The Impact of Positive and Negative Intraoperative Surgeons’ Leadership Behaviors on Surgical Team Performance

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**Brief title:**  
Impact of Surgeons’ Leadership on Team Performance
**BACKGROUND:** The effects of surgeons’ leadership on team performance are not well understood. The purpose of this study was to examine the simultaneous effects of transformational, passive, abusive supervision and over-controlling leadership behaviors by surgeons on surgical team performance.

**METHODS:** Trained observers attended 150 randomly selected operations at a tertiary care teaching hospital. Observers recorded instances of the four leadership behaviors enacted by the surgeon. Postoperatively, team members completed validated questionnaires rating team cohesion and collective efficacy. Multiple regression analyses were computed. Data were analyzed using the complex modeling function in MPlus.

**RESULTS:** Surgeons’ abusive supervision was negatively associated with psychological safety (unstandardized $B = -.352$, $p < .01$). Both surgeons’ abusive supervision (unstandardized $B = -.237$, $p < .01$), and over-controlling leadership (unstandardized $B = -.230$, $p < .05$) were negatively associated with collective efficacy.

**CONCLUSIONS:** This study is the first to assess the simultaneous effects of surgeons’ positive and negative leadership behaviors on intraoperative team performance. Significant effects only surfaced for negative leadership behaviors; transformational leadership did not positively influence team performance.

**Key Words:** leadership, operating room, surgeon, team performance

**Abbreviations**

OR, operating room
INTRODUCTION

Leadership has been studied for decades, including in healthcare\(^1\) and more recently surgeons’ leadership. Henrickson et al. showed in observational studies of 23 and 29 operations that leadership behaviors occur during surgery;\(^2\) they identified 258 leadership behaviors clustered around supportive behaviors, communication and task management\(^3\). Highlighting the role of leadership during surgery, these behaviors were more likely to occur during more complex operations.

Hu et al. were the first to study the effects of transformational, transactional and passive leadership on team behavior during surgery.\(^4\) They replicated findings from traditional organizations, showing that passive leadership exerted moderately negative effects, transformational leadership positively affected diverse aspects of surgical team behavior and performance, while transactional leadership was ineffective. We extend this and focus on transformational, passive and over-controlling leadership, and abusive supervision.

Abusive supervision, the most widely studied form of destructive leadership,\(^5\) is manifest in hostile verbal and nonverbal behaviors (e.g., rude, demeaning, demoralizing behaviors, excluding physical contact)\(^6\) that are sustained but intermittent. Over-control differs from abusive supervision; it is focused solely on performance mistakes or failures, would not be seen as personally directed, and occurs when leaders restrict followers’ decision-making, requiring that they “follow orders”. Like abusive supervision, over-controlling leadership exerts negative effects on subordinate creativity and performance, and psychological aggression by subordinates against their leaders.\(^7\) Over-controlling leadership behaviors are likely to occur during surgery, particularly after critical events during surgery when surgeons became more directive, and less developmental or supportive.\(^2\)
Passive leadership (reflected in leaders’ failing to reward or punish subordinates when warranted) has attracted little research. Yet passive leadership predicts workplace accidents and bullying (the antithesis of psychological safety), poorer workplace attitudes and team effectiveness. Passive leadership is also associated with less information sharing during surgery.

High quality team performance during surgery is critical for achieving satisfactory outcomes; in one study, a lack of information sharing during the surgery and handoff phases predicted post-surgery complications or death after controlling statistically for ASA scores. We focus on psychological safety and team efficacy, both of which are central to high quality team performance. Psychological safety reflects the belief among team members that it is safe to take risks, voice dissent and make errors. One of the most consistent predictors of psychological safety is high quality leadership. In organizational research, transformational leadership predicts safety climate, team leader coaching predicts team members’ psychological safety, and abusive supervision negatively predicts psychological safety. Within the surgical context, team safety climate predicted the successful implementation of new technology.

Team or collective efficacy reflects the sense among team members that together they can successfully accomplish required tasks, which in turn predicts team effectiveness. Transformational leadership is an important predictor of collective efficacy, and we posit that the three forms of negative leadership will impede collective efficacy.

Last, research on leadership and psychological safety and team efficacy has invariably focused on one form of leadership alone. We investigate the simultaneous effects of transformational, passive and over-controlling leadership, and abusive supervision.
METHODS

Observers and training

Five observers (three final year nursing students and two 2nd year medical students) attended a full day training program. The focus in the morning was on leadership and included lectures and videos, and ended with the observers practicing ratings. Training in the afternoon was led by a practicing surgeon, and followed the training procedure used by Vashdi et al.\textsuperscript{20}

Data collection

Between June 15 and August 31, 2014, randomly selected operations from the Departments of Surgery, Obstetrics and Gynecology, and Urology were studied in a Canadian tertiary care teaching hospital. Ethics approval was obtained from the institutional Health Sciences Research Ethics Board. Prior to the study period, all potential operating room (OR) nurses, anesthesiologists, surgeons and affiliated residents were informed about the study and consent was obtained from those who opted to participate. Preoperatively, potential patients were approached and interested patients were consented. Pairs of trained observers attended 150 randomly selected operations at a tertiary care teaching hospital. Observers recorded instances of the four leadership behaviors enacted by the surgeon. Potential confounds representing specific contextual characteristics of an operation, such as patient age and gender, ASA rating and surgeon-rated complexity were controlled statistically before the effects of the different leadership behaviors were examined. Postoperatively, team members completed validated questionnaires rating team cohesion and collective efficacy.

Instruments
A summary of the leadership coding instruments, and the self-reported team performance scales, is shown in Table 1.

**Statistical analyses**

Prior to data collection, we calculated the necessary sample size to detect medium-level effect sizes at a power level of 0.9, given the number of predictors and the nature of the data. Results indicated that 116 observations would achieve this, and 150 were collected to further increase the power. Inter-rater reliability for the observers’ ratings of the four leadership behaviors were calculated using weighted Cohen’s Kappa; inter-rater agreement for the team members ratings of the two team performance variables were calculated with James, Demaree & Wolf’s \( r_{WG(J)} \).

Because the intra-class correlation coefficients of the outcome variables deviated from zero (psychological safety = 0.63, team efficacy = 0.76), it was necessary to control for the nested nature of the data (i.e., the fact that data were derived from some surgeons who performed more than one surgery). This was accomplished using the “complex” function in the statistical program MPlus, and indicating the clustering variable at the surgeon level. The complex function uses a maximum likelihood algorithm to estimate coefficients, while controlling for the nested nature of the data. The coefficients and p-values may be interpreted as they would in a simple regression.

**RESULTS**

Ninety (60%) of the operations involved the Department of Surgery, 40 (27%) Obstetrics and Gynecology and 20 (13%) Urology. Within the Department of Surgery, specialties studied included general surgery, orthopedic surgery, vascular surgery, thoracic surgery, cardiac surgery, neurosurgery and plastic surgery. One hundred and twenty-six (84%) were elective operations.
and 24 (16%) were emergency procedures. Mean patient age was 51 years, and 53% of patients were male. Demographic information for the participating surgeons, anesthesiologists, nurses and residents is displayed in Table 2, but were not included in the statistical model due to the statistical limitations of analyzing clustered data and because of the skewed nature of this information (e.g., 93% of the surgeons were male) and the statistical limitations of analysis of clustered data.

Descriptive data and individual-level correlations for the control variables, the four leadership variables and the two-team performance variables are shown in Table 3.

Multilevel regression analyses predicting psychological safety and collective efficacy are shown in Table 4. Surgeons' abusive supervision was negatively associated with psychological safety (unstandardized $B = -.352, p < .01$). There were no significant associations between the other 3 leadership types and psychological safety ($p > .05$). Both surgeons' abusive supervision (unstandardized $B = -.237, p < .01$), and over-controlling leadership (unstandardized $B = -.230, p < .05$) were negatively associated with collective efficacy. Neither transformational leadership nor passive leadership were linked with collective efficacy.

**DISCUSSION**

Leadership in healthcare is becoming increasingly important, including the study of surgeons’ leadership in the OR. While most research focuses on the effects of positive (e.g. transformational) leadership, the negative personal and organizational effects of passive leadership, abusive supervision and over-controlling leadership behaviors have also been identified as important, but had yet to be studied together in the unique and stressful OR environment. Acknowledging that neither organizational leaders nor surgeons display only one
style of leadership—as is evidenced in studies showing that seemingly conflicting styles of
transformational and authoritarian leadership are not necessarily negatively related\textsuperscript{23}—this study
examined the simultaneous effects of four different types of leadership. Both abusive supervision
and over-controlling leadership predicted lower collective efficacy, while abusive supervision
was also associated with lower levels of team members’ psychological safety.

The findings from the present study achieve considerable importance for several reasons.
First, the data were analyzed using multilevel modeling which controlled for the fact that the data
are not independent as some surgeons were involved in more than one surgery, which could
upwardly bias the magnitude of any findings. Second, we controlled for several variables
(namely, patient age and gender, ASA score; see Table 4) that might provide potential rival
explanations of any findings. Third, this is the first study to focus on a large number of
operations among all surgical specialties (N = 150), thereby enhancing the generalizability of the
current findings. Fourth, while some surgeons enact leadership during surgery,\textsuperscript{24} people rated as
high on transformational leadership are also rated highly on other positive leadership
behaviors.\textsuperscript{25} As a result, analyzing only one leadership style could produce overly optimistic
estimates of the effects of transformational or passive leadership. In addition, even high quality
leaders suffer lapses and engage in negative leadership, with meta-analyses indicating significant
correlations (i.e., \textgreater .5) between transformational leadership and laissez-faire (or passive)
leadership.\textsuperscript{26,27} In turn, “bad” leaders do not limit themselves to one type of destructive leader
behavior,\textsuperscript{28} highlighting the need to understand the simultaneous effects of different leadership
behaviors. Simultaneously studying transformational, passive and over-controlling leadership, as
well as abusive supervision, thus allows for a more nuanced evaluation of their effects during
surgery.
Unlike previous findings, no support emerged for surgeons’ transformational leadership, and several factors might account for this. First, a substantial finding from psychological research points to the power of negative over positive events in all aspects of people’s lives. More specifically to the current research, bad mentoring has greater negative effects on the quality of the relationship between mentor and protégé/mentee. In the current study, any benefits to team performance that typically accrue from transformational leadership may have been suppressed in the presence of abusive supervision and/or over-controlling surgeon behaviors. Second, context may moderate which leadership behaviors are most effective: Authoritarian leadership was more effective than transformational leadership in situations in which resources were limited.

In addition, no effects emerged for passive leadership in the current study even though Flood et al. found simultaneous positive effects of CEO transformational leadership and negative effects for laissez-faire leadership in their study of top management team effectiveness. Similarly, while surgeons’ passive leadership predicted negative team performance when examined in isolation, surgeons’ passive leadership failed to predict either team cohesion of team efficacy in the current study. Again, its effects may be suppressed in the presence of more visible negative behaviors such as abusive supervision and over-controlling leadership.

These findings have several direct implications for our understanding of surgeons’ leadership, and leadership theory more generally. First, any research on surgeons’ leadership must go beyond the current practice in which single leadership behaviors are examined in isolation; instead, future research should focus on different leadership behaviors that are enacted simultaneously. Moreover, while the belief that people are either “good” leaders or not would suggest that focusing on multiple positive (or negative) leadership behaviors in isolation would
be sufficient, it is critical that any future research on surgeons’ leadership integrate both positive and negative leadership.

Second, the findings of the current study have important practical implications for surgeons’ leadership development, the need for which is emphasized by findings from the current study as well as other research: (a) Supportive and developmental leadership behaviors decrease in frequency after the “point of no return” during unanticipated surgical events, a time during which leadership arguably attains greater importance; (b) Surgical residents fared worse on the individualized consideration components of transformational leadership, the management-by-exception and laissez-faire components of transactional leadership than a U.S. normative sample; (c) Even when leadership behaviors are identified during surgery, they are often targeted at no specific team member in particular, potentially limiting their effects. Yet in the face of such findings, meta-analyses have shown that leadership training initiatives are effective, and cost effective as well, but are overwhelmingly focused on positive leadership behaviors. The current findings suggest strongly that the nature and effects of negative leadership behaviors need to be incorporated into leadership development initiatives; after all, even the best leaders lapse and enact negative leadership behaviors. Such lapses might become more likely in the presence of complications or unexpected events during surgery, and leadership development initiatives that focus on positive and negative leadership behaviors, and include components of relapse prevention are more likely to reap long-term benefits.

In the current study, we showed that surgeons’ abusive supervision and over-controlling leadership predicted team performance. These findings suggest several avenues for future research. First, do similar effects emerge for others present during surgery, such as anesthesiologists, nurses or residents? Some research, for example, points to the role of
circulating nurses’ leadership in establishing the nature of the initial work environment. Second, consistent with some organizational research that focuses on shared leadership, future research could also focus on the shared or distributed rather than individual leadership during surgery, as recent research shows that some functions (e.g., patient safety) are more a function of leadership distributed across all team members rather than individual leadership. Third, given that only abusive supervision and over-controlling leadership, but not passive leadership, exerted negative effects, future research should address which specific negative behaviors are sufficient to overwhelm the benefits of transformational leadership, and just how much negative leadership is sufficient to do so. Fourth, the simultaneous effects of different forms of leadership—regardless of the source—on patient outcomes such as unexpected blood transfusion during surgery or postoperative complications should be investigated. Fifth, with sufficiently large samples of surgeries, research should now focus on the effects of different leadership behaviors on clinical outcome measures such as complications during or following surgery.

Last, to be of any practical value, it is critical that leadership can be taught. While research has shown that this is possible in organizational contexts, future research should now implement and evaluate leadership development initiatives for all those involved in surgery with the same rigor typically given to clinical trials and clinical research in general.

CONCLUSIONS

This study is the first to assess the simultaneous effects of positive and negative leadership behaviors on intraoperative team performance, and extends research both on leadership in general and surgeons’ leadership in particular. In our large sample size of 150 observed operations, we analyzed the effects of surgeons’ use of 4 different leadership behaviors on the performance of the OR team. Interestingly, significant effects only surfaced for negative
leadership behaviors; transformational leadership behaviors did not positively influence team performance. This research highlights the need to go beyond an examination of single surgeons’ leadership behaviors in isolation and stresses the importance of simultaneously studying different types of leadership behavior in the OR.

As a result of our findings, two implications emerge. First, the possibility that negative leadership behaviors are sufficient to suppress the effects of transformational leadership warrants further attention. Second, since surgeons enact more than one type of leadership, characterization of surgeons in terms of one leadership style (e.g., a “transformational” or “abusive” surgeon) is likely inaccurate. Therefore, educating surgeons about both positive and negative leadership behaviors offers the opportunity to enhance surgical team performance.
REFERENCES

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33 Witkiewitz, K, Marlatt, G. Relapse prevention for alcohol and drug problems: That was Zen, this is Tao. American Psychologist, 2004; 59: 224-235.

Table 1. Summary of the leadership coding instruments and team performance scales.

<table>
<thead>
<tr>
<th>Source of rating</th>
<th>Behavior/item examples</th>
<th>Reliability</th>
</tr>
</thead>
</table>
| Transformational leadership\cite{36} | 2 trained observers  
Leader is enthusiastic about what he/she is capable of achieving | 0.67        |
| Passive leadership\cite{8} | 2 trained observers  
He/she often performs well and still receives no praise from the leader | 0.89        |
| Abusive supervision\cite{37} | 2 trained observers  
Leader puts him/her down in front of others | 0.96        |
| Over-controlling leadership\cite{38} | 2 trained observers  
My leader closely monitors my performance for errors | 0.73        |
| Psychological safety\cite{2} | Team members  
Members of this team are able to bring up problems and tough issues | 0.74        |
| Collective efficacy\cite{39} | Team members  
This team will be able to successfully overcome many challenges | 0.92        |
Table 2. Demographic characteristics of surgeons, anesthesiologists, nurses and residents

<table>
<thead>
<tr>
<th>Team Member</th>
<th>N</th>
<th>Male Gender</th>
<th>Age (yrs)</th>
<th>Hospital tenure (yrs)</th>
<th>Professional tenure (yrs) a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M/SD</td>
<td>M/SD</td>
<td>M/SD</td>
<td></td>
</tr>
<tr>
<td>Surgeons</td>
<td>42</td>
<td>93%</td>
<td>50.4/9.4</td>
<td>13.4/10.1</td>
<td>23.1/9.7</td>
</tr>
<tr>
<td>Anesthesiologists</td>
<td>32</td>
<td>66%</td>
<td>44.4/6.8</td>
<td>11.5/6.7</td>
<td>18.76.4</td>
</tr>
<tr>
<td>Nurses</td>
<td>39</td>
<td>5%</td>
<td>43.0/9.6</td>
<td>12.3/7.1</td>
<td>14.8/7.8</td>
</tr>
<tr>
<td>Residents</td>
<td>39</td>
<td>54%</td>
<td>30.2/3.3</td>
<td>2.7/1.4</td>
<td>2.9/1.5</td>
</tr>
</tbody>
</table>

a Not including medical school or university training
Table 3. Descriptive statistics and individual-level inter-correlations for control, leadership and team performance variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformational Leadership.</td>
<td>2.35 (1.72)</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abusive supervision</td>
<td>0.04 (0.24)</td>
<td>-0.03</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overcontrol</td>
<td>0.14 (0.37)</td>
<td>-0.03</td>
<td>0.08</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laissez-faire</td>
<td>0.08 (0.33)</td>
<td>-0.10</td>
<td>0.07</td>
<td>0.07</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Psychological safety</td>
<td>5.65 (0.53)</td>
<td>-0.02</td>
<td>-0.16</td>
<td>-0.25**</td>
<td>-0.06</td>
<td>1.00</td>
</tr>
<tr>
<td>Team efficacy</td>
<td>4.4 (0.32)</td>
<td>0.06</td>
<td>-0.17*</td>
<td>-0.27**</td>
<td>0.00</td>
<td>0.51**</td>
</tr>
</tbody>
</table>

Notes:
1. The correlations in the table do not take the nested nature of the data into account, and should only be considered as a guide to understanding the directional relationships of data.
2. Significant correlations are bolded.

*p<0.05 **p<0.001

YOB, year of birth; ASA, American Society of Anesthesiologists; TFL, transformational; AS, abusive supervision; OC, over-controlling; LF, laissez-faire
Table 4. Multilevel regression analyses predicting psychological safety and collective efficacy

<table>
<thead>
<tr>
<th></th>
<th>Psychological Safety</th>
<th>Collective Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beta¹ (S.E.)</td>
<td>p value</td>
</tr>
<tr>
<td>Constant</td>
<td>0.05 (0.07)</td>
<td>0.46</td>
</tr>
<tr>
<td>Patient Sex</td>
<td>-0.04 (0.11)</td>
<td>0.71</td>
</tr>
<tr>
<td>Patient Year of birth</td>
<td>0.00 (0.00)</td>
<td>0.18</td>
</tr>
<tr>
<td>Anesthesia-Spinal</td>
<td>0.26 (0.15)</td>
<td>0.09</td>
</tr>
<tr>
<td>Anesthesia-Local</td>
<td>-0.17 (0.15)</td>
<td>0.28</td>
</tr>
<tr>
<td>Anesthesia-Combination</td>
<td>-0.08 (0.18)</td>
<td>0.66</td>
</tr>
<tr>
<td>ASA Rating</td>
<td>-0.08 (0.06)</td>
<td>0.15</td>
</tr>
<tr>
<td>Emergency</td>
<td>-0.25 (0.14)</td>
<td>0.07</td>
</tr>
<tr>
<td>Complexity</td>
<td>0.01 (0.03)</td>
<td>0.74</td>
</tr>
<tr>
<td>Transformational leadership</td>
<td>-0.02 (0.02)</td>
<td>0.46</td>
</tr>
<tr>
<td>Abusive supervision</td>
<td>-0.35 (0.08)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Laissez-faire leadership</td>
<td>-0.04 (0.08)</td>
<td>0.67</td>
</tr>
<tr>
<td>Over-controlling leadership</td>
<td>-0.34 (0.18)</td>
<td>0.06</td>
</tr>
</tbody>
</table>

¹Unstandardized beta