings

This study analyzing and comparing two years of unplanned RV and RA patients operated in the general surgery clinic of a private hospital demonstrated a 30-day RV rate of 12% and a 30-day RA rate of 5.8%. The main reasons for readmission were gastrointestinal complaints (RV: 21.5% vs. RA: 26.9%) and wound problems (RV: 24.3% vs. RA: 26.9%) in both groups. The pain was a significant factor in the RV group (25.3%). The multivariate analysis showed that the

RV-related factors were prolonged length of stay, emergency surgery, abnormal WBC, electrolyte imbalance, and abnormal hemoglobin level, while the development of a complication, prolonged length of stay, and advanced age were significant factors for RA.

Interpretation within the Context of the Wider Literature

The concept of RA is a well-defined measure of quality and is widely used in many countries. Studies have found the most important reasons for postoperative RA as wound complications, gastrointestinal problems, postoperative pain, activation of associated illness, substance abuse, and socioeconomic status [13]. A study conducted in France found the rate of readmission for all gastrointestinal surgery cases as 11.3%. The most important reasons for readmission were gastrointestinal complications (27%), surgical site infection (22%), digestive problems (10%), and medical problems (41%). The presence of cancer or dyspnea, complexity of the surgery, and respiratory complications were found to be the most important risk factors [14]. Two studies conducted in the UK at an interval of about 10 years found this rate as 6.8% and 4.7% and reported the most important reasons for readmission as surgical infections (57%) and postoperative pain (29%) [15]. A study from China found the rate of readmission after colorectal surgery as 18.6% and reported the presence of preoperative comorbidity as the most important risk factor [16, 17]. Our RA rate is lower than the results reported in the USA and is similar to the results reported by studies of European origin. However, such comparisons may not be very reliable. Because the infrastructure of each clinic and its patient group operated do not have the same risk factors. For this reason, it will be of more significance for each clinic to carry out its own risk analysis. In the analysis of the reasons for readmission, gastrointestinal problems ranked first, while the surgical factors ranked second among our patients.

One of the important points is to understand the main factors for RA and to reduce preventable admissions with the improvements to be made based on these factors. It is very difficult to establish a standard model due to the problem's multifactorial nature, conditions specific to each clinic, and differences in their patient groups. Many studies have shown a significant relationship between the length of hospital stay at initial hospitalization and readmission. In general, the patient's physiological capacity, the complexity of the surgery, and the development of complications are predictive of prolonged length of stay [18]. Our study demonstrated that the development of complications in index surgery, prolonged length of hospital stay, and advanced age were the most important risk factors for readmission. Especially the patients who developed complications had a 12-fold higher RA rate than those who did not develop complications. Complications develop depending on many factors (patient, disease, surgeon, surgical intervention). Therefore, it may be possible to reduce the complication rate by analyzing each case in itself. Since gastrointestinal problems are the most important reason for RA, post-discharge close follow-up of patients with these risk factors, keeping the lines of communication open, providing good training at discharge and providing home care services, if necessary, are extremely important to reduce preventable readmissions.

Although the RA rates and reasons, and measures to be taken have been analyzed in a broad sense, the reasons for unplanned RV are not a well-studied subject after general surgical procedures. The subject of RV has mostly been analyzed after a day-case otological surgery, sinonasal surgery, and facial surgery. These studies have reported an RV rate ranging between 2.3-5.2% [19-21]. Another study found the RV rate after thyroidectomy as 3.6%. The multivariate analysis revealed that a high ASA score and renal failure were the most important factors affecting this rate. The most important reasons for RV were cough/sputum discharge and wound-related problems [9]. This rate was found to be 12% in our study. The therapeutic and diagnostic procedures performed on most patients, time spent in the hospital, negative effects on the work schedule, and dissatisfaction constitute an important problem. Moreover, it significantly increases costs, though not as much as RA. Considering the reasons of our patients for RV, it seems that the problems can be resolved without visiting the hospital in a significant number of patients. Only 12 (11.2%) of these patients were readmitted after the initial RV and were hospitalized. Pain complaints, simple GIS symptoms, and non-surgical systemic problems were determined as the most important reasons in this group. It seems that patients who underwent laparoscopic surgery had a lower rate of RA and a higher rate of RV. Today,

when a significantly higher number of minimally invasive procedures and day-case surgeries have been performed, it is suggested that the RV problem is an important issue after general surgical interventions, which should also be studied.

Implications for Policy, Practice and Research

The prevention of complications during index surgeries will decrease the rates of RA and RV. However, this rate is relatively stable for surgical patients. For this reason, identifying patients who may develop complications in advance and making the necessary improvements will help decrease the rate of RA/RV. The study by Merkow *et al*. [22] showed that only 2.3% of readmissions were associated with exacerbation or recurrence of pre-existing complications. Studies have shown that at least half of readmissions can be prevented with better follow-up and care, and 41.8% of patients have the potential to be treated outside the hospital [23]. It seems possible to solve a significant proportion of readmissions by expanding non-hospital approaches. Some changes have been made in our hospital and clinic to reduce the rates of unplanned and preventable RA and RV. Patients with risk factors are called at certain periods after discharge. Furthermore, the opportunity to consult a physician is facilitated by using the internet and social media. Home care service is provided to patients in this risk group and those who demand. The effectiveness of this system will be evaluated by future studies.

Strengths and Limitations

The major limitation of our study was its retrospective design and including the results of a single clinic. Moreover, non-hospital, healthcare-related factors, and social factors were not analyzed. Furthermore, patients who were readmitted to other hospitals were attempted to be analyzed by phone calls, but it was not possible to reach their records. However, this study aimed to analyze the results of a single surgical clinic and may therefore demonstrate some measures to be taken to reduce readmissions more clearly. It will be relatively easier to prospectively evaluate the improvements to be made with the results obtained from this study. Another limitation is that the study included a relatively small number of patient groups. However, large and multi-center studies may have a small effect on centers' own practices, considering in terms of

quality control study and measures to be taken. Therefore, local results are of importance in this respect. Due to the retrospective nature of our study, some of the unplanned RV events in the outpatient clinic may have been missed or the planned RV patients may have been evaluated as unplanned RV. However, this possibility was attempted to be reduced by measures such as analyzing only the patients of a single team that operated these patients as well as re-analyzing suspicious conditions.

CONCLUSION

In conclusion, this study analyzed the RA and RV patients who were operated in a general surgery clinic. Preventable or non-preventable factors associated with readmission and revisit were analyzed. Patients who developed complications, had prolonged length of hospital stay, and were at an advanced age had a higher rate of RA, while patients who had prolonged length of hospital stay, underwent emergency surgery, and had biochemical problems at initial admission had a higher rate of RV. It was found that these rates were affected by the current physical condition of the patient rather than the operation itself. The results of this study, which reflect the results of a single team, can be useful for many centers in the same category. Focusing on these patients during and after discharge and improving out-of-hospital care facilities with a multidisciplinary approach can reduce the rates of unplanned RA and RV.

grant during conduction or writing of this study.

Statement of data availability

Our data was sought from the hospital records system. The data that support the results of this study can be obtained from the corresponding author upon reasonable request.

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