



Interprofessional differences in preoperative planning – the individualist surgeon

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Received: 22 March 2022 / Accepted: 5 April 2022 / Published online: 2 May 2022
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Summary

Background Perioperative processes have a great impact on the quality of surgery. In a high-risk surrounding, proper planning and communication is of utmost importance. We have identified other professions next to surgery with comparable circumstances and conducted a survey to elaborate on the impact of perioperative processes.

Objective To identify standards in preoperative planning in high-risk professions and determine possible shortcomings in surgical practice.

Methods Two surveys were constructed and distributed to surgeons, mountain guides, and soldiers. Questions were designed to investigate preoperative planning behavior and compare the different professions.

Results Nearly every participant (97%) agreed to the fact that preoperative planning helps to avoid complications. Most surgeons agreed that the preoperative and postoperative phase of care had the greatest ability to improve overall quality of care. The opinions about planning were divided. The minority of surgeons agreed to the importance of sharing a plan preoperatively. Soldiers were the profession with the highest rate of plan sharing.

Conclusion The readiness to communicate varies between professions and is lowest for surgeons. Missing standardization of procedures and the surgeon's ego might be explanations for this behavior. Interventions to overcome this shortcoming, like the preoperative team timeout, have already been implemented but further improvements are needed.

Supplementary Information The online version of this article (<https://doi.org/10.1007/s10353-022-00761-z>) contains supplementary material, which is available to authorized users.

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Keywords Systems analysis · Operations research · Risk assessment · Communication and teamwork in health care · Workflow

Introduction

Perioperative processes and their impact on overall quality of surgery are of growing importance in surgical research. In recent years, knowledge of the effects of optimizing medical processes in surgery has developed [1–3]. Mainly the focus was on patient safety and prevention of medical errors rather than on improving overall effectiveness and quality.

Until today, only few studies have addressed the crucial problem of poorly defined processes causing delay, increased stress of the operating team, and intraoperative mistakes ultimately leading to increased complication rates [3, 4].

Historically, perioperative and operative process optimization has made references to the airline industry, taking the marked reduction of complications

in the 1960s and 70s as a blueprint for future quality improvement programs in surgery [5, 6]. But as most surgeons know, even elective surgery and to a greater extent emergency surgical operations have little in common with a scheduled airline flight. The complexity of interactions and possible complications varies depending on patient anatomy and medical condition as well as the level of skill and experience of the individual surgeon and his or her team members. Looking at other high-risk professions, we found mountain guides and combat soldiers could have a much higher degree of similarity to emergency care surgeons when it comes to taking risks in possibly poorly controllable situations. We therefore thought that learning from their strategies could offer a new and inspiring impact on quality improvement efforts in surgery.

A key to control even in possibly dangerous environments is proper preparation and planning. We therefore conducted this study to investigate and compare the strategies of preoperative planning between surgeons, soldiers, and mountain guides.

Methods

We conducted a two-tailored interprofessional comparison between the planning strategies of surgeons on the one hand and soldiers and mountain guides on the other based on an online questionnaire involving 23 questions on team interaction and planning. Surgeons were additionally asked for their opinion on the use and relevance of technical aids as well as interaction models in critical team situations.

Two distinct online questionnaires were distributed. One was targeted at surgeons, the other at mountain guides and soldiers (Supplementary Appendices 1 and 2).

Both questionnaires were designed and administered using SurveyMonkey (Momentive Europe UC, Dublin, Ireland) [7]. The decision was made to construct two questionnaires due to specific questions for surgeons concerning technical and team interaction models which had no particular relevance for the other two professions but were of interest when designing technical support programs for surgeons in the future. The survey for mountain guides and soldiers was distributed in two languages (German and English) to account for possible monolingual participants (German only). The survey for surgeons was offered in English only.

The link to the survey was distributed via Mail directly to the participants or via their supervisors/superiors. Two follow-up emails were sent to improve the response rate.

A total of 39 general, colorectal, orthopedic, and neurosurgeons from the United Kingdom, Australia, the United States, and Switzerland were invited to participate. Seven Swiss and five German mountain guiding companies were addressed, as well as the national

guiding associations of these two countries which had agreed to distribute the survey to their members. Soldiers from a special forces unit of the Israelian Defense Forces as well as the United States Army Corps were invited via personal contact.

Surgeons were invited to provide their baseline demographics, specialization, and position in the hospital hierarchy. They were then asked to indicate their level of agreement on a five-point rating scale regarding several items concerning the surgical quality and the pre-, intra-, and postoperative phase of care. Additionally, the participants were encouraged to comment on any of the items. Comment boxes were provided for every question.

Mountain guides and soldiers were invited to fill in their baseline demographics, occupation, and duration of occupation. We then asked several questions about their planning routine and provided different statements to which they could give their level of agreement on a five-point rating scale. Comment boxes for personalized answers were provided for these groups as well.

Certain questions were chosen to perform interprofessional comparisons. They addressed the relevance of preoperative planning, detail of planning, degree of team involvement, and number of team members. Parameters and scales of the answers were adapted to allow for comparative statistics between the groups.

The data analysis was performed after anonymized data was downloaded from SurveyMonkey after completion and closure of the survey. Descriptive statistics were used to analyze the quantitative data. All analyses were done using Stata version 15 (StatCorp, College Station, TX, USA).

Results

Surgeons

In all, 39 surgeons were invited to complete the questionnaire. After two reminders, 27 surgeons completed the questionnaire (69%) of whom 21 were males and 6 females. Most surgeons were between 40 and 50 years old (48%). The surgeons worked in different areas of expertise such as general surgery (8 surgeons; 30%), colorectal Surgery (12 surgeons; 44%), upper gastrointestinal surgery (2 surgeons; 7%), bariatric and endocrine surgery (4 surgeons; 15%), and orthopedic surgery (1 surgeon; 4%). Most of the surgeons worked at tertiary/referral centers (19 surgeons; 70%). Five surgeons worked at a general hospital (19%) and three surgeons worked at district hospitals (11%). Concerning their level of responsibility, 18 surgeons worked as consultants or chiefs of department (67%), six surgeons worked as junior consultants (22%), one surgeon was still in training (4%), and two surgeons worked in private practice (7%). (Table 1).

Table 1 Demographics, surgeons

Characteristic	Category	Value
Gender, <i>n</i> (%)	Female	6 (22%)
	Male	21 (78%)
Age, <i>n</i> years (%)	20–30	0 (0%)
	30–40	6 (22%)
	40–50	13 (48%)
	50–60	6 (22%)
	> 60	2 (7%)
Specialization, <i>n</i> (%)	General	8 (30%)
	Colorectal	12 (44%)
	Upper GI	2 (7%)
	Bariatric/endocrine	4 (15%)
	Orthopedic/trauma	1 (4%)
Type of hospital, <i>n</i> (%)	General	5 (19%)
	District	3 (11%)
	Referral center/tertiary	19 (70%)
Level of responsibility, <i>n</i> (%)	Consultant or chief	18 (67%)
	Junior consultant	6 (22%)
	Resident/doctor in training	1 (4%)
	Private practice	2 (7%)

The majority of surgeons agreed that improvement was needed in the structure (context in which care is delivered: utilities, financing, staff), process (transaction between patients and providers), and outcome (effects of healthcare on the health status of patients) dimensions of health care. The process dimension was rated highest in its ability to improve overall quality. Specifically, the preoperative surgical evaluation and postoperative phase of care were mentioned as areas that can improve the overall quality of care. Furthermore, it was stated that especially Preoperative evaluation needed further investigation. The majority also agreed that surgical skills and surgical training as subcategories of the intraoperative phase of care have the greatest impact on quality. Finally, the participating surgeons had different opinions on whether or not sub-steps of operations were defined beforehand and if there was reproducibility of surgical performance between different surgeons. Concerning the communication of sub-steps prior to the operation, opinions were divided, with a larger group disagreeing with this fact.

Mountain guides and soldiers

Mountain guides

A total of 44 mountain guides completed and returned the questionnaire. Of these 44 mountain guides, 4 were female (9%) and 40 male (91%); 11 were between 30 and 40 years old (25%), 13 were between 40 and 50 years old (30%), and 18 were over 50 years of age (41%); 11 mountain guides had been working in their profession for 10–20 years (25%) and 18 guides had over 20 years of experience (41%; Table 2).

Table 2 Demographics, mountain guides and soldiers

Characteristic	Category	Mountain guides	Soldiers
Gender, <i>n</i> (%)	Female	4 (9%)	3 (15%)
	Male	40 (91%)	17 (85%)
Age, <i>n</i> years (%)	20–30	2 (5%)	0 (0%)
	30–40	11 (25%)	6 (30%)
	40–50	13 (30%)	12 (60%)
	> 50	18 (41%)	2 (10%)
	Experience, <i>n</i> years (%)	1–5	7 (16%)
5–10		8 (18%)	3 (15%)
10–20		11 (25%)	0 (0%)
> 20		18 (41%)	5 (25%)

Soldiers

In all, 20 soldiers completed and returned the questionnaire. Three of them were female (15%) and 17 male (85%). Six were between the age of 30 and 40 (30%) and 12 were between the age of 40 and 50 (60%). Twelve soldiers had experience of 1–5 years (60%), 3 had experience of 5–10 years (15%), and 5 had been working for over 20 years (25%; Table 2).

Interprofessional comparison

Regardless of their profession 97% of the participants agreed that planning beforehand helps to avoid complications and mistakes ($n=88$, 96.7%). Two soldiers disagreed (10%) and one surgeon was undecided (3.7%; Table 3).

Concerning the detail of planning, most participants chose to create 1–9 sub-steps to their general plan ($n=45$, 49.5%). A group of participants did not

Table 3 Questions (Q) for interprofessional comparison

	Mountain guides	Soldiers	Surgeons	Total
<i>N</i>	44	20	27	91
Relevance of preoperative planning (Q: Planning avoids complications/mistakes)				
Agree	44 (100%)	18 (90%)	26 (96.3%)	88 (96.7%)
Disagree	0 (0%)	2 (10%)	0 (0%)	2 (2.2%)
Undecided	0 (0%)	0 (0%)	1 (3.7%)	1 (1.1%)
Detail of planning (Q: How many sub-steps are included in overall plan?)				
0	6 (13.6%)	6 (30%)	16 (59.3%)	17 (18.7%)
1–9	34 (77.3%)	6 (30%)	5 (18.5%)	45 (49.5%)
10–20	4 (9.1%)	2 (10%)	2 (7.4%)	8 (8.8%)
> 20	0 (0%)	6 (30%)	4 (14.8%)	10 (11%)
Degree of team involvement (Q: Is the plan shared prior to the operation?)				
Yes	27 (61.4%)	17 (85%)	8 (29.6%)	52 (57.1%)
No	17 (38.6%)	3 (15%)	19 (70.4%)	39 (42.9%)
Number of team members (Q: How many people are involved in the operation?)				
1–3	15 (34.1%)	4 (20%)	0 (0%)	19 (20.9%)
4–9	26 (59.1%)	6 (30%)	27 (100%)	59 (64.8%)
10–20	3 (6.8%)	3 (15%)	0 (0%)	6 (6.6%)
> 20	0 (0%)	7 (35%)	0 (0%)	7 (7.7%)

Table 4 Multivariate analysis

	Univariable	Multivariable	<i>p</i> -value
Sub-steps included in daily practice ^a			
Mountain guide	3.00 (1.13–7.95)	1.88 (0.66–5.32)	0.235
Soldier	5.23 (1.49–18.32)	4.08 (1.05–15.85)	0.042
Preoperative plan shared ^b			
Mountain guide	3.77 (1.35–10.51)	9.31 (2.39–36.24)	0.001
Soldier	13.46 (3.07–59.09)	14.99 (2.72–82.65)	0.002
Number of team members ^a			
Mountain guide	0.32 (0.11–0.91)	0.27 (0.08–0.84)	0.024
Soldier	4.78 (1.29–17.64)	5.90 (1.40–24.85)	0.015

^aProportional odds ratio from ordinal logistic regression model

^bOdds ratio from logistic regression model

create sub-steps for their plan ($n = 17$, 18.7%), whereas 8 participants created between 10 and 20 sub-steps (8.8%) and 10 participants planned with more than 20 sub-steps (11%). This group with a high number of sub-steps was comprised of 6 soldiers and 4 surgeons. The odds of defining more than one sub-step for the operation was 4.08 for the soldier in the multivariate analysis ($p = 0.042$). (Table 4).

Whether or not the plan that was made beforehand was shared with the rest of the team depended highly on the profession: 27 (61.4%) mountain guides and 17 (85%) soldiers shared their plan with the rest of the team before the operation, whereas only 8 (29.6%) surgeons claimed they shared their plan preoperatively, leading to an overall constellation of 52 (57.1%) participants sharing the plan to the rest of team before the operation. The odds for sharing a plan preoperatively were significantly higher for mountain guides (OR = 9.31, $p = 0.001$) and soldiers (OR = 14.99, $p = 0.002$) compared to surgeons.

Team sizes varied according to profession. Most mountain guides work in a team of 4–9 people ($n = 26$, 59.1%). A smaller group works with a team composed of 1–3 people ($n = 15$, 34.1%). The composition of team size is more spread with soldiers: 4 work with 1–3 people ($n = 4$, 20%), 6 work with 4–9 people ($n = 6$, 30%), 3 work with 10–20 people ($n = 3$, 15%), and 7 work with more than 20 people ($n = 7$, 35%). All surgeons stated that they work in a team of 4–9 people ($n = 27$, 100%).

Discussion

Our study shows that there is a significant difference in preoperative planning between surgeons and the other two investigated high-risk professions. Although all but one surgeon claimed that planning beforehand helps to avoid complications and mistakes, only 8 surgeons (29.6%) decided to share a potentially preformed plan with their team.

The difference in readiness to share a plan is also significant in a multivariate analysis controlling among other confounders for age. The fact that this behavior does not change especially among the

younger surgeons shows that it seems to be engrained in surgical culture and might not change in the future, if no dedicated measures are taken to improve preoperative planning. As a number of mountain guides and a relevant proportion of the soldiers reported they are even legally obliged to provide evidence of sufficient preoperative planning in a case of accident or mission failure.

This feels tragic, as poor communication can result in poor patient outcomes, resource waste, and inefficiency [8]. Yule emphasizes the importance of nontechnical skills to surgical performance [9] and Greenberg thoroughly investigates and clearly shows the benefit of communication for surgery [10].

Much is at stake, as, for example, medical errors account for more than 250,000 deaths per year in US (third leading cause of death) [11] and failure in communication is often cited as the cause [12].

Why do surgeons hesitate to communicate?

One explanation might be that no standardized plan exists for a specific surgical operation that the lead surgeon could easily circulate or regard as a given resource. The proficiency of a certain procedure was obtained via several channels, with reciprocal interactions and varying importance. He may have learned the procedure from a mentor who taught him the specific steps. Additionally, independent experiences have modified his approach. Most certainly, self-education by reading, watching, and listening has also played a role. Condensing these individual influences into a specific plan may be difficult and a surgeon reluctant to do so. Von Strauss has shown that creation of a standardized protocol for an operation can improve process quality [3]. Communication facilitation via the protocol surely plays an important role in process improvement.

Another explanation might be overrepresentation of self-importance in the context of the team. There is no benefit in sharing the plan because the other team members' knowledge is not helpful for the success of the operation. Myers' wonderful analysis of the "surgeon ego" shows how narcissism as a subclinical personality characteristic possessed by most people to varying degrees can manifest in behaviors and attitudes that threaten the quality of surgical outcome [13]. A study performed in the UK shows a significantly higher level of narcissism in surgeons than in their non-surgeon colleagues [14, 15]. The lacking initiative to share the plan by the lead surgeon is only one side of the coin. Team members adhere to their entrenched role in the multidisciplinary team and fail to demand emancipation and inclusion by receiving relevant information such as the strategy being followed [16].

Interestingly, plan distribution and communication are more prevalent in the other professions we questioned. These professions are similar to surgery as they can play out in high-risk surroundings and com-

prise dependent relationships such as patient-to-surgeon or customer-to-mountain guide.

However, one major difference between the two groups seems to be self-evident and brutally simple: mountain guides and soldiers, unlike surgeons, put their own safety, health, and not rarely their lives at risk during their operations. This might be one of the reasons why planning is more profound and team interaction is rated higher than in surgical teams where the leading character is usually asleep and intubated. In combination with limited nontechnical skills as described above, this can lead to communication failures with devastating consequences in the worst- and poor processes in the best-case scenario.

But we believe that process quality in surgery can still be further improved. Methods like the now ubiquitous preoperative team timeout, which employs a series of checklists to ensure that all team members are aware of basic facts regarding the case, have proven this [17–19]. A recent prospective study from Switzerland introducing such regular briefings intraoperatively could show a reduction of overall mortality in a large and broad spectrum of general surgical procedures.

This study has limitations: it only includes a rather small sample size. It was difficult to interview more participants, especially from the military sector. Due to the limited sample size, there is a certain risk for bias. Nevertheless, we believe that the difference observed in preoperative planning is significant and noteworthy. Furthermore, different cultural and social backgrounds can add to that bias, and we were not able to control for these differences.

If surgeons could be motivated to plan their operations in advance and then share their plan with the team pre- and intraoperatively in a standardized manner, many of the abovementioned problems in communication might be overcome. Future studies should therefore investigate such initiatives and their impact on patient outcome and process quality.

Conclusion

Handling of perioperative processes differs between the three investigated high-risk professions. This holds especially true for the communication of preoperative plans. Only a minority of surgeons agreed to the importance of sharing a plan preoperatively with their teams. In contrast, soldiers and, to a lesser extent, mountain guides did communicate preoperative plans with differing degrees of detail to their teams. This might reflect the different degree of involvement for the three professions in case of plan failure. In the light of these findings, both alpinism and the military might become new and interesting sources for interdisciplinary learning to improve the safety culture and communication in the field of surgery.

Funding Grant was awarded by propatient (Research foundation of the University Hospital of Basel) to Marco von Strauss. The reference number is pp18-15.

Funding Open access funding provided by University of Basel

Conflict of interest F. Haak, T. Poletti, N. Grossman, U. von Holzen, M. Bolli, J.M. Klasen, T. Glass, and M. von Strauss und Torney declare that they have no competing interests.

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References

- Haugen AS, Søfteland E, Almeland SK, et al. Effect of the World Health Organization checklist on patient outcomes: a stepped wedge cluster randomized controlled trial. *Ann Surg.* 2015;261(5):821–8. <https://doi.org/10.1097/SLA.0000000000000716>.
- Weiser TG, Haynes AB, Dziekan G, Berry WR, Lipsitz SR, Gawande AA. Effect of a 19-item surgical safety checklist during urgent operations in a global patient population. *Ann Surg.* 2010;251(5):976–80. <https://doi.org/10.1097/SLA.0b013e3181d970e3>.
- von Strauss Und Torney M, Aghlmandi S, Zeindler J, et al. High-resolution standardization reduces delay due to workflow disruptions in laparoscopic cholecystectomy. *Surg Endosc.* 2018;32(12):4763–71. <https://doi.org/10.1007/s00464-018-6224-y>.
- von Strauss Und Torney M, Dell-Kuster S, Hoffmann H, von Holzen U, Oertli D, Rosenthal R. Microcomplications in laparoscopic cholecystectomy: impact on duration of surgery and costs. *Surg Endosc.* 2016;30(6):2512–22. <https://doi.org/10.1007/s00464-015-4512-3>.
- Helmreich RL. On error management: lessons from aviation. *BMJ.* 2000;320(7237):781–5. <https://doi.org/10.1136/bmj.320.7237.781>.
- Sexton JB, Thomas EJ, Helmreich RL. Error, stress, and teamwork in medicine and aviation: cross sectional surveys. *BMJ.* 2000;320(7237):745–9. <https://doi.org/10.1136/bmj.320.7237.745>.
- Blum L, Cantieri R, Carr P, Clifford D, Cohen J. Survey monkey. 1999. https://www.surveymonkey.de/?ut_source=mp&ut_source2=aboutus&ut_source3=header. Accessed 09/17/2019.
- Lingard L, Espin S, Whyte S, et al. Communication failures in the operating room: an observational classification of recurrent types and effects. *Qual Saf Health Care.* 2004;13(5):330–4. <https://doi.org/10.1136/qhc.13.5.330>.
- Yule S, Paterson-Brown S. Surgeons' non-technical skills. *Surg Clin North Am.* 2012;92(1):37–50. <https://doi.org/10.1016/j.suc.2011.11.004>.
- Greenberg CC, Regenbogen SE, Studdert DM, et al. Patterns of communication breakdowns resulting in injury to surgi-

- cal patients. *J Am Coll Surg.* 2007;204(4):533–40. <https://doi.org/10.1016/j.jamcollsurg.2007.01.010>.
11. Makary MA, Daniel M. Medical error—the third leading cause of death in the US. *BMJ.* 2016;353:i2139. <https://doi.org/10.1136/bmj.i2139>.
 12. Awad SS, Fagan SP, Bellows C, et al. Bridging the communication gap in the operating room with medical team training. *Am J Surg.* 2005;190(5):770–4. <https://doi.org/10.1016/j.amjsurg.2005.07.018>.
 13. Myers CG, Lu-Myers Y, Ghaferi AA. Excising the “surgeon ego” to accelerate progress in the culture of surgery. *BMJ.* 2018;363:1–5. <https://doi.org/10.1136/bmj.k4537>.
 14. Bucknall V, Burwaiss S, MacDonald D, Charles K, Clement R. Mirror mirror on the ward, who’s the most narcissistic of them all? Pathologic personality traits in health care. *Can Med Assoc J.* 2015;187(18):1359–63. <https://doi.org/10.1503/cmaj.151135>.
 15. O’Boyle EH, Forsyth DR, Banks GC, McDaniel MA. A meta-analysis of the Dark Triad and work behavior: a social exchange perspective. *J Appl Psychol.* 2012;97(3):557–79. <https://doi.org/10.1037/a0025679>.
 16. Makary MA, Holzmueller CG, Thompson D, et al. Operating room briefings: working on the same page. *Jt Comm J Qual Patient Saf.* 2006;32(6):351–5. [https://doi.org/10.1016/s1553-7250\(06\)32045-4](https://doi.org/10.1016/s1553-7250(06)32045-4).
 17. Lingard L, Regehr G, Orser B, et al. Evaluation of a preoperative checklist and team briefing among surgeons, nurses, and anesthesiologists to reduce failures in communication. *Arch Surg.* 2008;143(1):12–7. <https://doi.org/10.1001/archsurg.2007.21>. discussion 18.
 18. Lingard L, Regehr G, Cartmill C, et al. Evaluation of a preoperative team briefing: a new communication routine results in improved clinical practice. *BMJ Qual Saf.* 2011;20(6):475–82. <https://doi.org/10.1136/bmjqs.2009.032326>.
 19. Haynes AB, Weiser TG, Berry WR, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. *N Engl J Med.* 2009;360(5):491–9. <https://doi.org/10.1056/NEJMsa0810119>.

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