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Epidemiology of post-operative complications in patients admitted to emergency service

Acil servise başvuran hastalarda post-operatif komplikasyonların epidemiyolojik incelenmesi

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Abstract

Introduction: The aim of this study was to evaluate unplanned emergency room visits due to postoperative complications.The present study was to determine incidence rates ofand clinic and laboratory causes of readmissions due to postoperative complications.

Methods: This prospective study included 300 of 640 patients who presented to Emergency Service of Gaziosmanpasa University, Faculty of Medicine Hospital due to postoperative complications in May 2014 and April 2015 period. The data were recorded in the SPSS environment. Qualitative data were analyzed using Chi-square tests. Quantitative data were analyzed using one-way analysis of variance. Tukey test was used for multiple comparisons.

Results: The unplanned readmission rate is a nation-wide measure of hospital care outcomes. Of all 11,755 patients presenting to our emergency department, 640 applied for postoperative complications. Re-operation is associated with older age, high mean arterial pressure and recurrent emergency readmission. Average CRP was significantly higher in this group of patients admitted to the emergency service with postoperative complications for reoperation. These patients had wound infections (20.3%), hemorrhage-hematoma (10%) and pulmonary embolism (2.33%). The incidence rates for these conditions were higher than the rates reported in literature.

Discussion and Conclusion: Patients with old age, comorbid diseases, elevated CRP and long hospitalizations should be discharged from hospital after they have been informed about the complications that may develop. Emergency care should be given more carefully to patients with recurrentreadmissions because of their high morbidity and mortality rates. Taking necessary precautions will significantly reduce both cost and number of emergency service visits.

Keywords: Emergency service; postoperative complications; readmission.

Özet

Amaç: Bu çalışmanın amacı postoperative komplikasyonlara bağlı olarak planlanmamış acil servis ziyaretlerinin değerlendirilmesidir. Bu çalışmada postoperatif ve komplikasyonlara bağlı klinik ve laboratuvar nedenler ve görülme oranları belirlendi.

Gereç ve Yöntem: Bu prospektif çalışmaya, Mayıs 2014 ve Nisan 2015 döneminde, postoperative komplikasyonlar nedeniyle Gaziosmanpaşa Üniversitesi Tıp Fakültesi Hastanesi Acil Servisine başvuran 640 hastanın 300'ü dahil edildi. Veriler SPSS ortamında kaydedildi. Niteliksel veriler Ki-kare testleri kullanılarak analiz edildi. Nicel veriler, tek yönlü varyans analizi kullanılarak analiz edildi.Çoklu karşılaştırma için Tukey testi kullanıldı.

Bulgular: Planlanmamış yeniden Kabul oranı, ülke çapında hastane bakım sonuçları ölçütüdür. Acil servisimize başvuran toplam 11755 hastadan 640'ı postoperative komplikasyonlar için başvurdu. Tekrar operasyona alınma; ileri yaş, yüksek ortalama arter basıncı ve tekrarlayan acil geri Kabul ile ilişkilidir. Ameliyat sonrası komplikasyonlar nedeniyle acil servise birden çok başvuran bu grupta, ortalama CRP değeri anlamlı olarak yüksek bulundu. Bu hastalarda yara yeri enfeksiyonları (%20.3), hemoraji-hematom (%10) ve pulmoner emboli (%2.33) vardı. Bu durumlar için insidans oranları literatürde bildirilen oranlardan daha yüksekti.

Sonuç: İleri yaş, komplikasyonlu hastalıklar, artmış CRP ve uzun yatışları olan hastalar, gelişebilecek komplikasyonlar hakkında bilgilendirildikten sonra hastaneden taburcu edilmeli. Yüksek morbidite ve mortalite oranlarından dolayı tekrarlayan başvuruları olan hastalara acil bakım dikkatle verilmelidir. Gerekli önlemlerin alınması hem maliyet hem de acil servis ziyaretlerinin sayısını önemli ölçüde azaltacaktır.

Anahtar Sözcükler: Acil servis; postoperatif komplikasyonlar; tekrar başvuru.

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Postoperative period starts by taking patient from operation room to post-anesthesia care unit and ends when patients recovers from surgical complications.[1] Early post-operative period is most critical for surgery patients and complication risk in this period is high. Post-operative period of a month is used as a quality indicator.[2]

A large cohort study consisting of 21 groups who had surgical in-patient procedures showed that about 42% of post-operative complications occur within the 30 days of hospital discharge, and reoperation and mortality risk is three times higher in these patients.[3] Considering the substantial clinical and financial burden on patient and health care system, reduction of postoperative complications (PCs) and readmissions has been a target for decreasing the costs and improving the patient care quality.[4, 5]

Medicare program predicted that through monitoring and reporting of feedbacks as quality indications, efforts to reduce readmissions would promote innovation, improve coordination of patient care and lower the burden of health care system.[6] A recent cohort study on 44.120 patients, readmissions after elective orthopedic surgeries were studied.[7] The authors mentioned that prevention of surgical site infections, venous thromboembolism and postoperative hemorrhage constitute the most effective intervention in reducing readmissions. Provision of adherence to clinical standards in antibiotic prophylaxis[8] and in Surgery Care Improvement Project[9] resulted in a moderate reduction in surgical site complications.

Increasing occupancy rate in hospitals negatively affect the operation of emergency services.[10] Shorter stay in emergency room, i.e. a faster patient circulation, is associated with higher patient satisfaction and reduced mortality and morbidity.[11-15] Readmissions to hospitals are influenced by many factors and lead to additional medical and financial burden on both patients and hospitals. Aim of the present study was to reveal indications that could contribute to reduction of avoidable readmissions and improvement of overall patient care.

Materials and Method

The present study was conducted in Adults Emergency Service of Gaziosmanpasa University, Faculty of Medicine Hospital in the period between May 1st, 2014 and April 30th 2015. A total of 11.755 patients had surgical operation in our hospital and 640 of them (5.44%) presented with PCs during this period. Three hundred of these patients were included in our prospective study on a voluntary basis. Study inclusion criteria were over 16 years of age, readmission to Emergency Service within the first 30 day after operation and PC diagnosis based on clinical and laboratory examinations. The patients who did not volunteer to participate in, who were not considered to have post-operative complications, who were under 16 years of age and who underwent surgery in other health institutions were excluded. Ethical board approval was taken for the study from Ethical Board of Gaziosmanpasa University, Faculty of Medicine Clinical Investigations.

Data were analyzed using Statistical Package for the Social Sciences software (SPSS Inc., Chicago, IL).Qualitative data were analyzed using Chi-square and multi-eyed Chi-square tests. Quantitative data were analyzed using one-way analysis of variance. Tukey test was used for multiple comparisons. $P<0.05$ was considered significant.

Results

Demographic data: The present study included 178 female (59.3%) and 112 male (40.7%) patients. Seventy-one of the participating patients (35 female and 36 male) were 56 years old and over, while 229 of them (153 female and 76 male) were under 56 years of age. General age average of patients was 48.36±18.74 years (range 17 to 87), while average age of male patients was 51.80±19.29 years (range 18 to 86), and average age of female patients was 46.01±18.04 age (range 17 to 87). Reasons for emergency service visits were given in Table 1.

It was found out that 87 of 300 patients (29.0%) presenting to Emergency Service were admitted to emergency operation while 213 (71%) were admitted for elective operation. Fifty patients (16.7%) were admitted to postoperative intensive care unit. Ninety-four per cent of patients (n=47) admitted to intensive care unit stayed there for seven days or shorter whereas 6% of them (n=3) stayed more than seven days.

Departments where patients presenting to emergency service were operated were given in Table 2.

Discharge status of patients presenting to emergency department with PCs based on age groups were given in Table 3.

Pain was the leading reason of the patients (n=137) in the study for admission to Emergency Service. Of these patients, 44 (32.1%) had abdominal pain, 38 (27.7%) had pain in surgical site and 31 (22.6%) had headache. Thirty patients presented with hemorrhage complaint and 21 of them (70%) had

Table 1. Frequencies of reasons for the patients in study to present to emergency service

	n	%
Pain	137	45.7
Surgical wound site infection	61	20.3
Hemorrhage	30	10.0
Fever	22	7.3
Dyspnea	18	6.0
Urinary retention	9	3.0
Nausea	7	2.3
Hand numbness	6	2.0
Syncope	4	1.3
Epileptic seizure	3	1.0
Cough	1	0.3
Cardiopulmonary arrest	1	0.3
Itching - erythema	1	0.3
Total	300	100.0

Table 2. Clinics where the patients were operated

	n	%		n	%
General Surgery	98	32.7	Cardiovascular Surgery	16	5.3
Gynecology and Obstetrics	46	15.3	Ear, Nose, Throat	10	3.3
Orthopedics	37	12.3	Plastic Surgery	10	3.3
Urology	32	10.7	Eye Diseases	6	2.0
Anesthesia	23	7.7	Chest Surgery	1	0.3
Brain Surgery	20	6.7	Cardiology	1	0.3
Total				300	100

Table 3. Discharge frequencies of participating patients with post-operative complications after discharge from hospital based on age groups

Age groups	Discharge with healing		Admission to int ensive care unit		Admission to service		Exitus		Total	
17-25	29	14.95	1	5.56	7	8.05	0	0	37	12.33
26-35	68	35.05	0	0.00	16	18.39	0	0	84	28.00
36-45	37	19.07	5	27.78	17	19.54	0	0	59	19.67
46-55	27	13.92	6	33.33	15	17.24	1	100	49	16.33
56 and over	33	17.01	6	33.33	32	36.78	0	0	71	23.67
Total	194	100.00	18	100.00	87	100.00	1	100	300	100.00

Table 4. Readmission of patients due to PCs

	Discharge with healing		Admission to intensive care unit		Admission to service		Exitus		Total	
Yes	13	6.70	7	38.89	29	33.33	1	100.00	50	16.67
No	181	93.30	11	61.11	58	66.67	0	0.00	250	83.33
Total	194	100.00	18	100.00	87	100.00	1	100.00	300	100.00

Table 5. Reason for reoperation of participating patients

Diagnosis	n	%	Diagnosis	n	%
Amputation repair	1	3.03	Perforation	6	18.18
Apsis	3	9.09	Prostate cancer	1	3.03
Arterial embolism	2	6.06	ICH, intra-cerebral shift	2	3.03
Hematoma	2	6.06	Pseudo-aneurism	1	3.03
Ileus	6	18.18	Tracheostomy	1	3.03
Hemorrhage	1	3.03	TUR-P	2	6.06
Mesentery ischemia	2	6.06	Surgical wound site infection	3	9.09
Total				33	100.0

hemorrhage in surgical site. Twenty-two patients presented to Emergency Service with fever complaint within the 30 days of post-operative period. The cause of fever was atelectasis in six patients (27.3%), apsis in five patients (22.8%) and pneumonia in four patients (18.2%). Eighteen patients in the hospital visited emergency department with dyspnea. The cause of dyspnea was pulmonary embolism in seven patients (39.0%, 7/300=2.3%), atelectasis in six patients (33.3%) and pneumonia in four patients (22.2%).

Of 300 patients in the study, 194 (64.7%) were discharged with healing, 87 (29%) were referred to services, 18 (6%) were referred to intensive care unit and one patient became exitus. In terms of discharge based on age groups, 35.05% of the patients (n=168) discharged with healing were in 26-35 age group, 66.66% of the patients referred to intensive care unit were in 46 years and over age group, and 36.78% of the patients referred to service were in 56 years and over age group.

Diagnoses of 33 patients who presented to emergency service

Table 6. Frequencies of Multiple readmissions to Emergency Service Based on Age and Clinical Findings within 30 days

	Reason for Recurrent Readmission to Emergency Service within 30 days	n	Mean	SS	Min.	Max.	t	p
Age	Yes	77	55.25	19.21	20	87	14.625	0.0001
	No	223	45.98	18.02	17	84		
	Total	300	48.36	18.74	17	87		
Fever	Yes	77	36.96	0.80	36.00	39.70	11.621	0.001
	No	223	36.65	0.64	35.00	39.50		
	Total	300	36.73	0.70	35.00	39.70		
Duration of stay in clinic	Yes	77	7.65	7.62	1.00	60.00	13.208	0.0001
	No	223	5.01	4.53	1.00	45.00		
	Total	300	5.69	5.60	1.00	60.00		
Admission Discharge Period	Yes	77	10.16	14.78	1.00	116.00	15.505	0.0001
	No	223	5.53	5.61	1.00	56.00		
	Total	300	6.71	9.11	1.00	116.00		
Stay in Intensive Care Unit	Yes	21	9.29	24.05	2.00	114.00	1.414	0.240
	No	29	3.97	2.18	1.00	11.00		
	Total	50	6.20	15.68	1.00	114.00		

Table 7. Frequencies of Reoperations Based on Age and Clinical Findings

		n	Mean	SS	Min.	Max.	t	p
Age	No	267	46.91	18.55	17	87	15.861	0.0001
	Yes	33	60.53	15.91	21	86		
	Total	300	48.36	18.74	17	87		
Mean Arterial Pressure	No	267	92.26	10.72	60.00	133.00	9.292	0.003
	Yes	33	98.66	14.75	77.00	133.00		
	Total	300	92.95	11.36	60.00	133.00		
Fever	No	267	36.72	0.71	35.00	39.70	0.359	0.550
	Yes	33	36.80	0.51	36.00	38.50		
	Total	300	36.72	0.69	35.00	39.70		
Duration of Stay in Intensive Care Unit	No	33	7.24	19.29	1.00	114.00	0.424	0.518
	Yes	17	4.18	1.47	2.00	7.00		
	Total	50	6.20	15.68	1.00	114.00		
Duration of Stay in Clinic	No	267	5.09	4.47	1.00	45.00	31.892	0.0001
	Yes	33	10.72	10.06	3.00	60.00		
	Total	300	5.69	5.60	1.00	60.00		
Admission Discharge Period	No	267	5.98	8.67	1.00	116.00	17.274	0.0001
	Yes	33	12.88	10.47	3.00	60.00		
	Total	300	6.71	9.11	1.00	116.00		
Multiple Admission within 30 Days	No	267	1.79	0.41	1.00	2.00	33.084	0.0001
	Yes	33	1.34	0.48	1.00	2.00		
	Total	300	1.74	0.44	1.00	2.00		

with PC and taken to operation again were given in Table 5.

Seventy-seven of 300 patients in the study (25.67%) had recurrent admissions to emergency department with PC complaints within the 30 days of postoperative period. Thirty-three patients in the study (33/100, 11%) were admitted for reoperation. Seventeen of these 33 patients (51.5%) had one or more accompanying conditions. Reoperation frequency of patients in 56 years and over group (n=17, 53.13%) was signif-

icantly higher (p<0.001). Seventy-seven patients in the study had recurrent emergency service visits within the 30 days of post-operative period, and 22 of them (28.57%) were admitted to reoperation. On the other hand, 223 patients presented to emergency service once and 11 of them (4.93%) were re-operated (p=0.001). Based on clinical findings, in patients presenting to emergency department more than once with PCs within the 30 days of postoperative period, average age (55.25±19.21 years), average fever (36.96±0.80 °C), average length of stay in clinic (7.65±7.62 days) and average duration to discharge (10.16±14.78 days) were significantly higher compared to the patients presenting only once within the 30 days of post-operative period.

It is given frequencies of multiple read missions to emergency service based on age and clinical findings within 30 days on Table 6.

Frequency of electrolyte imbalance was 21.26 and 33.33% in patients presenting to emergency department once and multiple times within the 30 days of post-operative period, respectively, and the difference was statistically significant (p=0.042).

In patients admitted for reoperation, average age (60.53±15.91, p=0.001), mean arterial pressure (98.66±14.75, p=0.003), average duration of stay in clinic (10.72±10.06, p=0.001) and average duration to discharge (12.88±10.47, p=0.001) were significantly higher compared to patients who were not admitted for reoperation (Table 7). Average CRP value in patients who were admitted for reoperation (93.99±80.06, p=0.004) was significantly higher than those who were not.

Discussion

Centers for Medicare and Medicaid Services (CMS) defined readmission in 2014 as admission to the same or another hospital department within the 30 days after discharge.CMS has developed a series of indicators for readmissions due to myocardial infarction, congestive heart failure and pneumonia diagnoses and started to inspect hospitals since October 1st, 2012.[16] Patient readmissions are frequently preventable cases and they increase costs for both patients and hospitals. Goldfield et al.[17] mentioned the importance of potentially preventable emergency service visits, post-operative complications and readmissions in proper planning of health care services and reducing the costs. Hospital Readmission Reduction Program was launched in 2012 within the context of Medicare program.[18] Thanks to this program, readmission rates within the 30 days fell from 19% in 2007-2011 period to 18.5% in 2012 and below 18% in 2013.[19] Reports of American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) indicated that post-operative complication rate dropped from 13% to 9% due to successful quality improvement efforts, and thus readmissions and their costs were reduced.[20, 21]

In the present study, data from 300 patients presenting to emergency service due to PCs were investigated. Studies in the literature show that risk for PC development after surgical procedures increase depending upon age.[22, 23] In parallel with literature, admission rate of older patients in intensive care unit was higher in the present study. The present study revealed a significant association between age and reoperation rate.

It was reported that most of the patients in red and yellow triage groups were older age (>65 years of age) patients (37.1%) and a 12.5% admission rate was reported for them.[24] In the present study, 38 of 71 advanced age patients (53.52%) who presented to emergency service with PCs were admitted to hospital. Hospital admission rate in the present study was somewhat high compared to the literature. Reoperation rate in the present study was 51.51%. Eighteen of 71 patients (25.35%) who were 56 years old and over were admitted for reoperation. Only 15 of 229 patients (6.55%) who were 55 years old and younger were admitted for reoperation, and the difference was significant between the two age groups (p=0.0001).

Admission rates and demographic and clinical features of patients could be affected by many factors such as country, town, localization of emergency services and demographic characteristics of the region.[25, 26] The most important factors affecting PCs are patient himself/herself, his/her general status and accompanying disorders.[22, 23] Control of blood pressure in surgical operations is critical to reduce cardiovascular morbidity and mortality. Hypertension is a serious problem that can develop during surgical intervention and it can even lead to postponement of surgery.[27] A change of more than 20% in average blood pressure increases the complication risk in high-risk diabetic and hypertensive patients.[28] A significant association was observed between average arterial pressure and reoperation rate in the present study.

It was shown in Reports of American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) that postoperative complications are 4.3 times higher in readmissions compared to the first time admissions.[19, 21, 29] There was a significant difference in reoperation rate between group of PC patients who made multiple visits to emergency service and group of patients who made one visit in the present study. ACS-NSQIP classified infections of surgical wound site as surgical complication.[21, 29] Surgical wound site infections accounted for 20.3% of the diagnoses of the patients in the present study. In a study by Hinami et al.,[30] 28.57% of readmissions within 30 days of patients who were discharged with elective surgery were due to infections (surgical site and others) based on patients' reporting. CDC released surgical site infection rate as 1.9% in 2011.[31] Infection rate was 27% in patients who applied once to emergency service with PCs while patients with multiple emergency service visits had an infection rate of 18.18%.

Verla et al.[32] investigated the United States medical data of post-operative complications in 2000-2009 period, and reported that 3% of the patients had surgical wound site infection, 2.4% had pneumonia, 1.5% had hemorrhage-hematoma

and 0.06% had pulmonary embolism. In the present study, 20.3% of the patients presenting to emergency service with PC had surgical wound site infection, 10% had hemorrhage-hematoma and 2.33% had pulmonary embolisms. These rates were clearly higher than those in literature. National Healthcare Quality Report by Agency of Healthcare Research and Quality (AHRQ)mentioned an average of 2.24 post-operative hemorrhage or hematoma incidence per 1,000 surgery discharges in the year 2000.[33] In the present study, 10% of the patients applied to emergency service with hemorrhage, and 70% of them involved surgical site.

Perlino [34] reported a 13-73% incidence rate for postoperative fever incidence due to surgical intervention. In the present study, 7.3% of the patients applied to emergency service with fever complaint. Jin et al.[35] reported a pulmonary complication rate of 9.7% after non-cardiac surgery operations for a multi-centered Chinese population. This rate was 6% in the present study.

In management processes of PCs, standard laboratory tests (such as hemogram and biochemistry), lung x-ray, ECG and respiration tests play crucial role in postoperative evaluation. [31, 36] In terms of laboratory findings, CRP levels were high in 84.3% of them, while WBC was high in 39.8% and creatinine was high in 16.9%. In patients who presented to emergency service with PCs, CRP was significantly high in 33 patients who were admitted for reoperation compared to 267 patients who were not. Electrolyte imbalance incidence was 21.26%in patients presenting to emergency service once and 33.33% in patients who made multiple visits to emergency service. The difference was statistically significant (p=0.042).

Cumming et al.[37] reported a hypovolemic hyponatremia rate of 70%. Similarly, hyponatremia was the most common electrolyte disorder (18%) in the present study.

Lawson et al.[36] reported that 19.6% of the post-operative patients were readmission within 30 days, 34% within 90 days and 56.1% within 365 days of postoperative period due to PCs. In another study in 2004,[38] readmission rate was 12.7% in surgery patients and 16.1% in medical patients. Merkow et al.[39], on the other hand, reported a 5.7% unplanned postoperative readmission rate within 30 days after operation. In the present study, readmission incidence due to PCs were 35% within 30 days after operation. In unplanned patient admissions, status of the patient (such as preoperative comorbidity, hypertension, and diabetes mellitus), surgical technique (laparoscopic vs. open surgery) and skill of the surgeon are critical factors.[40] Using surgical procedures applied in clinics, it is possible to reduce PC rates by half and readmissions by 40%.[41]

Based on their five-year study, Ferraris et al.[42] reported that high-risk patient groups had a PC frequency of 10.6% and a mortality rate of 1.1%. In the present study, one patient who had had operation because of brain tumor (0.33%) was brought to our emergency service because of cardiopulmonary arrest. Examinations carried out indicated intracerebral hemorrhage and shift, and the patient was lost.

Reoperation rate was 4.94% in 223 patients who presented to emergency service once with PCs within the 30 days of post-operation period and 27.27% in 77 patients who had more than one visits to our emergency service. Due to increases in hospital infections and costs, patients had tendencies toward short-term postoperative admissions and one-day or outpatient surgical interventions. In the present study, longer hospital stays and delayed discharges were significantly associated with reoperation frequency.

Patients should be discharged from hospital after a reevaluation to reduce post-discharge PCs. Proper discharge plans such as educating patients and close follow-ups are necessary for success of early discharge of patients.[43] First and second level health care services as well as effective care methods are necessary to reduce readmissions.[44, 45] Recurrent admissions could indicate a mistake or a complication in care plan. In general, emergency services throughout the world face bigger challenges arising from increasing number of patients and their demands because of their inelastic capacity to meet them. About half of all emergency services operate at full capacity or over.[46] On the other hand, there has been debate over the effects of many factors on hospital readmissions as well as over the use of these factors as indications for the quality of health care provided.

In conclusion, present study revealed that most of unplanned emergency service visits due to PCs were preventable causes. It is possible to prevent possible electrolyte imbalances and infections through determination of high risk groups, reducing the length of hospital stays, proper antibiotic treatment against infections, use of antiaggregants and anticoagulants and frequent policlinic check-ups when necessary. Patients with older age, comorbid diseases, higher CRP and longer hospital stay histories should be discharged from hospital after being informed in detail especially during their discharge about possible complications. Care must be observed for the patients with multiple emergency service visits because of their higher morbidity and mortality rates. Precautions for this purpose would considerably lower the costs for both patients and hospitals, contribute to national economy and reduce admissions to emergency services which are already overcrowded.

Limitations of the study

Volunteer participation led to fewer patients than expected in the present study because patients with PCswho applied to other health institutions and patients who had original operations in other health institutions were excluded. Thus, suboptimal patient population was the major limitation.

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