Comprehensive Psychiatry 95 (2019) 152138

Contents lists available at ScienceDirect

Comprehensive Psychiatry

journal homepage: www.elsevier.com/locate/comppsych

Frequency and predictors of perioperative psychiatric symptom worsening among patients with psychiatric disorders

Yoshihiro Matsumoto, Nobutaka Ayani*, Jin Narumoto

Department of Psychiatry, Graduate School of Medical Science, Kyoto Prefectural University of Medicine, 465 Kajii-cho, Kawaramachi-Hirokoji, Kamigyo-ku, Kyoto, 602-8566, Japan

ARTICLE INFO

Keywords:
Perioperative management
Psychiatric comorbidity
Patient safety
Medical expense
Medical resource

ABSTRACT

Objective: This study aimed to clarify the frequency of perioperative psychiatric symptom worsening among patients with psychiatric disorders and investigate factors predictive of symptom aggravation.
Method: This study adopted a retrospective cohort study design. The sample consisted of perioperative inpatients who were diagnosed with psychiatric disorders on admission and received psychiatric intervention between January 1, 2015 and November 31, 2017.
Results: Of 176 inpatients who met our inclusion criteria, 15 (8.5%) exhibited symptom worsening. Factors associated with symptom worsening included changes in surface morphology during surgery ($p < 0.01$; odds ratio (OR) = 10.58; 95% confidence interval (CI), 3.40–32.87), otolaryngological surgery ($p = 0.01$; OR = 6.95; 95% CI, 1.81–26.75), stay in the intensive care unit ($p < 0.01$; OR = 5.65; 95% CI, 1.79–17.81), and surgery duration longer than 180 min ($p = 0.03$; OR = 3.40; 95% CI, 1.04–11.13).
Conclusion: This was the first retrospective analysis to focus on the perioperative worsening of psychiatric symptoms. As only few inpatients exhibited symptom aggravation, general hospitals without psychiatric beds can receive perioperative patients with psychiatric comorbidity. However, caution should be exercised to address the potential worsening of symptoms in cases of surface-morphology changing surgery, otolaryngological surgery, long-duration operations, and when ICU stay is required.

1. Introduction

The total spending on healthcare by country in the Organisation for Economic Co-operation and Development has increased in recent decades. Demographic changes, advancements in medical care technology, and growing expectations from patients will increase the economic burden of healthcare in these countries [1]. Thus, the optimization of medical expenses and the allocation of medical resources have become increasingly urgent concerns.

Efficient healthcare spending must, therefore, address the lengthening of hospital stay and exacerbation of medical expenses caused by psychiatric comorbidity [2,3]; perioperative worsening of psychiatric symptoms can especially elevate the risks of prolonged hospitalization, increased medical expenses, and threats to patient safety [4]. Psychiatric intervention is recommended to prevent or ameliorate these problems [5]. In Japan, there are 9.4 psychiatrists per 100,000 people, a large ratio relative to those of other regions, e.g., Africa, 0.04; Americas, 2.00; East Mediterranean, 0.95; Europe, 9.80; South-East Asia, 0.20; West Pacific, 0.32; worldwide, 1.20 [6]. However, despite the comparative prevalence of psychiatrists in Japan, the number of psychiatrists working in general hospitals with beds for psychiatric inpatients is only approximately 2000 (≈ 15% of psychiatrists in Japan) [7], indicating that most hospitals lack the capacity to cope with the aforementioned intensification of the psychiatric healthcare burden. Further aggravating the situation, the number of psychiatric patients in Japan has continuously increased over the past 2 decades: from 2.04 million in 1999 to 3.94 million in 2014, 1.51 million (40%) of whom were older than 65 years [8]. The disproportionate prevalence of psychiatric illness among older adults is complicated by this population's vulnerability to other diseases and is compounded by the increased risk of developing cancer and cardiovascular disease among patients with chronic depression or schizophrenia [9–14]. This ultimately signifies that hospitals without psychiatric beds or psychiatrists hospitalize patients with psychiatric disorders in the general ward.

Epidemiological data capable of predicting worsening of psychiatric symptoms are required to properly allocate medical resources; namely, the admission of high- and low-risk patients to hospitals with and without psychiatric beds or psychiatrists.

Abbreviations: KPUM, Kyoto Prefectural University of Medicine.

* Corresoponding author.
E-mail addresses: thlbhym@koto.kpu-m.ac.jp (Y. Matsumoto), lingren@koto.kpu-m.ac.jp (N. Ayani), jnaru@koto.kpu-m.ac.jp (J. Narumoto).

https://doi.org/10.1016/j.comppsych.2019.152138

A few studies have reported that the frequency of abnormal or disruptive behaviors of patients with psychiatric comorbidity was high [5,15]. However, these studies did not define what constitutes "abnormal behavior" or "disruptive behavior." Moreover, these data do not necessarily denote that most patients with psychiatric comorbidity require stay in the psychiatric ward or treatment by psychiatrists during hospitalization because not all abnormal or disruptive behaviors require psychiatric intervention. We hypothesized that the frequency of requiring active psychiatric intervention would be lower than that reported by previous studies. This retrospective study investigated the prevalence of perioperative aggravation of psychiatric symptoms requiring psychiatric intervention and potential predictive factors that are associated with symptom worsening. Overall, we believe that the results of this study will contribute toward improving the global management of psychiatric care.

2. Methods

2.1. Data sources

Employing a retrospective cohort design, this study used clinical records from the University Hospital of the Kyoto Prefectural University of Medicine (KPUM). Situated in Kyoto, this hospital is one of the core institutes of the region; it has 1065 beds (28 psychiatric beds), conducts approximately 8000 surgeries per year, and employs an average of 18 psychiatrists, nine of whom were engaged in consultations and the others engaged in seeing outpatients and inpatients in the psychiatric ward from 2015 to 2017. The number of psychiatrists in the hospital was similar to those of other university hospitals in Japan (average in 2007, 15.7). [7] This study was approved by the Ethics Committee of the KPUM and performed according to the tenets of the Declaration of Helsinki [16].

2.2. Participants

The sample consisted of perioperative inpatients with psychiatric comorbidity that received psychiatric intervention between January 1, 2015 and November 31, 2017. We included inpatients who were diagnosed with psychiatric comorbidity by their primary physician before admission to surgical inpatient units. We excluded those with comorbid insomnia or dementia; the diagnostic criteria of insomnia without any other mental disorder are ambiguous, and the suspected number of patients with undiagnosed dementia complicated accurately incorporating this population into subsequent analyses. In addition, we excluded patients who were admitted to the hospital because of a suicide attempt or worsening of psychiatric symptoms, as their mental states were already unstable prior to hospitalization. The study participants thus consisted of the following: (1) liaison patients: patients who were referred to consultation-liaison psychiatry and concerning whom psychiatrists advised the physicians in charge of surgery on the management of the patients' psychiatric comorbidity; the risk of psychiatric symptom worsening was considered low. (2) General co-managed patients: patients that were co-managed by psychiatrists and the physicians in charge of surgery in the general ward; the risk of psychiatric symptom worsening was considered moderate. (3) Psychiatric inpatients: patients who were hospitalized in the psychiatric ward; the risk of psychiatric symptom worsening was considered high (Fig. 1).

We used the International Statistical Classification of Diseases, 10th revision (ICD-10) to classify psychiatric diseases.

2.3. Definition of independent variables

We extracted the following items from patient data as variables: patient sex, whether or not the patients were ≥ 65 years old, department of surgery, presence of malignant disease, Charlson comorbidity index [17], primary psychiatric diagnosis, admission ward (general or psychiatric), type of admission (voluntary or involuntary), and stay in the intensive care unit (ICU). In addition, as some studies have reported that changes in surface morphology during surgery affect psychological reactions [18–20], we included such changes as a variable, defined as tracheotomy, amputation, mastectomy without reconstruction, gastrostomy, colostomy, nephrostomy, and ophthalmectomy. Surgical variables included the form of anesthesia (general or local), the presence of delirium, emergency or planned surgery, and surgery duration longer than 180 min. Concerning this last variable, one study reported that surgery duration longer than 180 min increased the risk of physical complications [21]; therefore, we selected 180 min as the cut-off.

2.4. Definition of outcomes

The outcome of this study was the proportion of patients who exhibited perioperative worsening of psychiatric symptoms, defined as: (1) change in the type of admission, i.e., voluntary to involuntary admission, and (2) change in prescription, i.e., an increase in the dose of psychotropic prescription or provision of a new prescription. We excluded prescription changes that were made in response to factors other than worsening of the patient's original psychiatric disease, i.e., prescriptions addressing delirium, insomnia, or alcohol withdrawal syndrome, as well as changes made to prescribed antipsychotics due to physical disease (e.g., change from olanzapine to another antipsychotic because of diabetic mellitus). Two psychiatrists independently reviewed all patient clinical records and met to confirm the final definition of symptom worsening. When the reviewers disagreed, they reached consensus through discussion.

2.5. Statistical analyses

Continuous variables are presented as means with standard deviations (SDs) or medians with interquartile ranges, and categorical variables as numbers and percentages. We compared categorical variables with the chi-squared (χ^2) test when the expected value in each cell was greater than 5; otherwise, Fisher's exact test was used to assess the relationship between the worsening of symptoms and background factors. For all analyses, $p < 0.05$ (two-tailed) was considered statistically significant. We performed all analyses using JMP V.14 (SAS Institute, Cary, NC, USA).

3. Results

3.1. Demographic data

Of the 1991 patients who received psychiatric intervention over the course of three years, 176 inpatients met our criteria (males, 75; age range, 14–87 years; mean age, 52.7 years [SD 16.7]) (Fig. 2). The patients with malignant disease were 37.5% (n = 66). Concerning classification of the primary psychiatric diagnosis, 25.6% (n = 45) patients had schizophrenia or schizotypal/delusional disorders (F2), 25.6% (n = 45) had mood disorders (F3), 23.3% (n = 41) had neurotic, stress-related, or somatoform disorders (F4); and 25.6% (n = 45) had other psychiatric disorders. The proportion of patients admitted to the psychiatry ward was 12.5% (n = 22). The proportions of patients who stayed in the ICU and of changes in surface morphology were 13.1% (n = 23) and 16.5% (n = 29), respectively. The proportion of patients who received emergency surgery was 6.8% (n = 12). The median duration of surgery was 172.5 min (quartile,

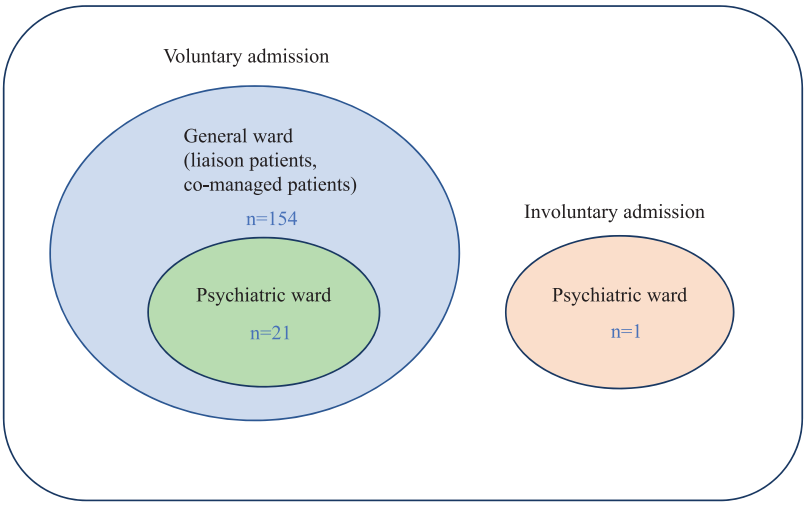

Fig. 1. Types of admission.

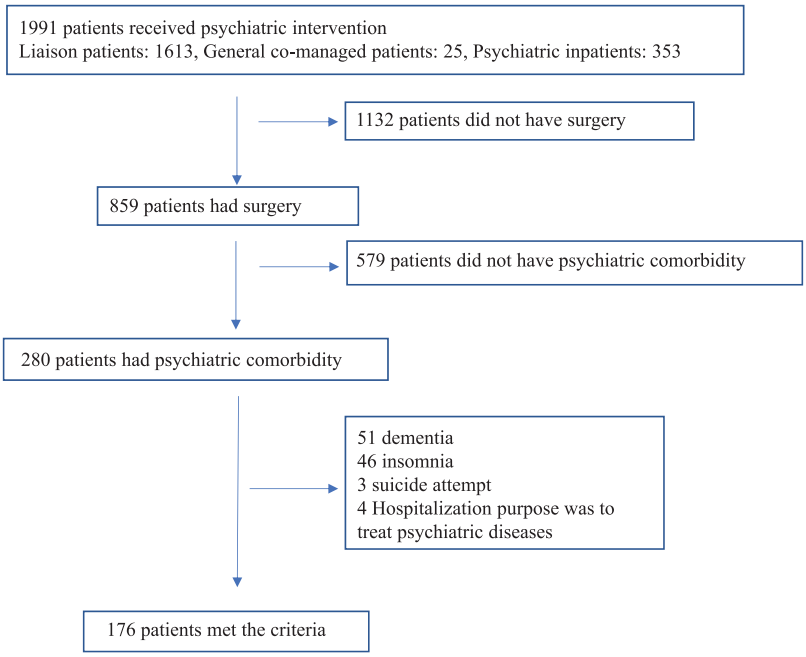

Fig. 2. Flowchart of patient selection.

77.3–314.5); the proportion of patients with duration of surgery that exceeded 180 min was 47.2% (n = 83) (Table 1).

3.2. Proportion and predictors of symptom worsening

The proportion of patients with perioperative worsening of psychiatric symptoms was 8.5% (n = 15). Several factors were significantly associated with exacerbation of symptoms (Table 2), i.e., change in surface morphology during surgery ($p < 0.01$), otolaryngological surgery ($p = 0.01$), stay in the ICU ($p < 0.01$), and surgery duration longer than 180 min ($p = 0.03$).

3.3. Classification of patients who experienced symptom worsening

Four patients required changes in their type of admission (26.7%), and psychotropic prescriptions changed in 11 cases (73.3%). The admission type was changed in 4/5 of F2 cases (80%) but in none of the others (0/10) ($p < 0.01$)

4. Discussion

This study found that the proportion of patients who exhibited perioperative psychiatric symptom worsening was 8.5% (n = 15); surgical changes in surface morphology, ICU stay, and surgery duration longer than 180 min were associated with symptom worsening. These predictors may reflect the vulnerability of inpatients to stress [22]. While surgical interventions for malignant diseases and emergency surgeries were not significantly related to perioperative exacerbation of psychiatric symptoms, the p values of the associations ($p = 0.06$ and $p = 0.07$, respectively) indicated distinct trends toward significance. The reason for otolaryngological surgery being associated with symptom worsening may be that in our hospital, most otolaryngological surgeries have long duration, are performed for the treatment of malignant disease, they involve surface morphology change, and require stay in the ICU.

We also found that the type of psychiatric disease did not predict worsening; however, change in the type of admission was only

Table 1
Characteristics of patients.

Factors	Number of patients Total (n = 176)
Male, n (%)	75 (42.6)
Age ≧ 65 years, n (%)	56 (31.8)
Department of Surgery, n (%)	34 (19.3)
Gastrointestinal	20 (11.4)
Breast	11 (6.3)
Cardiovascular	19 (10.8)
Obstetrics and Gynecology	15 (8.5)
Orthopedics	12 (6.8)
Otolaryngology	
Malignant Disease, n (%)	66 (37.5)
Charlson Risk Index, n (%)	75 (42.6)
Low	78 (44.3)
Medium	14 (8.0)
High	9 (5.1)
Very High	
Psychiatric diagnosis, n (%)	
F2	45 (25.6)
F3	45 (25.6)
F4	41 (23.3)
Admission to the psychiatry ward, n (%)	22 (12.5)
Voluntary admission, n (%)	175 (99.4)
Stay in the intensive care unit, n (%)	23 (13.1)
Changes in surface morphology, n (%)	29 (16.5)
General anesthesia, n (%)	164 (93.2)
Presence of delirium, n (%)	17 (9.7)
Emergency surgery, n (%)	12 (6.8)
Surgery duration > 180 minutes, n (%)	83 (47.2)

F2: schizophrenia or schizotypal/delusional disorders.
F3: mood disorders.
F4: neurotic, stress-related, or somatoform disorders.

required for patients with schizophrenia, schizotypal, and delusional disorders.

4.1. Comparison with findings of previous studies

A few prior studies have reported on the perioperative management of patients with psychiatric comorbidity [23]; one revealed the frequency of abnormal behaviors in patients with schizophrenia at 52.4% [15], while another reported the frequency of disruptive behavior among patients with schizophrenia at 29% [5]. The probable inclusion of cases of delirium in these studies likely accounts for these frequencies being higher than those reported herein. Moreover, we did not consider cases of abnormal behavior that were controlled without any changes in the type of prescription or admission as constituting worsening of symptoms. As such changes could be managed by general physicians they were excluded from the present study; we sought to characterize the epidemiology of patients who required active psychiatric intervention. Notably, in our study abnormal behaviors were seen in 47.6% (n = 20) and disruptive behaviors (including temporary shouting) in 28.6% (n = 12) of F2 patients. These results were similar to those of previous studies. However, most of these patients did not require prescription or admission ward change.

4.2. Clinical implications

The frequency of perioperative worsening of psychiatric symptoms was not high (8.5% n = 15); 73.3% of these cases could be controlled by adjustments to prescription. Thus, most perioperative inpatients with psychiatric comorbidity could receive surgery at hospitals without psychiatric wards.

Moreover, psychiatric diseases were not predictive of symptom worsening. When psychiatrists assess the risk of worsening

Table 2
Factors of worsening perioperative psychiatric symptoms.

	Number of patients (n = 176)	Number of worsening (n = 15)	Odds ratio	95% confidence interval	P†
Sex					
Female	101	7	Reference		
Male	75	8	1.60	0.55–4.64	0.38
Age, years					
<65	120	9	Reference		
≧65	56	6	1.48	0.50–4.38	0.48
Department of surgery	34	4	1.59	0.47–5.33	0.49
Gastrointestinal	20	3	2.12	0.54–8.26	0.38
Breast	11	1	1.08	0.13–9.05	1.00
Cardiovascular	19	0	0	0	0.38
Obstetrics and Gynecology	15	0	0	0	0.37
Orthopedics	12	4	6.95	1.81–26.75	0.01
Otolaryngology					
Malignant Disease	66	9	2.74	0.93–8.08	0.06
Charlson Risk Index					
≦ Medium	153	12	Reference		
≧ High	23	3		0.46–6.79	0.42
Psychiatric diagnosis					
F2	45	5	1.51	0.49–4.69	0.47
F3	45	4	1.06	0.32–3.53	0.92
F4	41	4	1.22	0.36–4.05	0.75
Admission Ward					
General	154	13	Reference		
Psychiatric	22	2	0.92	0.19–4.39	1.00
Stay in the intensive care unit	23	6	5.65	1.79–17.81	<0.01
Changes in surface morphology	29	9	10.58	3.40–32.87	<0.01
Presence of delirium	17	2	1.50	0.31–7.28	0.61
Emergency surgery	12	3	4.22	1.01–17.69	0.07
Surgery duration					
≦ 180 min	93	4	Reference		
> 180 min	83	11	3.40	1.04–-11.13	0.03

symptoms, they usually consider the patients' current psychiatric symptoms. However, our results indicate that psychiatrists should instead consider the manner of surgery, i.e., changes in surface morphology, ICU stay, and the length of surgery. As such information can be accessed prior to admission, it may help inform to which hospital the patient is admitted.

Although patients in psychiatric wards were originally considered to be at a higher risk of experiencing symptom worsening compared to patients in the general ward, we found that the frequency of psychiatric symptom worsening was similar between patients in both wards. While the reason for this finding is unclear, the availability of psychotherapy and social coordination in the psychiatric ward may have decreased the risk of worsening or the initial risk of worsening for some patients may have been overestimated. The latter hypothesis supports the need of predictors.

4.3. Study limitations and strengths

This study was subject to two limitations. First, we conducted this study at a single university hospital, had a small sample size, and did not perform a multivariate analysis. Therefore, our results may not be generalizable to other hospitals. However, considering the average sample size of studies on the perioperative worsening of psychiatric symptoms [23], this study population was relatively large. Moreover, no other study used a clear study methodology when evaluating the worsening of psychiatric symptoms. We consider that the data obtained in this study are the most robust among those currently available, considering the relatively large sample size and the clear study methodology. Second, we were unable to include inpatients who had not received psychiatric intervention; for example, when a general physician considered the mental state of a patient to have remained stable and did not consult a psychiatrist. Therefore, our results may have overestimated the frequency of psychiatric symptom worsening.

5. Conclusion

This was the first retrospective analysis to principally focus on the perioperative worsening of psychiatric symptoms. Instances of worsening that required psychiatric treatment were infrequent; indeed, general hospitals without psychiatric beds can receive perioperative patients with psychiatric comorbidity. However, caution should be exercised to address the potential worsening of symptoms in cases of surface-morphology changing surgery, otolaryngological surgery, long-duration operations, and when ICU stay is required.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest

None.

Acknowledgments

The authors are grateful to Dr. Takeshi Morimoto for his assistance with the study design and statistical analysis of this project.

References

[1] Value for Money in Health Spending; 2010, https://read.oecd-ilibrary.org/social-issues-migration-health/value-for-money-in-health-spending_9789264088818-en#page1: Last accessed Feb. 21. 2019: OECD Health Policy.
[2] Saravay SM, Lavin M. Psychiatric comorbidity and length of stay in the general hospital: a critical review of outcome studies. Psychosomatics 1994;35(3):233–52, http://dx.doi.org/10.1016/S0033-3182(94)71772-2.
[3] Koopmans GT, Donker MC, Rutten FH. Length of stay and health services use of medical inpatients with comorbid noncognitive mental disorders: a review of the literature. Gen Hosp Psychiatry 2005;27(1):44–56, http://dx.doi.org/10.1016/j.genhosppsych.2004.09.008.
[4] Maeda T, Babazono A, Nishi T, Tamaki K. Influence of psychiatric disorders on surgical outcomes and care resource use in Japan. Gen Hosp Psychiatry 2014;36(5):523–7, http://dx.doi.org/10.1016/j.genhosppsych.2014.05.014.
[5] Cooke BK, Magas LT, Virgo KS, Feinberg B, Adityanjee A, Johnson FE. Appendectomy for appendicitis in patients with schizophrenia. Am J Surg 2007;193(1):41–8, http://dx.doi.org/10.1016/j.amjsurg.2006.06.034.
[6] Mental Health Atlas. World Health Organization; 2005, : Last accessed Feb. 21. 2019 https://www.who.int/mental_health/evidence/mhatlas05/en/.
[7] Syuichiro Fujiwara. Sougoubyouinseishinkasaisei no syohou ha kanouka? Seishinkeishi (Psychiatria et Neurologia Japonica) 2008;110(11):1082–9.
[8] Patient survey. Ministry of Health, Labour and Welfare; 2014, : Last accessed Feb. 21. 2019 https://www.mhlw.go.jp/english/database/db-hss/ps.html.
[9] Rekhi G, Khyne TT, Lee J. Estimating 10-year cardiovascular disease risk in Asian patients with schizophrenia. Gen Hosp Psychiatry 2016;43:46–50, http://dx.doi.org/10.1016/j.genhosppsych.2016.09.005.
[10] Freedland KE, Hesseler MJ, Carney RM, et al. Major depression and long-term survival of patients with heart failure. Psychosom Med 2016;78(8):896–903, http://dx.doi.org/10.1097/PSY.0000000000000346.
[11] Zhuo C, Triplett PT. Association of schizophrenia with risk of breast cancer incidence: a meta-analysis. JAMA Psychiatry 2018;75(4):363–9, http://dx.doi.org/10.1001/jamapsychiatry.2017.4748.
[12] Zhou C, Tao R, Jiang R, Lin X, Shao M. Cancer mortality in patient with schizophrenia: systematic review and meta-analysis. Br J Psychiatry 2017;211(1):7–13, http://dx.doi.org/10.1192/bjp.bp.116.195776.
[13] Massetti GM, Thomas CC, King J, Ragan K, Buchanan Lunsford N. Mental health problems and cancer risk factors among young adults. Am J Prev Med 2017;53(3S1):S30–9, http://dx.doi.org/10.1016/j.amepre.2017.04.023.
[14] Currier MB, Nemeroff CB. Depression as a risk factor for cancer: from pathophysiological advances to treatment implications. Annu Rev Med 2014;65:203–21, http://dx.doi.org/10.1146/annurev-med-061212-171507.
[15] Tsuji Y, Ohue H, Ikuta H, Kinoshita O, Shibagaki F. Surgical treatment of patients with psychiatric disorders: a review of 21 patients. Surg Today 1997;27:387–91.
[16] World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. JAMA 2013;310(20):2191–4, http://dx.doi.org/10.1001/jama.2013.281053.
[17] Charlson ME, Pompei P, Ales KL, et al. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis 1987;40:373–83.
[18] Brandberg Y, Kock E, Osakar K, af Trampe E, Seregard S. Psychological reactions and quality of life in patients with posterior uveal melanoma treated with ruthenium plaque therapy or enucleation: a one year follow-up study. Eye (Lond) 2000;(Pt6):839–46, http://dx.doi.org/10.1038/eye.2000.233.
[19] Fang SY, Shu BC, Chang YJ. The effect of breast reconstruction surgery on body image among women after mastectomy: a meta-analysis. Breast Cancer Res Treat 2013;137(1):13–21, http://dx.doi.org/10.1007/s10549-012-2349-1.
[20] Hueso-Montoro C, Bonill-de-Las-Nieves C, Celdrán-Mañas M, Hernández-Zambrano SM, Amezcua-Martínez M, Morales-Asencio JM. Experiences and coping with the altered body image in digestive stoma patients. Rev Lat Am Enfermagem 2016;24:e2840, http://dx.doi.org/10.1590/1518-8345.1276.2840.
[21] Hardy KL, Davis KE, Constantine RS, Chen M, Hein R, Jewell JL, et al. The impact of operative time on complications after plastic surgery: a multivariate regression analysis of 1753 cases. Aesthet Surg J 2014;34:614–22, http://dx.doi.org/10.1177/1090820X14528503.
[22] Zubin J, Spring B. Vulnerability; a new view of Schizophrenia. J Abnorm Psychol 1977;86:103–26, http://dx.doi.org/10.1037/0021-843X.86.2.103.
[23] Copeland LA, Zeber JE, Pugh MJ, Mortensen EM, Restrepo MI, Lawrence VA. Postoperative complications in the seriously mentally ill: a systematic review of the literature. Ann Surg 2008;248(1):31–8, http://dx.doi.org/10.1097/SLA.0b013e3181724f25.