

# Association of Coworker Reports About Unprofessional Behavior by Surgeons With Surgical Complications in Their Patients

William O. Cooper, MD, MPH; David A. Spain, MD; Oscar Guillaumondegui, MD, MPH; Rachel R. Kelz, MD, MSCE, MBA; Henry J. Domenico, MS; Joseph Hopkins, MD, MMM; Patricia Sullivan, PhD; Ilene N. Moore, MD, JD; James W. Pichert, PhD; Thomas F. Catron, PhD; Lynn E. Webb, PhD; Roger R. Dmochowski, MD; Gerald B. Hickson, MD

**IMPORTANCE** For surgical teams, high reliability and optimal performance depend on effective communication, mutual respect, and continuous situational awareness. Surgeons who model unprofessional behaviors may undermine a culture of safety, threaten teamwork, and thereby increase the risk for medical errors and surgical complications.

**OBJECTIVE** To test the hypothesis that patients of surgeons with higher numbers of reports from coworkers about unprofessional behaviors are at greater risk for postoperative complications than patients whose surgeons generate fewer coworker reports.

**DESIGN, SETTING, AND PARTICIPANTS** This retrospective cohort study assessed data from 2 geographically diverse academic medical centers that participated in the National Surgical Quality Improvement Program (NSQIP) and recorded and acted on electronic reports of safety events from coworkers describing unprofessional behavior by surgeons. Patients included in the NSQIP database who underwent inpatient or outpatient operations at 1 of the 2 participating sites from January 1, 2012, through December 31, 2016, were eligible. Patients were excluded if they were younger than 18 years on the date of the operation or if the attending surgeon had less than 36 months of monitoring for coworker reports preceding the date of the operation. Data were analyzed from August 8, 2018, through April 9, 2019.

**EXPOSURES** Coworker reports about unprofessional behavior by the surgeon in the 36 months preceding the date of the operation.

**MAIN OUTCOMES AND MEASURES** Postoperative surgical or medical complications, as defined by the NSQIP, within 30 days of the operation.

**RESULTS** Among 13 653 patients in the cohort (54.0% [7368] female; mean [SD] age, 57 [16] years) who underwent operations performed by 202 surgeons (70.8% [143] male), 1583 (11.6%) experienced a complication, including 825 surgical (6.0%) and 1070 medical (7.8%) complications. Patients whose surgeons had more coworker reports were significantly more likely to experience any complication (0 reports, 954 of 8916 [10.7%];  $\geq 4$  reports, 294 of 2087 [14.1%];  $P < .001$ ), any surgical complication (0 reports, 516 of 8916 [5.8%];  $\geq 4$  reports, 159 of 2087 [7.6%];  $P < .01$ ), or any medical complication (0 reports, 634 of 8916 [7.1%];  $\geq 4$  reports, 196 of 2087 [9.4%];  $P < .001$ ). The adjusted complication rate was 14.3% higher for patients whose surgeons had 1 to 3 reports and 11.9% higher for patients whose surgeons had 4 or more reports compared with patients whose surgeons had no coworker reports ( $P = .05$ ).

**CONCLUSIONS AND RELEVANCE** Patients whose surgeons had higher numbers of coworker reports about unprofessional behavior in the 36 months before the patient's operation appeared to be at increased risk of surgical and medical complications. These findings suggest that organizations interested in ensuring optimal patient outcomes should focus on addressing surgeons whose behavior toward other medical professionals may increase patients' risk for adverse outcomes.

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**Author Affiliations:** Author affiliations are listed at the end of this article.

**Corresponding Author:** William O. Cooper, MD, MPH, Center for Patient and Professional Advocacy, Vanderbilt University School of Medicine, 2135 Blakemore Ave, Nashville, TN 37212 ([william.cooper@vumc.org](mailto:william.cooper@vumc.org)).

In an era of increased attention to safety and quality, health care systems are placing greater emphasis on understanding, identifying, and addressing threats to delivery of reliable care. In many health care settings, particularly surgery, reliability depends on well-functioning teams with optimal communication, mutual respect, and continuous situational awareness.<sup>1-4</sup> One factor that may affect surgical team performance is the level of professionalism displayed by all team members, but particularly the surgeon, whose role inherently requires team leadership.<sup>5</sup> Unprofessional behaviors may contribute to undermining a culture of safety, threaten teamwork, and lead to medical errors and surgical complications.<sup>1,6-13</sup>

Nurses and other health care team members are well positioned to observe surgeons' behaviors and can address unprofessional behavior directly or convey concerns through their institution's electronic event-reporting system.<sup>1-4,7-11</sup> For example, a nurse who reports, "I asked for the procedure time out. Dr X said, 'Look, we're all on the same page here. Let's get going without all this time out nonsense,'" might believe that Dr X is showing disrespect for and trivializing the system's safety processes. A physician from another service who reports, "The patient was hypotensive and we started vasopressors. I told Dr Y (the surgeon) as soon as I started the infusion. Dr Y yelled at me for 5 minutes about not giving the necessary information," might hesitate to speak up in future cases when a patient deteriorates.

We hypothesized that patients of surgeons with a higher number of coworker reports describing unprofessional behaviors would experience surgical complications more often than patients of surgeons with fewer such coworker reports. Thus, we conducted a study using data from 2 large, geographically diverse academic health systems that participate in the American College of Surgeons National Surgical Quality Improvement Program (NSQIP)<sup>12</sup> and linked these data with electronic reports of coworker concerns about unprofessional behaviors.<sup>13</sup>

## Methods

### Setting and Data Sources

We conducted a retrospective cohort study to investigate the association between prior coworker reports about a surgeon's unprofessional behaviors and their patients' risk for complications. Electronic event reports of coworker concerns about professionalism entered into each hospital's electronic safety-reporting system were linked to data from the American College of Surgeons NSQIP. The study period for surgical cases (in the NSQIP) was January 1, 2012, through December 31, 2016; coworker reports from the 3 years (36 months) before the date of the operation for each case (ie, January 1, 2009 for earliest cases through December 30, 2016 for latest cases) were included in the analysis. Surgeon sex and years of experience (measured as years since medical school graduation) were identified from publicly available data from each study site's website and online third-party physician review sites (eg, Healthgrades, Vitals.com, and Topnpi.com), which

## Key Points

**Question** Do patients of surgeons with a higher number of coworker reports about unprofessional behavior experience a higher rate of postoperative complications than patients whose surgeons have no such reports?

**Findings** Among 13 653 patients in this cohort study undergoing surgery performed by 202 surgeons, patients whose surgeons had a higher number of coworker reports had a significantly increased risk of surgical and medical complications.

**Meaning** Surgeons who model unprofessional behaviors may help to undermine a culture of safety, threaten teamwork, and thereby increase risk for medical errors and surgical complications.

have been shown to be consistent with surgeon age 95.7% of the time in a large national study using similar approaches.<sup>14</sup> The study was reviewed by the institutional review boards at Vanderbilt University Medical Center, Nashville, Tennessee, and Stanford University, Stanford, California, and qualified as nonhuman subjects research pursuant to CFR 46.102(f)(2) because the deidentified information on individuals in the cohort would not readily be ascertained by the investigators. The need for informed consent was therefore waived. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline for cohort studies.

The NSQIP files provided information for identifying the cohort, including the operation performed, patient characteristics, and operative characteristics that might be associated with surgical complications.<sup>5</sup> The NSQIP data undergo rigorous audits and quality checks at the local site and at the central NSQIP site.<sup>15</sup>

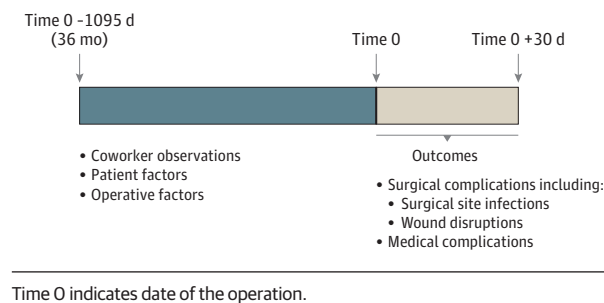
Coders trained for high interrater and intrarater reliability manually analyzed coworker reports of unprofessional behavior using a validated coding algorithm.<sup>16</sup> Coders used qualitative analysis to identify the following 4 domains of unprofessional behaviors: concerns about poor or unsafe care (eg, "Dr \_\_ wiped the lens of the bronchoscopy scope on the bedsheets and then used the scope on the patient."), clear and respectful communication (eg, "Dr \_\_ demanded, 'Who's the moron who has the patient in room 16?'"), integrity (eg, "Dr \_\_ instructed me to create false patients so it would look like the schedule was full."), and responsibility (eg, "Dr \_\_ refused to enter the electronic order after I described the verbal orders policy.")<sup>16</sup>

The NSQIP data did not include patient identifiers. To protect physician confidentiality, a computer systems analyst not involved in conducting the research linked the study data sets using a probabilistic linkage algorithm based on physician identifiers included in both data sets. Once data files were linked, physician identifiers were stripped to create a file that could not be linked to an individual physician. The resulting files were used to conduct all analyses.

### Cohort and Follow-up

The study cohort included patients in the NSQIP database who underwent an operation at a study site during the study period. Patients were excluded if they were younger than 18 years

Figure 1. Study Design



on the date of the operation, or if the attending surgeon had less than 36 months of monitoring for coworker reports preceding the date of the operation. Follow-up for each patient began on the date of the operation (defined as time 0) and continued through the next 30 days, to death, or to loss to follow-up (304 cases [2.2%]), whichever came first (Figure 1).<sup>5,17</sup>

### Outcomes

The primary outcome was any complication during the 30-day postoperative period, including surgical and medical complications.<sup>5</sup> Surgical complications included site infections (superficial surgical site infection, deep surgical site infection, organ or space surgical site infection) and wound disruption. Medical complications included pulmonary conditions (pneumonia, reintubation, mechanical ventilation), renal conditions (renal insufficiency, acute renal failure), central nervous system or nervous system complications (stroke), cardiovascular conditions (cardiac arrest, acute myocardial infarction), thromboembolic conditions (pulmonary embolism, deep venous thrombosis), and infectious conditions (sepsis or septic shock, urinary tract infections).<sup>17</sup> Secondary outcomes included any surgical complication, any medical complication, 30-day mortality, readmissions, and reoperations.

### Statistical Analysis

Data were analyzed from August 8, 2018, through April 9, 2019. Patient and surgeon covariates were compared across complaint groups using a Kruskal-Wallis test for continuous covariates or a Pearson  $\chi^2$  test for categorical covariates. Means (SDs) or counts (percentages) were used to summarize continuous and categorical covariates, respectively, by complaint category. Multivariable logistic regression was used to model the association between the surgeon's coworker reports in the 36 months (defined as 1095 days) preceding the date of the operation and the patient's risk for any complication. Each patient had a unique surgeon- and time-dependent value created for their surgeon's history of reports to the day preceding their operation. Regression models using the patient as the unit of analysis included variables believed to be the most important potential confounders. Models included total number of coworker reports, patient factors (age, sex, race/ethnicity, functional status, American Society of Anesthesiologists [ASA] class),<sup>15</sup> operative characteristics (wound classification [ie, clean vs contaminated]), and

long operative time to account for surgical complexity (defined as operative time >75th percentile for each *Current Procedural Terminology* code).<sup>5</sup> Significance of the number of reports for multiple regression models reflected a comparison across all groups. Using this model, we calculated each patient's estimated complication risk.<sup>18</sup> We then compared complication risk by report groups using a Kruskal-Wallis test.

We performed 3 sensitivity analyses. These included a model that added the surgeon's years of experience to assess the possibility that surgeon experience (or inexperience) might be associated with unprofessional behavior and risk for complications. A second sensitivity analysis managed site as a fixed effect to account for possible cultural differences between the study sites in terms of willingness to report unprofessional behaviors and inherent site differences in outcomes. A third sensitivity analysis excluded the small number of cohort members with incomplete follow-up to assess the association of loss to follow-up with the study findings. We used R statistical software, version 3.2.3 (R Foundation for Statistical Computing) to perform all analyses. Two-sided  $P < .05$  indicated significance.

## Results

The cohort included 13 653 patients who underwent an operation during the study period (6285 [46.0%] male and 7368 [54.0%] female; mean [SD] age, 57 [16] years) performed by 202 unique surgeons (143 [70.8%] male, 58 [28.7%] female, and 1 [0.5%] unknown). Patients in the cohort underwent 10 462 general surgical (76.6%), 1104 orthopedic (8.1%), 851 vascular (6.2%), 164 gynecologic (1.2%), 31 plastic surgery (0.2%), 688 neurosurgical (5.0%), 2 otolaryngologic (0.01%), 148 urologic (1.1%), and 203 cardiothoracic (1.5%) operations. In the 36 months preceding the date of the operation, surgeons of cohort patients received a mean of 1.3 (2.4) coworker reports indicating unprofessional behavior (interquartile range, 0-2). Surgeons of patients in the group with the highest numbers of coworker reports had a mean of 6.1 (2.6) reports in the prior 36 months (Table 1). A greater percentage of surgeons for patients in the group whose surgeons had 0 reports were female (1716 [19.3%]) than in the other 2 groups (1-3 reports, 341 [12.9%];  $\geq 4$  reports, 192 [9.2%] [ $P < .001$ ]), suggesting that women were less likely to generate coworker concerns than men.

Across groups of patients classified according to the number of surgeon's coworker reports, patients were comparable in terms of age, sex, race/ethnicity, and functional status. Compared with patients whose surgeons had no reports, patients whose surgeons had a greater number of coworker reports were more likely to have higher ASA classification (ASA classification 3, 1159 of 2087 [55.5%] vs 4192 of 8916 [47.0%]; ASA classification 4, 90 of 2087 [4.3%] vs 309 of 8916 [3.5%]), were more likely to have contaminated wounds (247 of 2087 [11.8%] vs 866 of 8916 [9.7%]), and had longer mean operative times (164 [119] vs 154 [132] minutes) (Table 1).

Among cohort patients, 1583 (11.6%) experienced a complication, including 825 (6.0%) who had a surgical complica-

**Table 1. Characteristics of the Cohort Across Groups of the Operating Surgeon's Coworker Reports About Unprofessional Behaviors in the 36 Months Preceding the Operation**

Patient Characteristic	No. of Coworker Reports of Surgeon's Unprofessional Behavior <sup>a</sup>				P Value
	All (N = 13 653)	0 (n = 8916)	1-3 (n = 2650)	≥4 (n = 2087)	
Age, mean (SD), y	57 (16)	56 (16)	58 (16)	56 (16)	<.001 <sup>b</sup>
Male	6285 (46.0)	4068 (45.6)	1196 (45.1)	1021 (48.9)	.01 <sup>c</sup>
Race/ethnicity					
White	10 075 (73.8)	6572 (73.7)	1959 (73.9)	1544 (74.0)	.13 <sup>c</sup>
Black	772 (5.7)	483 (5.4)	155 (5.8)	134 (6.4)	
Other	1146 (8.4)	743 (8.3)	242 (9.1)	161 (7.7)	
Unknown	1660 (12.2)	1118 (12.5)	294 (11.1)	248 (11.9)	
Functional status					
Independent	13 464 (98.6)	8801 (98.7)	2605 (98.3)	2058 (98.6)	.28 <sup>c</sup>
Partially dependent	153 (1.1)	97 (1.1)	32 (1.2)	24 (1.1)	
Totally dependent	32 (0.2)	16 (0.2)	12 (0.5)	4 (0.2)	
Unknown	4 (0.03)	2 (0.02)	1 (0.04)	1 (0.05)	
ASA classification					
1 (No disturbance)	882 (6.5)	678 (7.6)	105 (4.0)	99 (4.7)	<.001 <sup>c</sup>
2 (Mild disturbance)	5427 (39.7)	3722 (41.7)	968 (36.5)	737 (35.3)	
3 (Severe disturbance)	6816 (49.9)	4192 (47.0)	1465 (55.3)	1159 (55.5)	
4 (Life threatening)	504 (3.7)	309 (3.5)	105 (4.0)	90 (4.3)	
5 (Moribund)	10 (0.1)	5 (0.1)	4 (0.2)	1 (0.05)	
None assigned	14 (0.1)	10 (0.1)	3 (0.1)	1 (0.05)	
Wound class					
Clean	5950 (43.6)	4051 (45.4)	1224 (46.2)	675 (32.3)	<.001 <sup>c</sup>
Clean/contaminated	5524 (40.5)	3473 (39.0)	1033 (39.0)	1018 (48.8)	
Contaminated	1337 (9.8)	866 (9.7)	224 (8.5)	247 (11.8)	
Dirty/infected	842 (6.2)	526 (5.9)	169 (6.4)	147 (7.0)	
Length of operation, mean (SD), min	158 (128)	154 (132)	168 (123)	164 (119)	<.001 <sup>b</sup>
Surgeon's total coworker reports before surgery, mean (SD)	1.3 (2.4)	0 (0)	1.9 (0.8)	6.1 (2.6)	<.001 <sup>b</sup>
Female surgeon	2249 (16.5)	1716 (19.3)	341 (12.9)	192 (9.2)	<.001 <sup>c</sup>
Surgeon experience, mean (SD), y	23.3 (9.1)	23.1 (8.3)	22.7 (9.8)	24.5 (10.9)	<.001 <sup>b</sup>

Abbreviation: ASA, American Society of Anesthesiologists.

<sup>a</sup> Unless otherwise indicated, data are expressed as number (percentage) of patients. Percentages have been rounded and may not total 100.

<sup>b</sup> Calculated using Kruskal-Wallis test.

<sup>c</sup> Calculated using Pearson  $\chi^2$  test.

tion and 1070 (7.8%) who had a medical complication (Table 2). Within 30 days, 140 patients (1.0%) died, 473 (3.5%) returned to the operating room, and 1053 (7.7%) were readmitted to the hospital.

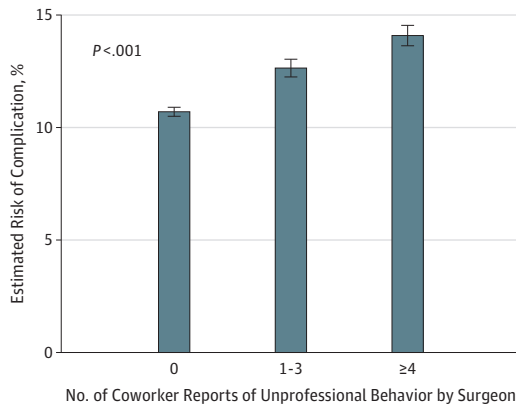
Patients whose surgeons had a greater number of coworker reports had a significantly increased rate of any complication (0 reports, 954 of 8916 patients [10.7%]; ≥4 reports, 294 of 2087 patients [14.1%];  $P < .001$ ), any surgical complications (0 reports, 516 of 8916 patients [5.8%]; ≥4 reports, 159 of 2087 patients [7.6%];  $P < .01$ ), and any medical complications (0 reports, 634 of 8916 patients [7.1%]; ≥4 reports, 196 of 2087 patients [9.4%];  $P < .001$ ). For surgical complications, surgical site infections were significantly more likely among patients whose surgeons had more coworker reports (0 reports, 477 of 8916 patients [5.3%]; ≥4 reports, 155 of 2087 patients [7.4%];  $P < .001$ ). For medical complications, pulmonary complications (0 reports, 234 of 8916 [2.6%]; ≥4 reports, 79 of 2087 [3.8%]), renal complications (0 reports, 60 of 8916 [0.7%]; ≥4 reports, 23 of 2087 [1.1%]), central nervous system complications (0 reports, 18 of 8916 [0.2%]; ≥4 reports, 2 of 2087 [0.1%]), and sepsis (0 reports, 249 of 8916 [2.8%]; ≥4 reports, 91 of 2087 [4.4%]) were more likely to occur in patients

whose surgeons had greater numbers of coworker reports. No significant difference occurred between the study groups in the percentage who died, had reoperations, or who were readmitted within the 30-day postoperative period.

In a logistic regression model adjusting for patient, surgeon, and operative characteristics, a surgeon's prior reports by coworkers were significantly associated with the odds of a patient having any complication (logistic regression model testing significance of prior complaint category after other covariates included in model: Wald  $\chi^2_2 = 5.9$ ;  $P = .05$ ) (full model is shown in eTable 1 in the Supplement). The adjusted complication rate was 14.3% higher for patients whose surgeon had 1 to 3 reports and 11.9% higher for patients whose surgeon had 4 or more reports compared with patients whose surgeon had 0 reports. Patients whose surgeon had 1 to 3 reports were at 18.1% higher estimated risk of complication, and those whose surgeon had 4 or more reports were at 31.7% higher estimated mean risk of complication compared with patients whose surgeon had 0 reports (Figure 2). Findings from 3 sensitivity analyses (Table 3) that accounted for surgeons' years of experience (odds ratio [OR] for 1-3 reports, 1.16 [95% CI, 1.01-1.34]; OR for ≥4 reports, 1.14 [95%

**Table 2. Complications Across Groups of the Operating Surgeons' Coworker Reports About Unprofessional Behavior in the 36 Months Preceding the Operation**

Outcome	No. of Coworker Reports of Surgeon's Unprofessional Behavior, No. (%) of Patients				P Value <sup>a</sup>
	All (N = 13 653)	0 (n = 8916)	1-3 (n = 2650)	≥4 (n = 2087)	
Any complication	1583 (11.6)	954 (10.7)	335 (12.6)	294 (14.1)	<.001
Surgical complications					
Any	825 (6.0)	516 (5.8)	150 (5.7)	159 (7.6)	<.01
Surgical site infection	775 (5.7)	477 (5.3)	143 (5.4)	155 (7.4)	<.001
Wound disruption	88 (0.6)	65 (0.7)	14 (0.5)	9 (0.4)	.22
Medical complications					
Any	1070 (7.8)	634 (7.1)	240 (9.1)	196 (9.4)	<.001
Pulmonary	409 (3.0)	234 (2.6)	96 (3.6)	79 (3.8)	.002
Renal	113 (0.8)	60 (0.7)	30 (1.1)	23 (1.1)	.02
Central nervous system	33 (0.2)	18 (0.2)	13 (0.5)	2 (0.1)	.01
Cardiovascular	121 (0.9)	67 (0.8)	31 (1.2)	23 (1.1)	.07
Thromboembolic	191 (1.4)	124 (1.4)	43 (1.6)	24 (1.1)	.39
Infectious/sepsis	413 (3.0)	249 (2.8)	73 (2.8)	91 (4.4)	<.001
Urinary tract infection	184 (1.3)	118 (1.3)	35 (1.3)	31 (1.5)	.84
Other complications within 30 d					
Death	140 (1.0)	82 (0.9)	33 (1.2)	25 (1.2)	.24
Reoperation	473 (3.5)	309 (3.5)	95 (3.6)	69 (3.3)	.87
Readmission	1053 (7.7)	664 (7.4)	203 (7.7)	186 (8.9)	.08

<sup>a</sup> Calculated using Pearson  $\chi^2$  test.**Figure 2. Estimated Complication Rate According to the Operating Surgeon's Reports by Coworkers About Unprofessional Behaviors in the 36 Months Preceding the Operation**

Analyses are adjusted for total coworker reports, patient factors (age, sex, race/ethnicity, functional status, American Society of Anesthesiologists class), and operative characteristics (wound classification, long operative time [calculated as >75th percentile for each *Current Procedural Terminology* code]). Error bars indicate 95% CIs.

CI, 0.98-1.32];  $P = .05$  for primary exposure coworker concern category) and the effect of the study site (OR for 1-3 reports, 1.17 [95% CI, 1.01-1.34]; OR for ≥4 reports, 1.13 [95% CI, 0.97-1.30];  $P = .05$ ) and excluded the small number of cohort members with incomplete follow-up (OR for 1-3 reports, 1.17 [95% CI, 1.02-1.35]; OR for ≥4 reports, 1.13 [95% CI, 0.97-1.31];  $P = .05$ ) were not materially different from findings in our primary models. Full models for sensitivity analyses are shown in eTables 2 to 4 in the [Supplement](#).

**Table 3. Sensitivity Analyses<sup>a</sup>**

Sensitivity Analysis Description	Odds Ratio (95% CI) Estimate From Multivariate Regression Model <sup>b</sup>	
	1-3 Reports	≥4 Reports
Added surgeon's years of experience to regression model	1.16 (1.01-1.34)	1.14 (0.98-1.32)
Added study site to regression model	1.17 (1.01-1.34)	1.13 (0.97-1.30)
Excluded patients with incomplete follow-up	1.17 (1.02-1.35)	1.13 (0.97-1.31)

<sup>a</sup>  $P = .05$  for association of reports in the multivariate regression model.  $P$  value was calculated from logistic regression results testing significance of surgeon report category after other covariates were included in the model.

<sup>b</sup> Reference group includes operations performed by surgeons with no coworker reports of surgeon's unprofessional behavior in the 1095 days (36 months) preceding operation.

## Discussion

In this study of 13 653 patients and 202 surgeons from 2 academic medical centers in geographically distinct locations, patients whose surgeons had a higher number of coworker reports about unprofessional behavior in the 36 months before their operation were more likely to experience a surgical or medical complication than patients whose surgeons had no coworker reports. The differences remained significant in multivariable analyses controlling for patient, operative, and surgeon characteristics, as well as in 3 different sensitivity analyses. Although not demonstrating causality, the findings of this study are comparable to those of previous studies by Cooper et al<sup>5</sup> and Catron et al<sup>19</sup> that suggested a relationship between unprofessional behaviors and surgical complications. In those studies,

the measure of unprofessional behavior was unsolicited patient complaint reports, which identify a small percentage (3%-5%) of surgeons who have multiple interactions in which patients perceive them as rude or disrespectful.<sup>20</sup> In the studies of patient reports and surgical complications, patient reports were hypothesized to be a marker for surgeon behaviors that affect team performance.<sup>5,19</sup> In the present study, we were able to measure reports of surgeon behaviors toward other team members more directly by identifying coworker descriptions of unprofessional interactions.

This study provides additional evidence of the important association between unprofessional behaviors and team performance by directly measuring patient outcomes. A series of studies by Riskin et al<sup>21</sup> measured the effect of unprofessional behaviors on neonatology team performance in simulations. Neonatal teams performed worse in diagnosing a condition and treating a complication when they were randomized to a condition of a rude consultant compared with teams not exposed to the condition.<sup>21</sup> Lagoo et al<sup>22</sup> recently described the effects of rude behaviors on surgical teams with a study identifying the association between negative behaviors and malpractice claims. The present study highlights the specific interactions, including disrespect, disregard for hospital policies, and lack of availability to answer questions, that might reasonably be expected to have a negative effect on team performance and increase the risk for complications. Although unprofessional behaviors by surgeons may occur in stressful environments with patients who have numerous comorbidities and critical illnesses, this study and the work by Riskin et al<sup>21</sup> and Lagoo et al<sup>22</sup> suggest that these are the environments in which surgeons have opportunities to promote and support optimal team function.

Although the relative increase in rates of surgical complications represents a small absolute increase, the independent association of surgeons with more coworker reports and increased risk of complications suggests that the elevated odds are modifiable. Previous studies<sup>13,20,23</sup> demonstrated that peer-delivered interventions effectively address physicians who generate a disproportionate share of patient or coworker reports of unprofessional behavior. Using a tiered escalation model with increasing consequences for failure to improve<sup>24</sup> has been shown to decrease physicians' reports by patients<sup>20</sup> and

coworkers,<sup>13</sup> even for those with persistent patterns of unprofessional behavior. Future work should assess whether improved interactions with patients, families, and coworkers by surgeons who receive interventions for patterns of unprofessional behavior are also associated with improved surgical outcomes for their patients.

### Limitations

Coworkers may have differing thresholds for reporting surgeon behavior, and the report of the observed behavior may be subjective in nature. However, the surgeons for patients in this study practiced in 1 of 2 academic medical centers, so presumably had similar opportunities to have reports filed by the same coworkers. In addition, many unprofessional behaviors by surgeons may go unreported, leading to some misclassification of our primary exposure. Even with a large cohort population (>13 500), the study had a relatively limited sample size. We included several patient, surgeon, and operative variables in our models, but other unmeasured factors related to surgeons who care for sicker patients may have influenced the results, although we included the primary variables hypothesized as likely to be associated with risk based on prior work.<sup>5</sup> Because of the sampling strategy used in the NSQIP, we could not account for individual surgeon volume or case mix.<sup>25</sup> The NSQIP data represent a purposive sampling of a surgeon's cases during a year-long audit period. Thus, the cases selected at random might not represent all the cases for that surgeon. Finally, the study was conducted at 2 large academic medical centers; whether the findings extend to other academic centers or nonacademic centers is unknown.

### Conclusions

Patients whose surgeons had an increased number of coworker reports about unprofessional behavior in the 36 months before the patient's operation appeared to be at increased risk of surgical and medical complications. It would seem that organizations interested in ensuring optimal patient outcomes should focus on addressing surgeons whose behavior toward other medical professionals may increase their patients' risk for adverse outcomes.

#### ARTICLE INFORMATION

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**Author Affiliations:** Center for Patient and Professional Advocacy, Vanderbilt University Medical Center, Nashville, Tennessee (Cooper, Moore, Pichert, Catron, Webb, Dmochowski, Hickson); Department of Surgery, Stanford University, Stanford, California (Spain); Section of Surgical Sciences, Vanderbilt University Medical Center, Nashville, Tennessee (Guillamondegui); Center for Surgery and Health Economics, Department of Surgery, Perelman School of Medicine, Philadelphia, Pennsylvania (Kelz); Department of Biostatistics, Vanderbilt University Medical Center, Nashville, Tennessee (Domenico);

Department of Medicine, Stanford University, Stanford, California (Hopkins); Department of Clinical Effectiveness and Quality Improvement, University of Pennsylvania Health System, Philadelphia (Sullivan); Department of Urology, Vanderbilt University Medical Center, Nashville, Tennessee (Dmochowski); Center for Quality, Safety and Risk Prevention, Vanderbilt University Medical Center, Nashville, Tennessee (Dmochowski, Hickson).

**Author Contributions:** Dr Cooper and Mr Domenico had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

**Concept and design:** Cooper, Spain, Guillamondegui, Kelz, Hopkins, Catron, Dmochowski, Hickson.

**Acquisition, analysis, or interpretation of data:**

Cooper, Spain, Guillamondegui, Domenico, Hopkins, Sullivan, Moore, Pichert, Webb, Dmochowski.

**Drafting of the manuscript:** Cooper, Guillamondegui, Domenico, Dmochowski, Hickson.

**Critical revision of the manuscript for important intellectual content:** Cooper, Spain, Guillamondegui, Kelz, Domenico, Hopkins, Sullivan, Moore, Pichert, Catron, Webb, Hickson.

**Statistical analysis:** Cooper, Domenico.

**Administrative, technical, or material support:** Cooper, Spain, Guillamondegui, Sullivan, Moore, Pichert, Catron, Dmochowski, Hickson.

**Supervision:** Cooper, Spain.

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