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THERAPY ARTICLES

Surgeon personality is associated with recommendation for operative treatment

Teun Teunis[1] · Stein J. Janssen[1] · Thierry G. Guitton[1] · Ana-Maria Vranceanu[2] · Bert Goos[3] · David Ring[1]

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Abstract

Purpose When surgeons disagree about the role of surgery, patient values and preferences should drive decision-making, but there is evidence that surgeon preferences have substantial influence. Surgeon preferences may relate to surgeon personality. Our primary null hypothesis is that specific personality characteristics (work styles) are not associated with the recommendation for operative treatment accounting for surgeon demographics.

Patients and Methods We invited members of the Science of Variation Group to assess images of 15 upper extremity injuries with debatable indications for surgery, recommended operative or non-operative treatment, and grade their confidence in this decision (n=270); subsequently, participants completed the validated Octogram Work and Leadership Style Test (n=223). We selected injuries that could be treated either operatively or non-operatively including fractures of the clavicle, scapula, humerus, and radius fractures, and proximal and distal bicep ruptures.

Results A higher proportion of recommendations for surgery was independently associated with a higher Octogram test pioneer score (β regression coefficient [β] 0.0054, partial R^2 0.065, 95 % confidence interval [CI] 0.0027–0.0080, $P<0.001$) and practice location outside North America and Europe (β 0.13, partial R^2 0.079, 95% CI 0.073–0.020, $P<0.001$) (adjusted R^2 0.12, $P<0.001$). No work styles were associated with more confidence in treatment.

Conclusions A recommendation for discretionary surgery for musculoskeletal injury was related to surgeon personality. Surgeon self-awareness of how their work style can influence their recommendations might make them more receptive to techniques that ensure patient values have more influence than surgeon preferences on treatment decisions.

Keywords Practice variation · Surgical decision-making · Work style

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✉ David Ring
dring@mgh.harvard.edu

Teun Teunis
teunteunis@gmail.com

Stein J. Janssen
steinjanssen@gmail.com

Thierry G. Guitton
guitton@gmail.com

Ana-Maria Vranceanu
avranceanu@mgh.harvard.edu

Bert Goos
b.goos@onlinetalentmanager.com

1 Orthopaedic Hand and Upper Extremity Service, Massachusetts General Hospital—Harvard Medical School, 55 Fruit Street, Boston, MA 02114, USA

2 Department of Psychiatry, Massachusetts General Hospital—Harvard Medical School, 55 Fruit Street, Boston, MA 02114, USA

3 Online Talent Manager, Claudius Prinsenlaan 126, 4818 CP Breda, The Netherlands

Introduction

There is substantial, largely unexplained, variation in the rate of surgery from surgeon to surgeon [2, 18, 19]. The study of unexplained variation and how to reduce it contributed to improved quality, safety, and resourcefulness in other fields [5], and many see the same potential in medicine [1, 2].

Disparity in illness burden and patient attitudes about medical intervention explain a small amount of the variation. Evidence suggests that surgical variation results mainly from differences in physician beliefs and variation in the extent to which patient preferences are incorporated into treatment decisions [2]. Physician beliefs seem related in part to training [7] and in part to personality characteristics, but we need more data. For instance, one study linked surgeon attitudes to readmission and reoperation rates [10].

Many conditions in orthopedic surgery can be treated with or without surgery. The likelihood a patient will choose surgery seems strongly related to the recommendations of their surgeon. Surgeons may not be aware of the influence they have on this decision, and they may not be aware of their reasons for their preferences. Incorporating patient preferences leads to more informed values-based choices and improved patient-practitioner communication [16]. Evidence that surgeon personality affects treatment recommendations might make surgeons more receptive to techniques that ensure patient values have more influence than surgeon preferences on treatment decisions.

Our primary null hypothesis is that specific work styles are not associated with the decision to operate accounting for surgeon demographics. Secondarily, we addressed [2] the influence of work style on surgeon confidence about their recommended treatment; and [18] the difference in confidence between surgeons recommending surgery or non-operative treatment.

Materials and Methods

Study Design

After the institutional review board approval, we approached 691 members of the Science of Variation Group of whom 270 (39 %) participated in this cross-sectional survey. This does not represent a response rate per se, because many of the surgeons we email do not regularly participate, and the email addresses have not been confirmed. Invitations were sent on June 6th 2014, followed by two reminders after 2 and 4 weeks to those who had not yet responded. The Science of Variation Group is an international collaboration of upper extremity surgeons that studies variation in the definition, interpretation, classification, and treatment of human illness. Acknowledgment, scientific curiosity, and camaraderie are the only incentives for participation.

Our survey was developed in an online survey tool (SurveyMonkey, Palo Alto, CA, USA) and consisted of 15 anonymized cases followed by a personality work style test. Cases consisted of a descriptive diagnosis (e.g., distal radius fracture), illustrated by one or two photos, radiographs, or 3D fracture reconstructions (Appendix 1), without additional patient information. We selected cases that could be treated either operatively or non-operatively including fractures of the clavicle, scapula, humerus, and radius fractures, and proximal and distal biceps ruptures (Table 1). Participants were asked: “What treatment do you recommend?” They had to choose either operative or non-operative. We calculated the proportion of cases treated operatively. We also asked participants: “How confident are you about this decision?” Confidence was graded on an 11-point ordinal scale, ranging from 0 (not at all confident) to 10 (very confident).

After rating all cases, participants were directed to a separate website where they completed the Octogram Work and Leadership Style Test (short: Octogram test [Online Talent Manager, Breda, The Netherlands]).

Work Style Test

The Octogram Work and Leadership Style Test is a validated survey that focuses on the personality traits that drive behavior in the workplace [12]. Previously, Quinn and Rohrbaugh described that the aspects of effective company management are contradicting to one another (focus on flexibility versus control; individual employees versus the overall organization); they coined this as the “competing values framework” [15]. From this framework flowed eight fundamental management roles [14]. The Octogram test is designed to identify the eight work styles that underpin the competing values framework and its roles. This model groups two related styles within each of the four quadrants identified in the competing values framework; contradicting styles are placed opposite one another. Styles measured are [2] pioneer and [18] networker, [19] achiever and [5] strategist, [1] anchor and [7] analyst, and [10] team player and [16] helper (Fig. 1) [13].

The Octogram test consists of 36 questions asking the participant to rank four statements about their own behavior at work from most to least applicable. Each statement is linked to one of eight work styles. The statement that ranked first, adds four points to its related style; the statement that ranked second, adds three points; and so on, resulting in a possible score ranging from 18 to 72 per work style. All items within each of the eight traits have a Cronbach’s alpha score higher than 0.70 with the trait they measure [12].

Study Population

Among the 270 surgeons that completed the survey, 223 (83 %) also completed the Octogram test. Nine percent (22

Table 1 Proportion of operative versus non-operative treatment and confidence in treatment choice n=270

Case	Description	Operative treatment % (number)	Non-operative treatment % (number)	Mean confidence in treatment if chosen surgery±SD	Mean confidence in treatment if chosen non-operative±SD	P value[a]
1	Displaced clavicle shaft fracture	45 % (121)	55 % (149)	7.4±2.0	7.6±1.8	0.55
2	Displaced lateral clavicle fracture	70 % (188)	30 % (82)	8.0±1.8	6.7±1.8	*<0.001*
3	Displaced acromioclavicular joint dislocation	17 % (47)	83 % (223)	7.6±2.3	7.9±2.2	0.37
4	Acromion fracture	50 % (134)	50 % (136)	7.3±2.0	6.3±2.2	*<0.001*
5	Coracoid fracture	40 % (107)	60 % (163)	6.8±2.2	6.5±2.4	0.42
6	Glenoid fracture	37 % (100)	63 % (170)	7.8±1.8	7.4±1.9	0.068
7	Proximal humerus surgical neck fracture	78 % (210)	22 % (60)	8.1±1.7	6.5±1.7	*<0.001*
8	Proximal humerus greater tuberosity fracture	13 % (36)	87 % (234)	7.6±1.8	7.9±1.8	0.32
9	Proximal humerus valgus impacted fracture	40 % (107)	60 % (163)	7.5±1.8	7.3±1.8	0.36
10	Proximal diaphyseal humerus fracture	34 % (91)	66 % (179)	7.6±1.8	7.2±1.7	0.086
11	Proximal bicep rupture	20 % (54)	80 % (216)	7.1±1.9	7.8±2.1	0.018
12	Distal diaphyseal humerus fracture	71 % (192)	29 % (78)	8.2±1.6	7.1±2.0	*<0.001*
13	Distal bicep rupture	87 % (235)	13 % (35)	8.0±1.9	6.3±2.5	*<0.001*
14	Distal radius fracture (1)	53 % (143)	47 % (127)	8.1±1.8	7.2±1.9	*<0.001*
15	Distal radius fracture (2)	38 % (103)	62 % (167)	7.6±1.9	7.8±2.0	0.45

Confidence is on a scale between 0 (no confidence) and 10 (completely confident)

[a] Italicized indicates significant difference in confidence

SD standard deviation

of 270) were women, and the majority practiced in North America (51 % [138 of 270]) and Europe (34 % [92 of 270]). The majority supervised trainees (88 % [237 of 270]) (Table 2).

The mean proportion of cases treated operatively was 0.46 (standard deviation ±0.17, range 0–0.87). Mean confidence score in the selected treatment was 7.5 (±1.1, range 2–9.7).

Statistical Analysis

We used frequencies to describe discrete variables; continuous variables are reported as means and standard deviations. To identify independent predictors for surgery and confidence, we performed two stepwise, backwards, multivariable linear regression analyses for all bivariate analyses (Appendix 2) with $P<0.10$, after changing all categorical values into dummy variables with the first variable exempted from analysis. Multivariable analyses only included participants who rated all cases and completed the Octogram test. A P value<0.05 was considered significant. Distribution of the data was assessed by visual inspection of histograms; subsequently, on bivariate analysis, we compared continuous and discrete variables by Student's t test or one-way analysis of variance; two continuous variables are compared by Pearson correlation.

A priori power analysis indicated that a sample of 215 participants would provide 90 % statistical power with α= 0.05 for an effect size and f^2=0.10 for regressions with ten main predictors.

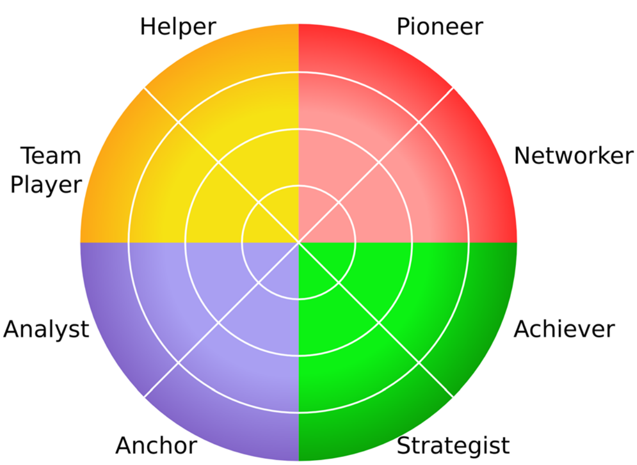

Fig. 1 Graphical depiction of the Octogram with its eight work styles

Results

Accounting for potential interaction of variables using multivariable analysis, a higher proportion of recommendations for surgery was independently associated with a higher pioneer score (β regression coefficient [β] 0.0054, partial R^2 0.065, 95 % confidence interval [CI] 0.0027–0.0080, $P<0.001$) and practice location outside North America and Europe (β 0.13, partial R^2 0.079, 95 % CI 0.073–0.020, $P<0.001$) (adjusted R^2

Table 2 Baseline characteristics of participants

Characteristics	Percentage (number) n=270
Women	8.5 % (23)
Practice location	
North America	51 % (138)
Europe	34 % (92)
Other	15 % (40)
Practice years	
0–5	37 % (99)
6–10	21 % (57)
11–20	26 % (71)
20–30	16 % (43)
Supervise trainees	88 % (237)
Specialization	
General	6.3 % (17)
Traumatology	35 % (95)
Shoulder-elbow	17 % (47)
Hand-wrist	34 % (93)
Other	2.6 % (7)
Resident	4.1 % (11)
Work styles	Mean±standard deviation (range) n=223
Pioneer	40±7.6 (24–62)
Networker	34±7.4 (18–59)
Achiever	47±8.8 (25–69)
Strategist	48±7.1 (29–63)
Anchor	50±8.1 (26–67)
Analyst	53±7.4 (28–68)
Team player	44±9.5 (23–66)
Helper	45±8.3 (27–63)

0.12, $P<0.001$). The β regression coefficient indicates that a 1-point increase in pioneer score results in an average increase of 0.54 % recommending surgical treatment; the proportion of cases treated surgically differs 0.29 between highest and lowest possible pioneer scores. Practicing outside North America and Europe results in a 0.13 increase in recommending surgical treatment, as compared to practicing within the United States (Table 3).

No work styles were associated with more confidence in treatment. Accounting for interaction between variables in multivariable analysis, confidence in treatment was independently associated with practice location outside North America and Europe (β 0.75, partial R^2 0.058, 95 % CI 0.38–1.1, $P<0.001$) and 11–20 years in practice (β 0.41, partial R^2 0.027, 95 % CI 0.11–0.70, $P=0.007$) (adjusted R^2 0.077, $P<0.001$). This indicates that a surgeon practicing outside North America and Europe on average has a 0.75-point higher confidence score than someone practicing within the United States. Surgeons practicing 11–20 years on average have a 0.41-point higher confidence score than surgeons practicing 0–5 years (Table 3).

With the exception of a proximal biceps rupture, practitioners selecting surgery had equal (n=8) or more confidence (n=6) in their decision than surgeons selecting non-operative treatment. Average confidence per injury ranged between 6.3 ±2.2 and 7.9±1.8 for non-operative treatment and between 6.8±2.2 and 8.2±1.6 when surgery was recommended (Table 1).

Discussion

There is substantial unexplained variation in rates of orthopedic surgery by surgeon [2, 18, 19]. Practice variation is related to increased healthcare cost [1]. Evidence suggests that surgical variation in part results from differences in physician beliefs values and preferences [2]. This variation may relate in part to surgeon personality. We found a higher pioneer score to be associated with a higher rate of surgery.

Table 3 Multivariable analyses of factors associated with operative treatment and confidence in recommended treatment

Variable	β Regression coefficient (95 % confidence interval)	Standard error	P value	Partial R^2	Adjusted R^2
Operative treatment					
Pioneer	0.0054 (0.0027–0.0080)	0.0014	*<0.001*	0.065	0.12
Practice location outside United States and Europe[a]	0.13 (0.073–0.20)	0.031	*<0.001*	0.079	
Confidence in recommended treatment					
Practice location outside United States and Europe[a]	0.75 (0.38–1.1)	0.19	*<0.001*	0.058	0.077
Practice years: 11–20[b]	0.41 (0.11–0.70)	0.15	*0.007*	0.027	

Italicized indicates statistically significant association

[a] As compared to surgeons practicing within the United States

[b] As compared to surgeons 0–5 years in practice

This study has some limitations. Personality and attitudes are complex and difficult to capture in a single test; we only measured one part of personality, namely working style. The group of surgeons that participated may not be representative of the average surgeon. In particular, the group of surgeons that are neither American nor European was small, and the observed differences might be spurious.

A higher pioneer score is associated with innovation and creativity. But trying out new things also implies the tendency to accept a certain level of risk. New ideas and methods are often more likely to fail than established practice, and often times, surgery carries more risk than non-operative treatment. The tendency of surgeons with a higher pioneer score to accept a higher level of risk, might explain why they are more likely to recommend surgery. In aviation, pilots with a more cautious work style (agreeing with "I am a very careful pilot" and "I am a very cautious pilot") had a lower risk of future accidents [9]. One previous study on hazardous attitudes among orthopedic surgeons found that higher macho attitude level—feeling the need to demonstrate superior ability [3]—explained 19 % of the variation in readmission and reoperation rate [10].

Previous work found a large variation in practice within the United States and United Kingdom [11, 17]. In our study, surgeons practicing outside Europe and North America differed in their recommendation for treatment and were more likely to recommend surgery.

Work styles measured by the Octogram Test were not associated with confidence in the recommended treatment. Previous study linked experience and being married to increased confidence in surgery trainees [4]. We found a slightly higher confidence score for surgeons 11–20 years in practice, but it is not clear how to interpret this finding, and it only explains a small amount of variation in confidence. As previous research linked higher confidence with increased job satisfaction in trauma surgeons [6], factors associated with confidence and their effect on treatment recommendation warrant additional study.

We found no difference in average confidence in a recommendation for surgery compared to a recommendation for non-operative treatment in eight of the 15 cases. Surgeons recommending opposite treatments can be equally confident about their decision.

Orthopedic surgeons tend to assume that variations in treatment are associated with variations in pathophysiology, and that patients with more advanced disease will seek more care. Our study builds on growing evidence that the decision for surgery is in part related to variations among surgeons' preferences, which relates in part to their work style. Patients, on average, prefer to take the lead in medical decision-making [8], and achieving this leads to more informed values-based choices, and improved patient-practitioner communication [16]. Surgeon self-awareness of how their work style can influence their recommendations might help increase the adoption of methods designed to help the patient determine their preferences and values and remain involved in decision-making.

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David Ring certifies that he, or a member of his immediate family, has or may receive payments or benefits during the study period from Wright Medical (USD less than 10,000) (Memphis, TN, USA); Skeletal Dynamics (USD less than 10,000) (Miami, FL, USA); Biomet (USD less than 10,000) (Warsaw, IN, USA); AO North America (USD less than 10,000) (Paoli, PA, USA); and AO International (USD less than 10,000) (Dubendorf, Switzerland).

Teun Teunis declares that he has no conflict of interest.

Stein J Janssen declares that he has no conflict of interest.

Theirry Guitton declares that he has no conflict of interest.

Ana-Maria Vranceanu declares that she has no conflict of interest.

Statement of Human and Animal Rights The work was performed at the Massachusetts General Hospital—Harvard Medical School. This study is approved by our institutional review board and is conducted in accordance with the Helsinki Declaration of 1975, as revised in 2000.

Statement of Informed Consent Informed consent is not applicable to this study design as participants of the SOVG signed up for such projects.

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