



# The correlation between patient safety culture and regional anesthesia development

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## Abstract

*Background and purpose:* Through the development of security systems, improvement of knowledge and skills, and cooperation with other professions anesthesiologists have become leaders in improving patient safety and creators of a positive culture of patient safety among health professionals in the developing countries. Taking the significant progress made in regional anesthesia in Croatia as an indicator of the aforementioned role that anesthesiologists play within the health care system of transitional societies such as Croatia, research was carried out with the purpose of detecting differences in patient safety culture among anesthesiology, surgical and non-surgical staff in a sample of Croatian hospitals.

*Material and methods:* The research covered 560 health professionals in three general hospitals in Croatia who anonymously and voluntarily filled in the Croatian version of the Hospital Survey on Patient Safety Culture (HSOPSC). One-way analysis of variance and multiple post hoc test according to Bonferroni were carried out in order to test statistical differences in 12 dimensions of patient safety culture between surgical, non-surgical and anesthesiology staff.

*Results:* Statistically significant differences between the three groups of staff were found in 9 out of 12 HSOPSC dimensions, which was distributed to differences between anesthesiology and non-surgical staff in 7 dimensions, anesthesiology and surgical staff in 2 dimensions, and surgical versus non-surgical staff in 3 dimensions.

*Conclusions:* Our research proved the hypothesis that anesthesiologists are the profession that is the most aware of and devoted to patient safety problems, spreading their positive influence through patient safety culture to all anesthesiology staff as well as to those with whom they predominantly collaborate.

## INTRODUCTION

Patient safety is a relatively new concept in the health care system, which is related to the prevention of errors and adverse events in medicine and to the activities toward building a culture of safety in order to protect patients from adverse events in the process of diagnosis and treatment (1). During the past decade, patient safety has been recognized as a top priority in the field of health care quality, not only in developed countries, but also in the growing number of developing countries (2).

From the very beginning anesthesiologists have had a leading role in developing the concept of patient safety, and as early as in 1984 the *American Society of Anesthesiologists (ASA)*, faced with the problem of high perioperative mortality rate, founded the first foundation for patient safety (Anesthesia Patient Safety Foundation). From that event to the mobilization of other specialists at the first multidisciplinary conference on patient safety organized by the National Patient Safety Foundation of the American Medical Association (AMA) (1st Annenberg Conference on Patient Safety, 1996) more than 10 years passed (3). From that time to now the efforts of anesthesiologists in patient safety improvement have led to a drop in mortality from 1:5000 to 1:200 000 (4, 5). The strongest impetus for studying and improving patient safety was given by the Institute of Medicine in 1999, when the report "To err is human" was published, in which it was estimated that in the United States between 44,000 to 98,000 patients die due to medical errors every year (6). The report prompted the introduction of a number of measures with the purpose of improving patient safety, but it did not immediately produce the desired results. Analyzing the effect of individual measures on improving patient safety, Leape et al. concluded that the progress in the field of patient safety depends on the changes of the existing patient safety culture (7). Patient safety culture is defined as a set of individual and group values, attitudes, skills, strategies and methods of organization and behavior with the purpose of providing the safest possible healthcare (1). The assessment and building of patient safety culture is an important component of risk management in providing healthcare services, and the concern for patient safety is shared by all interested parties (4, 5). With the purpose of assessing the state of patient safety culture in the hospital setting several tools have been developed and the most famous and widely used one is the Hospital Survey on Patient Safety Culture (HSOPSC), developed by the Agency for Healthcare Research and Quality (AHRQ) in 2004 (8, 9). Croatian version of the HSOPSC is used in our research with the purpose of detecting the differences in patient safety culture among anesthesiology, surgical and non-surgical staff in a sample of three Croatian hospitals.

Our hypothesis is that anesthesiologists in Croatia, like their colleagues in developed countries, share the strongest sense of medical system imperfection and the need for continuous improvement compared to all other specialties. In their activities anesthesiologists in Croatia follow all safety principles contained in two key documents at the European level, which relates to the Declaration of Vienna from 2009 that is focused on patient safety in the intensive care medicine and the Helsinki Declaration on Patient Safety from 2010 (10, 11). This is indicated by a wide development of all the fields in which anesthesiologists work, such as intensive end emergency medicine, pain medicine and especially regional anesthesia which has developed rapidly in the past decade in Croatia, mostly due to activities of the Croatian Society of Regional Anesthesia and Analgesia constituted in 2003

within the Croatian Medical Association. If the hypothesis is right, we expect to find significant differences in patient safety culture dimensions measured by HSOPSC survey between anesthesiology staff in comparison to surgical and non-surgical staff.

## MATERIALS AND METHODS

In order to investigate patient safety culture we used HSOPSC that has previously been translated from English into Croatian, and back from Croatian into English by a translator who was blind for the original version (12). The survey consists of 42 questions designed to measure 12 dimensions of patient safety culture, seven of which are on the unit level (*Communication Openness, Supervisor/Manager Expectations and Actions Promoting Patient Safety, Teamwork within Hospital Units, Staffing, Feedback and Communication about Error, Nonpunitive Response to Error and Organizational Learning-Continuous Improvement*), three on the hospital level (*Hospital Management Support for Patient Safety, Teamwork across Hospital Units and Hospital Handoffs and Transitions*), and two of them being dimensions of outcome (*Overall Perceptions of Patient Safety, Frequency of Events Reported*). The results of the 12 dimensions of patient safety culture are expressed as a percentage of positive, negative and neutral responses on the Likert scale. Responses "I agree" and "I strongly agree" are considered as positive, "neither" as neutral, while "I disagree" and "I strongly disagree" are considered as negative responses. In questions regarding frequency of reporting events, responses such as "most of the time" and "always" are considered as positive, "sometimes" as neutral, while "rarely" or "never" are considered as negative responses. Each dimension consists of three to four questions, and their sum total represents the total value for each dimension (9).

The research included health workers in three general hospitals in Croatia after ethical approvals had been obtained from the hospitals' ethics committees. It was conducted in the period between October 2010 and April 2011. The employees were informed about the purpose of completing the survey, and they participated voluntarily and anonymously. The number of 576 completed surveys was submitted, which accounted for 37 % of health workers in the three hospitals in question. Surveys in which an employee's department was not indicated were excluded from statistical analysis, so we analyzed 560 correctly completed surveys. In order to compare the three groups of staff, we will use only positive values of the responses for each of the 12 dimensions. The groups compared are anesthesiology staff consisting of those who work in Anesthesiology, Intensive care unit, and Emergency department; surgical staff consisting of Surgery and Obstetrics staff and non-surgical staff consisting of staff working in Medicine, Pediatrics, Psychiatry, Rehabilitation, Pharmacy and Radiology. The collected responses were processed electronically using the AHRQ program (Microsoft Excel Data Entry and Reporting Tool), which offers basic elements of statistical sample processing (13). In further analysis the IBM SPSS Sta-

tistics program support version 19.0.0.1 was used to analyze the main positive scores of each group. One-way analysis of variance (ANOVA) and multiple post hoc test according to Bonferroni were carried out in order to test

statistical differences in 12 dimensions of patient safety culture between surgical, non-surgical and anesthesiology staff (14).

**TABLE 1**

Mean value of positive responses for the three studied groups in 12 HSOPSC dimensions.

HSOPSC dimensions	Groups	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Overall Perceptions of Patient Safety	Surgical staff	160	3,73	0,57	0,04	3,64	3,82	2,00	5,00
	Anesthesiology staff	62	3,76	0,68	0,09	3,58	3,93	2,50	5,00
	Non-surgical staff	338	3,71	0,69	0,04	3,64	3,79	1,00	5,00
	Total	560	3,72	0,65	0,03	3,67	3,78	1,00	5,00
Frequency of Events Reported	Surgical staff	153	3,24	1,32	0,11	3,03	3,45	1,00	5,00
	Anesthesiology staff	62	3,01	1,42	0,18	2,65	3,37	1,00	5,00
	Non-surgical staff	327	3,50	1,38	0,08	3,35	3,65	1,00	5,00
	Total	542	3,37	1,37	0,06	3,25	3,48	1,00	5,00
Supervisor/Manager Expectations and Actions Promoting Patient Safety	Surgical staff	159	3,53	0,72	0,06	3,42	3,64	1,75	5,00
	Anesthesiology staff	62	3,44	0,86	0,11	3,22	3,66	1,00	4,75
	Non-surgical staff	338	3,71	0,74	0,04	3,63	3,79	1,00	5,00
	Total	559	3,63	0,76	0,03	3,57	3,69	1,00	5,00
Organizational Learning – Continuous Improvement	Surgical staff	160	3,56	0,56	0,04	3,48	3,65	2,00	5,00
	Anesthesiology staff	62	3,36	0,70	0,09	3,19	3,54	1,33	4,33
	Non-surgical staff	338	3,60	0,65	0,04	3,53	3,67	1,00	5,00
	Total	560	3,56	0,63	0,03	3,51	3,62	1,00	5,00
Teamwork within Hospital Units	Surgical staff	160	3,49	0,80	0,06	3,37	3,62	1,25	5,00
	Anesthesiology staff	62	3,31	0,77	0,10	3,11	3,50	1,25	5,00
	Non-surgical staff	338	3,63	0,70	0,04	3,56	3,71	1,00	5,00
	Total	560	3,56	0,74	0,03	3,50	3,62	1,00	5,00
Communication Openness	Surgical staff	160	3,13	0,85	0,07	3,00	3,26	1,00	5,00
	Anesthesiology staff	62	3,34	0,78	0,10	3,14	3,54	1,67	5,00
	Non-surgical staff	338	3,40	0,87	0,05	3,31	3,49	1,00	5,00
	Total	560	3,31	0,86	0,04	3,24	3,39	1,00	5,00
Feedback and Communication about Error	Surgical staff	160	3,25	0,86	0,07	3,11	3,38	1,00	5,00
	Anesthesiology staff	62	3,35	0,88	0,11	3,12	3,57	1,67	5,00
	Non-surgical staff	338	3,41	0,89	0,05	3,32	3,51	1,00	5,00
	Total	560	3,36	0,88	0,04	3,29	3,43	1,00	5,00
Nonpunitive Response to Errors	Surgical staff	160	2,72	0,70	0,06	2,61	2,83	1,33	5,00
	Anesthesiology staff	62	2,66	0,84	0,11	2,44	2,87	1,00	4,67
	Non-surgical staff	338	2,94	0,78	0,04	2,86	3,03	1,00	4,67
	Total	560	2,85	0,77	0,03	2,78	2,91	1,00	5,00
Staffing	Surgical staff	160	2,95	0,61	0,05	2,86	3,05	1,25	4,25
	Anesthesiology staff	62	3,15	0,62	0,08	3,00	3,31	1,50	4,75
	Non-surgical staff	338	3,07	0,59	0,03	3,01	3,14	1,50	4,50
	Total	560	3,05	0,60	0,03	3,00	3,10	1,25	4,75
Hospital Management Support for Patient Safety	Surgical staff	159	3,37	0,76	0,06	3,25	3,49	1,33	5,00
	Anesthesiology staff	62	3,17	0,76	0,10	2,97	3,36	1,00	4,33
	Non-surgical staff	334	3,47	0,76	0,04	3,39	3,55	1,00	5,00
	Total	555	3,41	0,77	0,03	3,34	3,47	1,00	5,00
Teamwork across Hospital Units	Surgical staff	159	3,35	0,74	0,06	3,23	3,46	1,00	5,00
	Anesthesiology staff	62	2,81	0,84	0,11	2,59	3,02	1,00	4,25
	Non-surgical staff	336	3,39	0,78	0,04	3,31	3,47	1,00	5,00
	Total	557	3,31	0,79	0,03	3,25	3,38	1,00	5,00
Hospital Handoffs and Transitions	Surgical staff	159	3,58	0,64	0,05	3,48	3,68	1,75	5,00
	Anesthesiology staff	62	3,44	0,69	0,09	3,26	3,62	2,00	4,75
	Non-surgical staff	336	3,57	0,65	0,04	3,50	3,64	1,75	5,00
	Total	557	3,55	0,65	0,03	3,50	3,61	1,75	5,00

TABLE 2

Analysis of statistically significant differences (ANOVA) between three groups in 12 HSOPSC dimensions.

		Sum of Squares	df	Mean Square	F	P
Overall Perceptions of Patient Safety	Between Groups	,109	2	,055	,127	0,881
	Within Groups	239,628	557	,430		
	Total	239,737	559			
Frequency of Events Reported	Between Groups	16,239	2	8,120	4,358	0,013
	Within Groups	1004,229	539	1,863		
	Total	1020,468	541			
Supervisor/Manager Expectations and Actions Promoting Patient Safety	Between Groups	6,306	2	3,153	5,573	0,004
	Within Groups	314,547	556	,566		
	Total	320,853	558			
Organizational Learning - Continuous Improvement	Between Groups	2,997	2	1,498	3,791	0,023
	Within Groups	220,146	557	,395		
	Total	223,143	559			
Teamwork within Hospital Units	Between Groups	6,591	2	3,296	6,063	0,002
	Within Groups	302,745	557	,544		
	Total	309,336	559			
Communication Openness	Between Groups	7,955	2	3,978	5,452	0,005
	Within Groups	406,376	557	,730		
	Total	414,331	559			
Feedback and Communication about Error	Between Groups	3,069	2	1,535	1,975	0,140
	Within Groups	432,694	557	,777		
	Total	435,763	559			
Nonpunitive Response to Errors	Between Groups	8,040	2	4,020	6,838	0,001
	Within Groups	327,437	557	,588		
	Total	335,477	559			
Staffing	Between Groups	2,311	2	1,156	3,240	0,040
	Within Groups	198,655	557	,357		
	Total	200,966	559			
Hospital Management Support for Patient Safety	Between Groups	5,123	2	2,562	4,431	0,012
	Within Groups	319,113	552	,578		
	Total	324,236	554			
Teamwork across Hospital Units	Between Groups	18,077	2	9,038	15,157	<0,001
	Within Groups	330,363	554	,596		
	Total	348,440	556			
Hospital Handoffs and Transitions	Between Groups	,941	2	,470	1,115	0,329
	Within Groups	233,762	554	,422		
	Total	234,703	556			

## RESULTS

Table 1 presents the results of the statistical data processing that show the average value of positive answers in each of the 12 HSOPSC dimensions for all three groups and the sample as a whole. One-way analysis of variance (ANOVA) was used to test the existence of statistically significant differences between the three groups for each of the 12 HSOPSC dimensions (Table 2). A statistically significant difference was determined in 9 out of 12 dimensions of patient safety culture with  $p < 0.05$  in eight and  $p < 0.001$  in one dimension. In dimensions *Overall Perceptions of Patient Safety*, *Feedback and Communication about Error* and *Hospital Handoffs and Transitions* no statistically significant difference was determined, so they were excluded from further analysis.

Table 3 presents the 9 dimensions for which, using the one-way analysis of variance, the existence of a statistically significant difference was determined. The relation between all groups and, furthermore, the source of statistically significant differences from the previous table are shown.

Statistically significant difference between anesthesiology staff and non-surgical staff was determined in seven dimensions, between anesthesiology staff and surgical staff in two dimensions and between surgical staff and non-surgical staff in three dimensions. The seven HSOPSC dimensions in which significant differences between anesthesiology staff and non-surgical staff were determined are: *Teamwork within Hospital Units*, *Non-punitive Response to Error*, *Frequency of Events Reported*,

TABLE 3

Multiple post hoc test of the three groups according Bonferroni in nine HSOPSC dimensions.

Dependent Variable	(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	P	95% Confidence Interval	
						Lower Bound	Upper Bound
Frequency of Events Reported	Surgical staff	Anesthesiology staff	,2320964	,2054942	0,778	-,261393	,725586
		Non-surgical staff	-,2599788	,1336974	0,157	-,581050	,061092
	<i>Anesthesiology staff</i>	Surgical staff	-,2320964	,2054942	0,778	-,725586	,261393
		<i>Non-surgical staff</i>	-,4920752*	,1890719	0,029	-,946127	-,038023
Supervisor/Manager Expectations and Actions Promoting Patient Safety	Non-surgical staff	Surgical staff	,2599788	,1336974	0,157	-,061092	,581050
		Anesthesiology staff	,4920752*	,1890719	0,029	,038023	,946127
	<i>Surgical staff</i>	Anesthesiology staff	,0930463	,1126178	1,000	-,177377	,363469
		<i>Non-surgical staff</i>	-,1843763*	,0723313	0,033	-,358062	-,010691
Organizational Learning – Continuous Improvement	<i>Anesthesiology staff</i>	Surgical staff	-,0930463	,1126178	1,000	-,363469	,177377
		<i>Non-surgical staff</i>	-,2774225*	,1039157	0,023	-,526950	-,027895
	Non-surgical staff	Surgical staff	,1843763*	,0723313	0,033	,010691	,358062
		Anesthesiology staff	,2774225*	,1039157	0,023	,027895	,526950
Teamwork within Hospital Units	Surgical staff	Anesthesiology staff	,2016801	,0940477	0,097	-,024150	,427511
		Non-surgical staff	-,0374877	,0603287	1,000	-,182351	,107376
	<i>Anesthesiology staff</i>	Surgical staff	-,2016801	,0940477	0,097	-,427511	,024150
		<i>Non-surgical staff</i>	-,2391678*	,0868567	0,018	-,447731	-,030605
Communication Openness	Non-surgical staff	Surgical staff	,0374877	,0603287	1,000	-,107376	,182351
		Anesthesiology staff	,2391678*	,0868567	0,018	,030605	,447731
	<i>Surgical staff</i>	Anesthesiology staff	,1867776	,1102888	0,273	-,078052	,451607
		<i>Non-surgical staff</i>	-,1416328	,0707469	0,137	-,311512	,028247
Nonpunitive Response to Errors	<i>Anesthesiology staff</i>	Surgical staff	-,1867776	,1102888	0,273	-,451607	,078052
		<i>Non-surgical staff</i>	-,3284103*	,1018560	0,004	-,572990	-,083830
	Non-surgical staff	Surgical staff	,1416328	,0707469	0,137	-,028247	,311512
		<i>Anesthesiology staff</i>	,3284103*	,1018560	0,004	,083830	,572990
Staffing	<i>Surgical staff</i>	Anesthesiology staff	-,2132728	,1277783	0,287	-,520098	,093553
		Non-surgical staff	-,2698040*	,0819658	0,003	-,466623	-,072985
	Anesthesiology staff	Surgical staff	,2132728	,1277783	0,287	-,093553	,520098
		Non-surgical staff	-,0565311	,1180082	1,000	-,339896	,226834
Hospital Management Support for Patient Safety	Non-surgical staff	Surgical staff	,2698040*	,0819658	0,003	,072985	,466623
		Anesthesiology staff	,0565311	,1180082	1,000	-,226834	,339896
	<i>Surgical staff</i>	Anesthesiology staff	,0649194	,1146983	1,000	-,210498	,340337
		<i>Non-surgical staff</i>	-,2239398*	,0735754	0,007	-,400612	-,047268
Teamwork across Hospital Units	<i>Anesthesiology staff</i>	Surgical staff	-,0649194	,1146983	1,000	-,340337	,210498
		<i>Non-surgical staff</i>	-,2888592*	,1059283	0,020	-,543218	-,034501
	Non-surgical staff	Surgical staff	,2239398*	,0735754	0,007	,047268	,400612
		<i>Anesthesiology staff</i>	,2888592*	,1059283	0,020	,034501	,543218
Teamwork across Hospital Units	Surgical staff	Anesthesiology staff	-,2004032	,0893393	0,046	-,414928	,014121
		Non-surgical staff	-,1180720	,0573084	0,120	-,255683	,019539
	<i>Anesthesiology staff</i>	<i>Surgical staff</i>	,2004032	,0893393	0,046	-,014121	,414928
		Non-surgical staff	,0823312	,0825083	0,956	-,115791	,280453
Hospital Management Support for Patient Safety	Non-surgical staff	Surgical staff	,1180720	,0573084	0,120	-,019539	,255683
		Anesthesiology staff	-,0823312	,0825083	0,956	-,280453	,115791
	Surgical staff	Anesthesiology staff	,2002096	,1138424	0,238	-,073160	,473579
		Non-surgical staff	-,1021856	,0732578	0,491	-,278100	,073728
Teamwork across Hospital Units	<i>Anesthesiology staff</i>	Surgical staff	-,2002096	,1138424	0,238	-,473579	,073160
		<i>Non-surgical staff</i>	-,3023952*	,1051431	0,013	-,554875	-,049915
	Non-surgical staff	Surgical staff	,1021856	,0732578	0,491	-,073728	,278100
		Anesthesiology staff	,3023952*	,1051431	0,013	,049915	,554875
Teamwork across Hospital Units	Surgical staff	Anesthesiology staff	,5415568*	,1156225	0,000	,263916	,819198
		Non-surgical staff	-,0416246	,0743319	1,000	-,220116	,136867
	<i>Anesthesiology staff</i>	<i>Surgical staff</i>	-,5415568*	,1156225	0,000	-,819198	-,263916
		<i>Non-surgical staff</i>	-,5831813*	,1067374	0,000	-,839487	-,326876
Non-surgical staff	Surgical staff	,0416246	,0743319	1,000	-,136867	,220116	
	Anesthesiology staff	,5831813*	,1067374	0,000	,326876	,839487	

*Organizational Learning-Continuous Improvement, Hospital Management Support for Patient Safety and Teamwork across Hospital Units*. In all seven dimensions anesthesiology staff showed a statistically significantly lower percentage of positive answers compared with non-surgical staff. Anesthesiology staff showed a statistically significantly lower percentage of positive answers in the two dimensions in which they differ from surgical staff, in dimensions *Staffing and Teamwork across Hospital Units* respectively. Surgical staff showed a statistically significantly lower percentage of positive answers compared with non-surgical staff in three dimensions: *Supervisor/Manager Expectations and Actions Promoting Patient Safety, Communication Openness and Nonpunitive Response to Error*.

We may say that anesthesiology staff shows the highest degree of sensitivity to patient safety culture and systematic statistically significant differences compared with surgical and non-surgical staff as the result of a lower level of positive answers given by anesthesiology staff. Surgical staff is in the same correlation compared with non-surgical staff, whereas in comparison with anesthesiology staff they mostly come between anesthesiology and non-surgical staff, except in dimensions *Communication Openness and Staffing*, in which surgical staff shows the lowest percentage of positive answers, whereas anesthesiology staff is positioned between them and non-surgical staff, i.e. above non-surgical staff.

## DISCUSSION

In the analysis of the results of this research, first we have to warn against certain limitations. Although the number of 560 subjects may seem statistically relevant, it involves an unequal number of employees from the three observed groups. Thus, the anesthesiology staff group is the smallest one, as it includes 62 subjects, whereas the non-surgical staff group is the largest one with 338 subjects. The non-surgical staff group is also the most heterogeneous one according to the distribution of specialties that are, as a rule, exposed to a smaller number of urgent states in which errors may be fatal, so it is logical to expect a lower level of awareness of the patient safety problem, i.e. a higher percentage of positive answers in most of the 12 HSOPSC dimensions. Anesthesiology staff is, almost without exception, directly exposed to solving the most urgent and complex states, so it is to be expected that they show the highest level of awareness of the size and complexity of patient safety problems and, therefore, the highest level of sensitivity to the state of safety culture on all levels within hospital, which was also confirmed by other research projects (15, 16).

A statistically significant difference in the assessment of *Hospital Management Support for Patient Safety* between anesthesiology and non-surgical staff points to the fact that the position of anesthesiology staff, especially anesthesiologists, is the weakest in hospital compared with the other two groups that easily carry out their initiatives for improving patient safety, which results in

significant dissatisfaction, even frustration among anesthesiology staff. This dissatisfaction is not only directed towards hospital management, but also towards their own management, which is expected to achieve changes in relations and strengthen the position of anesthesiology in the fight for higher work safety standards, which is visible from statistically lower level of positive attitude towards *Supervisor/Manager Expectations and Actions Promoting Patient Safety*. Both of these facts point to the need of strengthening the role of health care management in improving patient safety culture and readiness of anesthesiology profession to be its main support (17, 18).

At first sight it may seem peculiar that anesthesiology staff shows the lowest *Frequency of Events Reported*, even though it certainly witnesses the highest number of adverse events. One of the possible explanations is probably related to the fact that they mostly work in a team with surgical staff within which we find the lowest level of communication openness, which is primarily dictated by surgeons (19, 20). This is connected with *Nonpunitive Response to Error*, which shows an accentuated fear of adverse events reporting among surgical and anesthesiology staff compared with non-surgical staff. One of the direct consequences of possible adverse event reporting would be further deterioration of badly assessed team work and communication between departments and within the team and anesthesiology staff often spends more time working in a team with surgical staff that working with staff from their own department (21, 22).

According to this research, inadequate staffing as a growing problem of most of health care systems, especially ours, affects surgical staff the most, whereas it has the smallest effects on anesthesiology staff, which is a bit surprising, as anesthesiology staff deals with the most difficult patients and often works in several work places at the same time. This result probably arises from the high grade moral of anesthesiology staff that is not prone to complain too much, but also due to the fact that a part of surgical staff is very unsatisfied with working conditions resulting from insufficient staffing of ward personnel, especially during night shifts (23, 24).

*Organizational Learning-Continuous Improvement* as an important dimension of patient safety culture also received the lowest assessment by anesthesiology staff and serves as an awareness indicator within this group regarding the necessity of creating an atmosphere in which errors are used more in order to carry out the root cause analysis and prevent them from reoccurring as it is done in health care systems of economically advanced countries (25).

Comparing the results of this research with findings of other authors and own experiences from daily practice, we may say that the lower percentage of positive assessment of patient safety culture among anesthesiology staff was expected and that it points not only to a high level of problem awareness, but also to them being prepared for changes, which results from dissatisfaction,

even frustration due to slow and difficult initiation of positive changes (15, 18). Despite this, it seems that within our society that goes through transition and which still involves very strong cultural obstacles against equal cooperation within teams and open communication in general, especially in the area of error reporting and error analyzing without fear of being punished with the purpose of learning and prevention, anesthesiology profession is the leader in creating patient safety culture. In this effort anesthesiologists start from themselves by giving positive examples of improving patient safety through constant education and training, acceptance and implementation of new drugs and technologies (26). The advancement achieved in any segment of anesthesiology could be placed in correlation with the described characteristics of patient safety culture that are characteristic of anesthesiologists, such as the development of intensive medicine or pain treatment. The reason why we highlight the correlation between patient safety culture and propulsive development of regional anesthesia in Croatia relates to the fact that this reflects anesthesiologists' decisiveness for finding safer alternatives to general anesthesia even at a cost of own exposure to additional burden in acquiring new knowledge and skills and possible complications (27, 28, 29). Mastering of ultrasound techniques additionally elevates the safety level of regional anesthesia, which represents a challenge taken by anesthesiologists (30).

To conclude, we may say that our research of differences in patient safety culture between anesthesiology, surgical and non-surgical staff confirmed the hypothesis that anesthesiologists in our health care system as well constitute the specialty that shows the highest level of awareness and decisiveness for solving patient safety problems. A rapid development of anesthesiology, especially of regional anesthesia and analgesia techniques correlates well with a high level of patient safety culture among anesthesiologists and may be observed as its indicator. Our research shows that anesthesiologists' influence is not only transferred to other anesthesiology staff, but also to staff from other departments with whom anesthesiologists cooperate the most, so that attitudes towards patient safety differ less between anesthesiology and surgical staff than the attitudes of these two groups compared with non-surgical staff.

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## REFERENCES

- EMANUEL L, BERWICK D, CONWAY J, COMBES J, HATLIE M, LEAPE L et al. 2009 What exactly is patient safety? *The Journal of Medical Licensure and Discipline* 95(1): 1–18
- World Health Organization 2004 World Alliance for Patient Safety. Available from URL: <http://www.who.int/patientsafety/worldalliance/en/>
- WHITE S V 2004 Patient safety issues. In: Fowler B J, White S V (ed) Patient safety: principles and practices. Springer publishing Company, p 3–5
- Safety of Anesthesia in Australia. Australian and New Zealand College of Anaesthetists 2002. Available from URL: <http://www.anzca.edu.au/resources/college-publications/pdfs/books-and-publications/reports/Safety%20of%20Anaesthesia/mortality97.pdf>
- STAENDER S E A 2010 Patient safety in anesthesia. *Minerva Anestesiologica* 76: 45–50
- KOHN L, CORRIGAN J, DONALDSON M (ed) 1999 To err is human: building a safer health system (Institute of Medicine report). National Academy Press, Washington (DC).
- LEAPE L, BERWICK D, CLANCY C, CONWAY J, GLUCK P, GUEST J et al. 2009 Transforming healthcare: a safety imperative. *Qual Saf Health Care* 18: 424–428
- SORRA J S, NIEVA V F 2004 Hospital Survey on Patient Safety Culture. AHRQ Publication No. 04–0041. Agency for Healthcare Research and Quality, Rockville (MD), Available from URL: <http://www.ahrq.gov/qual/patientsafetyculture/>
- Hospital Survey on Patient Safety Culture 2011 Agency for Healthcare Research and Quality, Rockville (MD), Available from URL: <http://www.ahrq.gov/qual/patientsafetyculture/hospindex.htm>
- MORENO R P, RHODES A, DONCHIN Y 2009 Patient safety in intensive care medicine: the Declaration of Vienna. *Intensive Care Med* 35(10): 1667–1672
- MELLIN-OLSEN J, STAENDER S, WHITAKER D K, SMITH A F 2010 The Helsinki Declaration on Patient Safety in Anaesthesiology. *Eur J Anaesthesiol* 27(7): 592–597
- Hospital survey on patient safety culture: background and information for translators 2009 Agency for Healthcare Research and Quality, Rockville (MD), Available from URL: <http://www.ahrq.gov/qual/patientsafetyculture/infotranshops.htm>
- Microsoft Excel Data Entry and Reporting Tool 2004. Available from URL: <http://www.premierinc.com/quality-safety/tools-services/safety/topics/culture/survey.jsp>
- IBM SPSS Statistics 19.0.0.1 2011. Available from: URL: <http://www.spss.com/>
- CANAS M, MORENO R, RHODES A, GROUNDS R M 2010 Patient safety in anesthesia. *Minerva Anestesiologica* 76(9): 753–757
- SINGER S J, GABA D M, GEPPELT J J, SINAICO A D, HOWARD S K, PARK K C 2003 The culture of safety: Results of an organization-wide survey in 15 California hospitals. *Qual Saf Health Care* 12: 112–118
- Joint Commission on Accreditation of Healthcare Organizations (JCAHO) 2009 Leadership in Healthcare Organizations: A Guide to Joint Commission Leadership Standards. Available from URL: [http://www.jointcommission.org/NR/rdonlyres/48366FFD-DB16-4C91-98F3-46C552A18D2A/0/WP\\_Leadership\\_Standards.pdf](http://www.jointcommission.org/NR/rdonlyres/48366FFD-DB16-4C91-98F3-46C552A18D2A/0/WP_Leadership_Standards.pdf)
- GABA D M 2000 Anaesthesiology as a model for patient safety in health care. *BMJ* 320: 785–788
- MAKARY M A, SEXTON B J, FREISCHLAG J A, HOLZMUELLER C H, MILLMAN E A, ROWEN L et al. 2006 Operating room teamwork among physicians and nurses: Teamwork in the eye of the beholder. *J Am Coll Surg* 202: 746–752
- MAKARY M A, SEXTON B J, FREISCHLAG J A, ANNE MILLMAN E A, DAVID PRYOR D, HOLZMUELLER C, PRONOVOST P J 2006 Patient Safety in Surgery. *Ann Surg* 243(5): 628–635
- SNIJDDERS C, KOLLEN B J, VAN LIGEN R A, FETTER W P F, MELONDIJK H 2009 Which aspects of safety culture predict incident reporting behavior in neonatal intensive care units? A multi-level analysis. *Crit Care Med* 37: 61–67
- MUSTAJBEGOVIĆ J 2007 Otežana komunikacija u medicinskom timu?! Zašto? Hciz Available from URL: <http://www.hciz.hr/clanak.php?id=13250&rnd=>
- HUGHES R G, CLANCY C M 2005 Working conditions that support patient safety. *J Nurs Care Qual* 20(4): 289–292
- CHO S H, KETEFIAN S, BARKAUSKAS V H, SMITH D G 2005 The effects of nurse staffing on adverse events, morbidity, mortality, and medical costs. *Nurs Res* 52: 71–79
- ROONEY J J, VANDEN HEUVEL L N 2004 Root cause analysis for beginners. *Quality Progress* 37(7): 45–53
- Lucian Leape Institute at the National Patient Safety Foundation 2011 Unmet Needs: Teaching Physicians to Provide Safe Patient Care. Available from: URL: <http://www.npsf.org/LLI-Unmet-Needs-Report/>
- CHENEY F W, POSNER K L, LEE L A, CAPLAN R A, DOMINO K B 2006 Trends in anesthesia-related death and brain damage: A closed claims analysis. *Anesthesiology* 105: 1081–1086

28. LEE L A, POSNER K L, DOMINO K B, CAPLAN R A, CHENEY F W 2004 Injuries associated with regional anesthesia in the 1980s and 1990s: a closed claims analysis. *Anesthesiology* 101: 143–152
29. MALLER T P, MADSEN M D, FUHRMANN L, OSTERGAARD D 2013 Postoperative handover: characteristics and considerations on improvement. *Eur J Anaesthesiol* 30: 229–242
30. NEAL J M 2010 Ultrasound-guided regional anesthesia and patient safety: An evidence-based analysis. *Reg Anesth Pain Med* 35(2 Suppl): S59–67