Rev Bras Cir Cardiovasc 2014;29(3):308-15

Chronic stress and coping among cardiac surgeons: a single center study

Estresse crônico e enfrentamento entre os cirurgiões cardíacos: um estudo de centro único

Kyriakos Spiliopoulos[1], MD; Laura Gansera[2]; Hans Christian Weiland[2], MD; Tibor Schuster[3], MD; Walter Eichinger[2], MD, PhD; Brigitte Gansera[2], MD, PhD

DOI: 10.5935/1678-9741.20140083

RBCCV 44205-1555

Abstract

Introduction: **Cardiac surgeons stress may impair their quality of life and professional practice.**

Objective: **To assess perceived chronic stress and coping strategies among cardiac surgeons.**

Methods: **Twenty-two cardiac surgeons answered two self -assessment questionnaires, the Trier Inventory for Chronic Stress and the German SGV for coping strategies.**

Results: **Participants mean age was 40±14.1 years and 13 were male; eight were senior physicians and 14 were residents. Mean values for the Trier Inventory for Chronic Stress were within the normal range. Unexperienced physicians had significantly higher levels of dissatisfaction at work, lack of social recognition, and isolation (*P*<0.05). Coping strategies such as play down, distraction from situation, and substitutional satisfaction were also significantly more frequent among unexperienced surgeons. "Negative" stress-coping strategies occur more often in experienced than in younger colleagues (*P*=0.029). Female surgeons felt more exposed to overwork (*P*=0.04) and social stress (*P*=0.03).**

Conclusion: **Cardiac surgeons show a tendency to high perception of chronic stress phenomena and vulnerability for negative coping strategies.**

Descriptors: **Stress, Psychological. Cardiac Surgical Procedures. Case Studies.**

Resumo

Introdução: **O estresse em cirurgiões cardíacos pode prejudicar sua qualidade de vida e prática profissional.**

Objetivo: **Avaliar a percepção de estresse crônico e as estratégias de enfrentamento entre os cirurgiões cardíacos.**

Métodos: **Vinte e dois cirurgiões cardíacos responderam a dois questionários de autoavaliação, o Inventário de Trier sobre estresse crônico (Trier Inventory for Chronic Stress - TICS) e o German SVF sobre estratégias de enfrentamento do estresse.**

Resultados: **Os participantes tinham idade média de 40±14,1 anos; sendo 13 do sexo masculino. Oito participantes eram mé-**

[1]Department of Cardiovascular Surgery, Clinic Bogenhausen, Munich, Germany Department of Thoracic and Cardiovascular Surgery, University of Thessaly, Larissa, Greece (Lecturer).
[2]Department of Cardiovascular Surgery, Clinic Bogenhausen, Munich, Germany.
[3]Institute for Medical Statistics and Epidemiology, Technical University Munich, Germany.

This study was carried out at Department of Cardiovascular Surgery, Clinic Bogenhausen, Munich, Germany.

No financial support.

Correspondence address:
Kyriakos Spiliopoulos
Department of Cardiovascular Surgery,
Klinikum Muenchen-Bogenhausen, Englschalkinger Str. 77, D-81925 Munich, Germany.
E-mail: spiliopoulos@med.uth.gr

Article received on November 12th, 2013
Article accepted on June 22nd, 2014

Abbreviations, acronyms & symbols	
TICS	Trier inventory for chronic stress

dicos seniores e 14 eram residentes. Os valores médios do Inventário de Trier sobre Estresse Crônico estavam dentro da faixa normal. Médicos inexperientes tinham níveis significativamente mais elevados de insatisfação no trabalho, isolamento e falta de reconhecimento social (*P*<0,05). As estratégias de enfrentamento, como minimização, distração da situação e satisfação substituta, também foram significativamente mais frequentes entre os cirurgiões inexperientes. Estratégias "negativas" de enfrentamento do estresse ocorrem mais frequentemente em cirurgiões experientes do que em colegas mais jovens (*P*=0,029). As cirurgiãs sentem-se mais expostas ao excesso de trabalho (*P*=0,04) e estresse social (*P*=0,03).

Conclusão: **Cirurgiões cardíacos mostram tendência para alta percepção de fenômenos de estresse crônico e vulnerabilidade para estratégias de enfrentamento negativas.**

Descritores: **Estresse Psicológico. Procedimentos Cirúrgicos Cardíacos. Estudos de Casos.**

INTRODUCTION

In recent years the constantly changing working conditions in hospitals, mainly determined by rising numbers of patient numbers and shorter stays[1], have increased psychosocial stress and its consequences among hospital doctors[2]. In particular, surgeons appear to suffer high levels of stress, as described by many authors[3-5]. This is specially true for a post in cardiac surgery usually characterized by overtime, sleep deprivation, delays in payment, limited control and loss of autonomy, feelings of isolation, and lack of time for research activities, all of which may place physicians at particular risk of having to cope with an imbalance between their personal and professional life. Serious manifestations of chronic stress among surgeons include depression, anxiety, divorce or broken relationships, mistakes at work and thoughts about giving up their profession as well as symptoms of burnout, such as emotional exhaustion, depersonalization, and low personal accomplishment[6].

In the last 20 years, the inconsistent and fragile coherence between acute stress and measurable variables of health and illness paved the way for the development of research i on the topic of chronic occupational stress. Nevertheless, as of 2003 there were no methods in the German language to evaluate chronic stress comprehensively and validly. The Trier Inventory for Chronic Stress (TICS) represents a standardized instrument to measure chronic stress. It consists of a self-assessment questionnaire validating different kinds of chronic stress, and it measures primarily experiences of specific sources of work load[7]. On the other hand, the German multidimensional stress-coping inventory (SVF) measures the trait aspects of coping with everyday stress[8,9]. A detailed description of both assessment tools is given in the method-section.

Given the fact, that there is a lack of evidence-based data analyzing stress-experience and coping strategies specifically in the cardiac surgeon population, the present series set out to assess, for the first time, stress-factors, satisfaction at work, and emotional burden in this particular group of physicians. The aims of this single-center pilot-study were to compare chronic stress experience and coping strategies among cardiac surgeons with those of an age-matched representative sample and to analyze the impact of different factors such as gender and position (head of department, senior physician, resident) on stress experience and coping.

METHODS

Study Sample

The study population consisted of 22 cardiac surgeons, from a single center, with different positions and experience. Due to the small size of the group, the survey should be treated as a pilot study. All participants signed informed consent forms and, in accordance with German law, approval from a medical ethics review board was not required. All surgeons worked on a regular basis, 5 days and 40 hours per week, excluding "on call" services.

Measures

Psychosocial stress at work was assessed by two anonymous well-established and standardized written questionnaires used to measure perceived chronic stress, TICS and coping strategies (German SVF).

The TICS standardized questionnaire consists of 57 Items and 10 scales for a differentiated diagnosis of various facets of perceived chronic stress. Participants had to report the frequency of specific stress situations experienced within the last 3 months.

The 10 scales include: overwork, social trashing, pressure to succeed, lack of work satisfaction, excessive demands at work, lack of social recognition, social stress, social isolation, chronic worrying, and total value of chronicle stress.

Overwork, social stress, and pressure to succeed are related to stress resulting from high demand at work whereas lack of work satisfaction, excessive demand at work, lack of

social recognition, social trashing, and social isolation detect stress-phenomena arising from a lack of satisfaction of one's needs. Furthermore, TICS contains a scale for chronic worrying as well as a 12-Item-screening-scale, providing the full extent of perceived stress. The assessment achieves good profile reliability[7] and all scales fit the ordinal Rasch-model.

Validated instruments were used to make measurements in accordance with the demand-control and effort-reward imbalance models. Internal consistency ranged between 0.84 and 0.91 (Cronbach's Alpha) and split-half reliability between 0.78 and 0.89 (m: 0.83, Rasch). Reliability of all scales was sufficiently high (Cronbach's Alpha between 0.84 and 0.91; m: 0.87). For each item, the frequency of experience in the last 3 months had to be indicated on a 5-point rating scale, ranging from "never" to "very often".

The German SVF questionnaire was used to assess coping. It comprises 19 scales for different types of reactions to an unspecified range of situations that impair, adversely affect, irritate or disturb the emotional equilibrium or balance of the subject. Each scale consists of six items that are answered using a 5-point scale, according to the probability of that reaction. The coping mechanism scales of the SVF are depicted in Table 1. Items are rated on a scale of 1 to 5: never, hardly, potentially, probably, most likely. Total negative and positive coping strategies are measured after summarizing the values of scales 1-10 or 13 to 18, according to the test-developers` instructions. The reliability of all scales was sufficiently high (median Cronbach's Alpha was 0.8 for test-retest reliability by the authors). Validity has been tested by intercorrelations between subscales, correlations with a variety of questionnaires and specification of different stressful situations, confirming the relationship between coping and personality described by Watson & Hubbard[10].

Statistical methods

Statistical analyses were performed using 95% confidence intervals and the Mann-Whitney-U Test. The level of significance was set at $P<0.05$. Due to the limited sample size and in order to avoid being overconservative in our evaluation, Bonferroni correction of *P*-values was not performed. However, all statistical comparisons were thoroughly reported enabling an informal correction of *P*-values by the reader. With this approach, we followed a practical solution as proposed by Saville[11] to consider multiple testing.

In addition the results were compared to an age-matched representative sample, using available normal values (T-scale; mean=50 and SD=10) for the SVF and TICS in German volunteers with regard to gender for the age range of 20 to 64 years.

RESULTS

Twenty two professionals answered the questionnaires, corresponding to the total sample size.

Among the participants, the mean age was 40±14.1 years, ranging from 26 to 60 years; 59% (n=13) were male and 41% (n=9), female. Concerning position and professional qualification, 36.4% (n=8) were specialists (6 males), including the head of the department, and 63.6% (n=14) were residents (7 males).

Figure 1 shows that the surveyed cardiac surgeons, when compared to the age-matched population, presented mean

Table 1. Coping mechanism scales of the SVF.

Coping mechanism	Response
Play down	I tell myself, "It is not that bad"
Compare with others	I tell myself, "Others couldn't take it the way I do"
Guilt defence	I tell myself, "I am not to blame"
Distraction from situation	I try to concentrate on something else
Substitutional satisfaction	I treat myself by buying something nice
Ego boost	I think about my success in other situations
Situational control	I make a plan how to solve the problem
Reaction control	I try to keep my behaviour under control
Positive self-instruction	I tell myself not to give up
Need for social support	I try to talk to someone about the problem
Avoidance	I start to avoid this kind of situation
Flight tendency	I only want to get out of this
Social retreat	I prefer to be by myself
Rumination	I think about it over and over
Resignation	I tend to give up
Self-pity	I ask myself "why me?"
Self –accusation	I tell myself, "After all it's my fault"
Aggression	I get enraged
Self-medication/ use of drugs	I'll have a few beers, glass of wine…

values and 95% confidence intervals for TICS and SVF mostly within the normal range. The only marginal outlier (but still with a mean value within the normal range) refers to the item measuring lack of social recognition.

With regard to the level of professional experience, the analysis revealed that inexperienced surgeons showed significantly higher levels ($P< 0.05$) of dissatisfaction at work and lack of social recognition and isolation (TICS). Coping strategies (SVF), such as play down, distraction from situation, and substitutional satisfaction were also significantly more frequent in this group (Figure 2). On the other hand, their experienced counterparts presented higher, but non-significant, values for pressure to succeed, overwork, self accusation, and social stress as well as for coping strategies such as flight tendency, guilt defence, social retreat, self-pity and self-accusation, ego boost, resignation and aggression (Figure 2). In terms of coping, "negative" strategies were more present in experienced than in younger colleagues (P=0.029); (Figure 2).

Concerning the impact of gender, female surgeons felt significantly more exposed to overwork (P=0.04) and social stress (P=0.03); (Figure 3). Interestingly, although all of our female surgeons (2 senior physicians and 7 residents) felt more exposed to overwork, isolated gender-specific comparisons among residents showed significantly higher values for male residents regarding overwork (P=0.002), social stress (P=0.001) and play-down strategies (P=0.04).

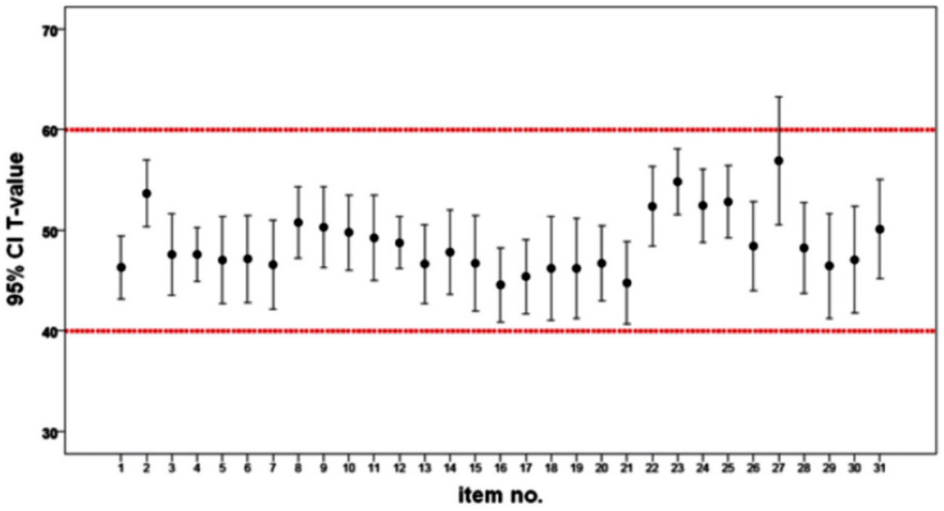

Fig. 1 - Mean values and 95% confidence intervals for TICS and SVF (all surgeons).

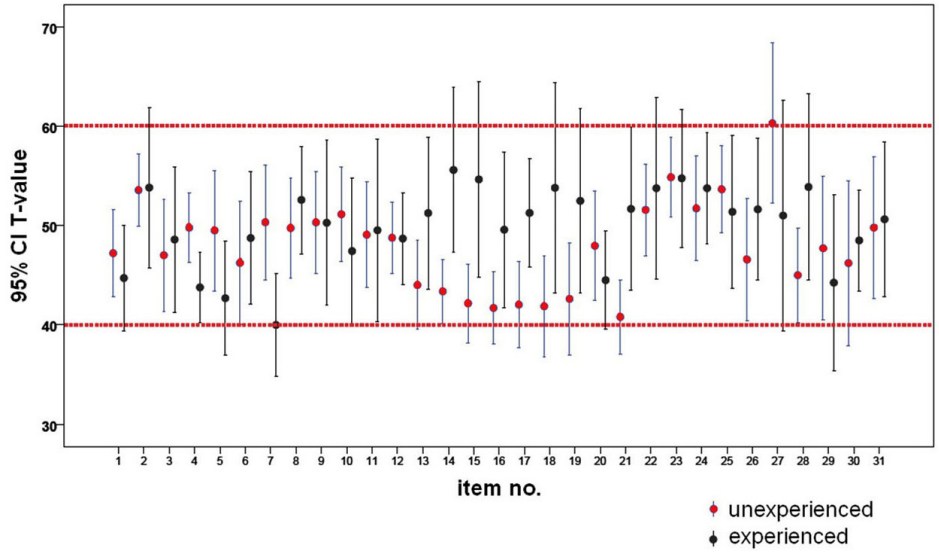

Fig. 2 - Mean values and 95% confidence intervals for TICS and SVF (senior physicians versus residents).

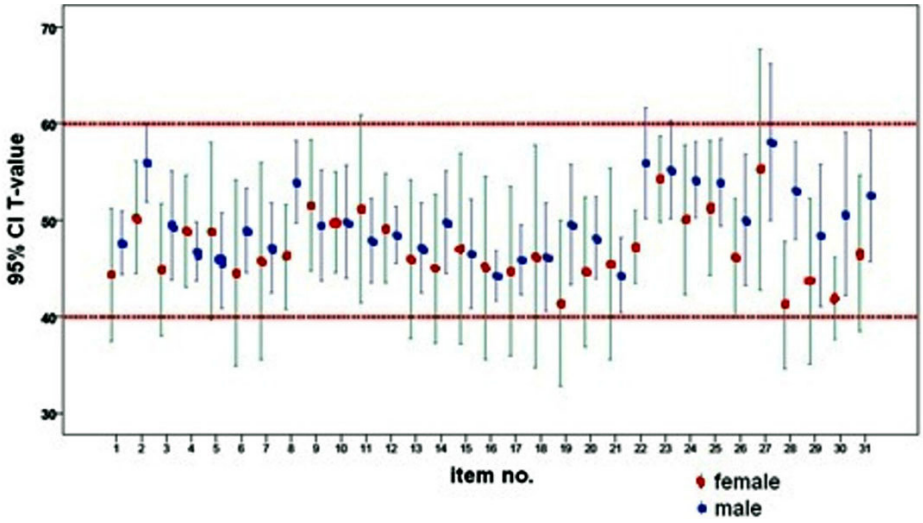

Fig. 3 - Mean values and 95% confidence intervals for TICS and SVF (females versus males).

Item (Fig. 1 to Fig. 3)					
1	Compare with others	12	Flight tendency	23	Social trashing
2	Play down	13	Social retreat	24	Pressure to succed
3	Guilt defense	14	Rumination	25	Lack of work satisfaction
4	Distraction from situation	15	Resignation	26	Excessive demands at work
5	Substitutional satisfaction	16	Self-pity	27	Lack of social recognition
6	Ego boost	17	Self-accusation	28	Social stress
7	Situational control	18	Aggression	29	Social isolation
8	Reaction control	19	Self- medication/ use of drugs	30	Chronic worrying
9	Positive self- instruction	20	Total of positive coping strategies	31	Total value for chronicle stress
10	Need for social support	21	Total of negative positive coping strategies		
11	Avoidance	22	Overwork		

DISCUSSION

Although several studies have dealt with coping strategies in the context of health, their main focus has been surgical patients' reactions and, specifically for cardiac surgery, patients undergoing heart transplantation[12,13]. There are few reports analyzing psychological implications, especially in healthcare professionals of surgical specialties. In recent years, occupational stress among medical doctors has become the subject of extensive investigation since it is a determinant factor of physical and mental disorders that force these professionals to take leaves of absence from their work.

To our knowledge, the present study represents the first published attempt to assess directly perceived chronic stress and coping mechanisms among cardiac surgeons, and the second one, beside a series performed by Mikalauskas et al.[14] on the incidence of burnout syndrome, to focus on this specific surgical specialty.

Cardiac surgery, characterized by special attributes of surgical practice along with the rigors and length of training for this profession, seems to attract individuals of a particular character and determination as indicated by the relatively high mean age of 40 years of our study population, despite 64% being residents. In addition, the specialty still poses barriers to women, which was confirmed by the lower percentage of women in our series (41%) the finding with only two female out of eight specialists.

Cardiac surgeons work hard, deal regularly with matters of life and death, and make substantial personal sacrifices in

favor of their professional practice, making them prone to burnout syndrome.

Studies including either surgeons from several surgical subspecialties and/or graduates report that the incidence of burnout syndrome ranges from 30% to 38%[15-19], while Mikaulskas et al.[14] stated that in their cardiac surgical collective more than half (62%) of the respondents met the criteria for being burned out, with 19.3%, 25.9%, and 42.3% experiencing high emotional exhaustion, high depersonalization, and low personal accomplishment at work, respectively. Similary, in a large study published by Campbell et al.[16] surveying 582 surgeons from the University of Michigan, 32% showed high levels of emotional exhaustion, 13% increased levels of depersonalization, and 4% presented evidence of a low sense of personal accomplishment, while an Australian study of 126 surgeons, carried out by Benson et al.[20], indicated that burnout levels were significantly higher for surgeons than for the normal population, with 67.6% of the sample approaching high burnout levels. All of these findings confirm that a substantial number of colleagues in surgical specialties are struggling with a high level of personal and professional distress and that among cardiac surgeons appear to be even more susceptible to burnout.

Further analysis of the aforementioned studies[16,20] showed that younger surgeons were more vulnerable to developing burnout syndrome than their older counterparts. These data, although gathered from general surgeons, concur with ours, in which younger colleagues felt exposed to chronic stress phenomena more frequently, in particular to dissatisfaction at work, lack of social recognition, and social isolation. Younger surgeons reported significantly higher burnout levels, regardless of their career status.

Concerning the role of various factors in predicting occupational chronic stress and subsequent burnout syndrome, it is noteworthy to mention the main findings of a prospective study performed by the Buddeberg-Fischer et al.[21] in a cohort of Swiss medical school graduates, who where followed throughout their professional career, beginning in 2001. In their fourth and eighth years after graduation, 443 physicians reported on their workplace conditions, the experienced effort-reward imbalance, the professional and emotional support received as well as their personal characteristics. The mean chronic stress (TICS-SCSS) of the study-sample was significantly higher (P<0.001) compared to an age-matched representative population. In the prediction of chronic stress, workplace effort-reward imbalance as well as over-commitment turned out to be the most important risk factors, while stress protective factors were high satisfaction with career support, sense of coherence, and occupational self-efficacy.

However, in the prediction of chronic stress, gender had no significant moderator effect, a finding which is in contrast to our results of gender specific differences in the historically male- dominated discipline of cardiac surgery. In particular, male residents showed significant higher values concerning overwork (P=0.002), social stress (P=0.001) and play- down strategies (P=0.04) than their young female colleagues, whereas all female surgeons (senior physicians and residents) felt more exposed to overwork (P=0.04) and social stress (P=0.03).

These findings suggest that experienced female surgeons suffer from the incompatibilities between their professional career and family, children, household etc., whereas experienced male surgeons are more frequently stressed by isolated job-related factors, such as pressure to succeed and overwork. The only other available study in cardiac surgeons constructed by Mikalauskas et al.[14] did not include female surgeons, thus all information about gender differences is derived from general series in populations of all specialties. A prospective study from Johns Hopkins University including more than 1300 male physicians, documented that the prevalence of clinically significant depression was 12.8%[22], while in the analysis of 4500 female physicians in the Women Physicians' Health-study, the prevalence of depression was 19.4%[23]. Regarding coping strategies among cardiac surgeons, there is a substantial lack of evidence in the literature.

Despite suggestions that, in general, negative stress-coping responses decrease with experience[24,25], most of the studies assessed only intraoperative stress and not the entire chronic occupational stress of surgeons. The negative correlation of experience and negative coping-strategies was documented among others surgeons in an investigation of "burnout" among American surgeons[16]. The study showed younger surgeons to be more susceptible to burnout and negative stress coping-mechanisms. The results of our study compare favorably to this report in terms of dissatisfaction at work, lack of social recognition and isolation (TICS), but are contrary in terms of coping strategies, where experienced surgeons showed higher values for negative coping compared to the unexperienced ones. These discrepancies in the results may be caused by the relatively small sample size of our series. To sum up, we did not have a solid explanation for this observation and this finding should be considered as tentative.

Finally the findings of our study imply that stress management strategies are particularly important in the prevention of professional burnout in cardiac surgeons. This will further help them to improve their technical skills, decision-making time and trust with subsequent improvement in the quality of the provided health care. Interventions aiming at reducing psychosocial stress at work should consist of both an organizational and a health policy level approach.

Limitations of the study

The small number of surgeons, involved in the investigation might be regarded as a substantial limitation. Nevertheless, explanatory power of both questionnaires is sufficiently proven for each item or scale in terms of individual deviation from the normal range.

A second caveat concerns the generalizability of our results, as health care systems differ across countries.

CONCLUSION

Although most values were within the normal range, cardiac surgeons tend to a high level of perceived stress phenomena and vulnerability for negative coping strategies. In particular, dissatisfaction at work, social isolation, and a lack of social recognition were more frequent among residents. On the other hand, senior physicians showed higher values for pressure to succeed and negative coping strategies, such as resignation and aggression. It is a matter of concern that especially young cardiac surgeons report feeling stressed early in their professional career. Actions have to be taken in order to reduce stress levels, mainly through the re-establishment of reciprocity between perceived effort invested and rewards received, in the form of career opportunities and acceptance of personal capacities including emotional support.

Authors' roles & responsibilities	
KS	Main author, drafting of the paper
LG	Data collection, drafting of the paper
HCW	Data collection, drafting of the paper
TS	Data collection, statistical analysis
WE	Co-author, drafting of the paper, data collection
BG	Senior author

REFERENCES

1. Zahlen, Daten, Fakten 2007. In: Deutsche Krankenhausgesellschaft Geschäftsbericht 2007. Berlin: DKB; 2008.

2. von dem Knesebeck O, Klein J, Grosse Frie K, Blum K, Siegrist J. Psychosocial stress among hospital doctors in surgical fields: results of a nationwide survey in Germany. Dtsch Arztebl Int. 2010;107(14):248-53.

3. Dyrbye LN, Shanafelt TD. Protecting and promoting the well-being of surgeons. In: Timbros J, Timbros-Kemper TCM, eds. Basics of Surgery. Maarssen: Elsevier Gezondheidzorg; 2007. p.177-84.

4. Shanafelt T. A career in surgical oncology: finding meaning, balance, and personal satisfaction. Ann Surg Oncol. 2008;15(2):400-6.

5. Balch CM, Freischlag JA, Shanafelt TD. Stress and burnout among surgeons: understanding and managing the syndrome and avoiding the adverse consequences. Arch Surg. 2009;144(4):371-6.

6. Klein J, Grosse Frie K, Blum K, von dem Knesebeck O. Psychosocial stress at work and perceived quality of care among clinicians in surgery. BMC Health Serv Res. 2011;11:109.

7. Schulz P, Schlotz W, Becker P. Trierer Inventar zur Erfassung von chronischem Streß (TICS): Skalenkonstruktion, teststatistische Überprüfung und Validierung der Skala Arbeitsüberlastung. Diagnostica. 1999;45(1):8-19.

8. Janke W, Erdmann G, Kallus W. Der Stressverarbeitungs-Fragebogen (The coping questionnaire).Verlag für Psychologie; 1985.

9. Ising M,Weyers P,Janke W, Erdmann G. Untersuchung zu den Gütekriterien des SVF78 von Janke und Erdmann, eine Kurzform des Stressverarbeitungfragebogens SVF 120. Zeitschrift für differentielle und diagnostische Psychologie. 2001;4:279-90.

10. Watson D, Hubbard B. Adaptional style and dispositional structure: coping in the context of the five-factor model. J Pers. 1996;64:737-74.

11. Saville DJ. Multiple comparison procedures: the practical solution. The American Statistician. 1990;44:174-80.

12. Pfeifer PM, Ruschel PP, Bordignon S. Coping strategies after heart transplantation: psychological implications. Rev Bras Cir Cardiovasc. 2013;28(1):61-8.

13. Allman E, Berry D, Nasir L. Depression and coping in heart failure patients: a review of the literature. J Cardiovasc Nurs. 2009;24(2):106-17.

14. Mikalauskas A, Širvinskas E, Marchertienė I, Macas A, Samalavičius R, Kinduris Š, et al. Burnout among Lithuanian cardiac surgeons and cardiac anesthesiologists. Medicina (Kaunas). 2012;48(9):478-84.

15. Bertges Yost W, Eshelman A, Raoufi M, Abouljoud MS. A national study of burnout among American transplant surgeons. Transplant Proc. 2005;37(2):1399-401.

16. Campbell DA Jr, Sonnad SS, Eckhauser FE, Campbell KK, Greenfield LJ. Burnout among American surgeons. Surgery. 2001;130(4):696-702.

17. Harms BA, Heise CP, Gould JC, Starling JR. A 25-year single institution analysis of health, practice, and fate of general surgeons. Ann Surg. 2005;242(4):526-9.

18. Kuerer HM, Eberlein TJ, Pollock RE, Huschka M, Baile WF, Morrow M, et al. Career satisfaction, practice patterns and burnout among surgical oncologists: report on the quality of life of members of the Society of Surgical Oncology. Ann Surg Oncol. 2007;14(11):3043-53.

19. Sharma A, Sharp DM, Walker LG, Monson JR. Stress and burnout in colorectal and vascular surgical consultants working in the UK National Health Service. Psychooncology. 2008;17(6):570-6.

20. Benson S, Truskett PG, Findlay B. The relationship between burnout and emotional intelligence. Australian surgeons and surgical trainees. ANZ J Surg. 2007;77(suppl 1): A79.

21. Buddeberg-Fischer B, Klaghofer R, Abel T, Buddeberg C. Junior physicians' workplace experiences in clinical fields in German-speaking Switzerland. Swiss Med Wkly. 2005;135(1-2):19-26.

22. Ford DE, Mead LA, Chang PP, Cooper-Patrick L, Wang NY, Klag MJ. Depression is a risk factor for coronary artery disease in men: the precursors study. Arch Intern Med. 1998;158(13):1422-6.

23. Frank E, McMurray JE, Linzer M, Elon L. Career satisfaction of US women physicians: results from the Women Physicians' Health Study. Society of General Internal Medicine Career Satisfaction Study Group. Arch Intern Med. 1999;159(13):1417-26.

24. Kikuchi K, Okuyama K, Yamamoto A, Hara T, Hara T. Intraoperative stress for surgeons and assistants. J Ophthalmic Nurs Technol. 1995;14(2):68-70, 72-3.

25. Yamamoto A, Hara T, Kikuchi K, Hara T, Fujiwara T. Intraoperative stress experienced by surgeons and assistants. Ophthalmic Surg Lasers. 1999;30(1):27-30.