Scoring Correspondence in Outcomes Related to Erectile Dysfunction Treatment on a 4-Point Scale (SCORE-4)

Joseph C. Cappelleri, PhD, MPH,* Andrew G. Bushmakin, MS,* Tara Symonds, PhD,† and Gabriel Schnetzler, MD‡

*Pfizer Inc.—Global Research & Development, New London, CT, USA; †Pfizer Ltd Outcomes Research, Sandwich, UK; ‡Pfizer International Operations, Paris, France

DOI: 10.1111/j.1743-6109.2008.01155.x

ABSTRACT

Introduction. The Erection Hardness Score (EHS), a validated single-item patient-reported outcome (PRO), may provide a simple method to capture erectile dysfunction (ED) symptoms and to monitor treatment outcome.

Aim. To map the relationship between the EHS, which was used as the anchor, and other validated PROs: International Index of Erectile Function (IIEF), Quality of Erection Questionnaire (QEQ), Sexual Experience Questionnaire (SEX-Q), and Self-Esteem and Relationship questionnaire (SEAR).

Methods. Data were from a trial of flexible-dose sildenafil (50 or 100 mg) in 209 men with ED.

Main Outcome Measures. A mixed-effects repeated-measures model with EHS as a categorical explanatory variable and each of the other PROs, as a separate dependent variable, was applied to analyze the longitudinal data from randomization to the end of the 10-week, double-blind, placebo-controlled phase and the 6-week open-label phase. EHS data, which were generated at each sexual encounter (event), were averaged per patient over the same recall period that preceded administration of the other PRO questionnaires.

Results. Scores on all domains of the IIEF and SEX-Q, as well as the SEAR total score and SEAR Sexual Relationship domain, discriminated on all EHS categories. The QEQ total score discriminated on all EHS categories except EHS 1 and EHS 2. Although the model did not impose any functional relationship between PRO score and EHS, an approximately linear relationship existed between the EHS and all other PROs, which was especially pronounced for those PROs that were more directly related to erectile quality or function.

Conclusions. The relationship between discrete EHS categories and PRO scores demonstrates the close correspondence of erectile hardness with erectile function (IIEF), erection quality (QEQ), overall sexual experience (SEX-Q), and ED-related psychosocial factors (SEAR) in men with ED. Cappelleri JC, Bushmakin AG, Symonds T, and Schnetzler G. Scoring correspondence in outcomes related to erectile dysfunction treatment on a 4-point scale (SCORE-4). J Sex Med 2009;6:809–819.

Key Words. Erectile Dysfunction; Erection Hardness; Drug Therapy; Quality of Life; Function; Penile Erection; Satisfaction

Introduction

For a man, better sex encompasses improvements of both hardness and rigidity of his erection as well as his psychological response to the sexual experience and his partner’s satisfaction [1]. Erectile function, emotional well-being, and satisfaction-related concepts (i.e., individual satisfaction, couples satisfaction, and satisfaction with the quality of erections) are among the concepts used commonly in patient-reported outcome (PRO) instruments designed to assess sexual health [2].

Several PROs have been developed for use in the erectile dysfunction (ED) clinical trials program of sildenafil citrate. The International Index of Erectile Function (IIEF), which includes the domains of Erectile Function, Intercourse Satisfaction, Orgasmic Function, Sexual Desire, and Overall Satisfaction [3], has become the standard instrument to assess treatment efficacy in ED clinical trials research [4]. Additionally, the IIEF...
Erectile Function domain has become the gold standard to categorize erectile dysfunction (ED) severity in clinical trials [5]. The Quality of Erection Questionnaire (QEQ) is a specialized instrument that targets satisfaction with quality of erection, rather than erectile functioning more broadly [6]. The Sexual Experience Questionnaire (SEX-Q) is designed to capture the overall sexual experience by assessing erectile function (inclusive of hardness) and emotional well-being (Individual Satisfaction and Couples Satisfaction) [7]. The Self-Esteem And Relationship questionnaire (SEAR) addresses emotional well-being in its Confidence domain (including self-esteem and overall relationship satisfaction) and its Sexual Relationship Satisfaction domain [8]. All of these PROs have been validated [3,6–8] and, for some, estimated clinically meaningful differences in scores have been established [7,9,10]. Although the IIEF, QEQ, SEX-Q, and SEAR share some concepts, each is distinct and tailored to a specific objective [11].

Despite the proven benefit of using structured questionnaires in the clinical practice setting [12], the robustness of existing PROs, and the role of these instruments in clinical trials research, evidence suggests that usage is not very common in the clinical practice setting. For example, a single-item poll of approximately 500 attendees of an educational symposium at the 2007 Annual Congress of the European Society for Sexual Medicine revealed that only 44% of respondents usually assess ED treatment outcomes in their daily practice with a validated PRO [13]. This suggests that simpler tools are needed to monitor ED symptoms and treatment outcomes.

The Erection Hardness Score (EHS) is a valid, reliable, and responsive single-item PRO for assessing erection hardness (Table 1) [14]. It has recently been proposed as a simple measure to capture ED symptoms and to monitor treatment outcome [15]. Erection hardness is important to men and to women—94% of men and 87% of women reported that they believe erection hardness is important for a satisfying sexual experience, but only one-third of each sex were “very satisfied” with the hardness of their or their partner’s erection [16]. Beginning with the placebo-controlled clinical trials that established efficacy and supported regulatory approval of sildenafil in the 1990s for the treatment of ED, the EHS has been an integral part of the sildenafil clinical trials program [17,18].

Although the EHS is simple, it may act as a proxy for other aspects of male sexual health. An international expert panel reported that improvement in erection hardness from EHS 3 (hard enough for penetration but not completely hard) to the maximal EHS category (EHS 4, completely hard and fully rigid) was associated with improvement in erectile function assessed with the IIEF and in emotional well-being assessed with the SEAR ($P < 0.05$ for each) [15]. Also, EHS 4 correlated positively with overall sexual satisfaction assessed with the IIEF [19]. The odds of successful sexual intercourse for EHS 4 were 24 times greater than for EHS 3, and the indirect effect of sildenafil treatment on successful sexual intercourse via erection hardness accounted for almost 90% of the total effect on successful sexual intercourse [20]. Thus, achievement of hard erections may be considered a unifying factor that defines response to ED treatment [21], particularly the sentinel response of successful sexual intercourse, and EHS 4 could be recognized as the optimal goal of an ED therapy [15,21].

The objective of this analysis is to broaden the understanding of the role of erection hardness in sexual health by mapping the relationship between four categories of the EHS, used as the anchor, and key-validated PRO instruments that assess erectile function (IIEF), satisfaction with the quality of erections (QEQ), the sexual experience (SEX-Q), and emotional well-being (SEAR) in men with ED.

### Methods

#### Data Source

Data were from a parallel-group, randomized (1:1), 10-week, double-blind, placebo-controlled (DBPC) trial with 6-week open-label (OL) extension that was conducted at 20 centers in the United States and assessed the efficacy and safety of flexible-dose sildenafil (50 or 100 mg) for the treatment of men with ED [22]. Inclusion criteria were age ≥18 years, a diagnosis of ED (score ≤25 out of 30 on the Erectile Function domain of the IIEF)
in a stable sexual relationship for ≥6 months, previous use of ≤6 doses of sildenafil or any other phosphodiesterase type 5 inhibitor (PDE5i) in total and no dose within the previous 6 months, and written informed consent. Major exclusion criteria were hypotension (blood pressure <90/50 mm Hg) or uncontrolled hypertension (blood pressure >170/110 mm Hg), significant cardiovascular disease in the last 3 months, treatment with nitrates or nitric oxide donors, and current use of any other treatment for ED. The institutional review board and independent ethics committee at each center approved the protocol, and written informed consent was obtained from all subjects.

**Outcomes**

At each occasion of sexual activity (event), the EHS questionnaire was completed. At week 0 (baseline), weeks 6 and 10 (during the DBPC treatment phase), and week 16 (end of the OL phase), assessments included the domains and individual questions of the IIEF (score range 1–30 [Erectile Function domain], 0–15 [Intercourse Satisfaction domain], 0–10 [Orgasmic Function domain], and 2–10 [Sexual Desire and Overall Satisfaction domains]) [3], the QEQ (transformed score range, 0–100) [6,24], the domains and individual questions of the SEX-Q (transformed score range, 0–100) [7], and the components of the SEAR questionnaire (transformed score range, 0–100) [8,25,26].

**Analyses**

A mixed-effects, repeated-measures model with EHS as a categorical explanatory variable and each of the other PROs as a dependent variable was applied to analyze the longitudinal data from randomization to the end of the 10-week DBPC phase and to the end of the 6-week OL phase. The procedure PROC MIXED in SAS was used to model the data [27]. All analyses were performed using SAS/STAT Version 8.2 (SAS Institute, Cary, NC, USA) [28].

Included were data from administration of the IIEF, QEQ, SEX-Q, and SEAR at week 0 (baseline), week 6 (interim), week 10 (end of the DBPC phase), and week 16 (end of the OL phase), and from the EHS recorded at each event. Responses to IIEF, QEQ, SEX-Q, and SEAR items were based on recall from the previous 4 weeks or, at baseline, from the 2 weeks since screening. EHS data from multiple events were averaged per patient over those same recall periods.

Averaging created a continuous EHS in reference to its original five discrete categories (0–4). However, because the objective was to map the scales of the other four questionnaires (IIEF, QEQ, SEAR, SEX-Q) onto the original EHS categories, the continuous averaged EHS was recategorized: 0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, and 4. Categories 1.5, 2.5, and 3.5 (the midpoints between EHS categories 1 and 2, 2 and 3, and 3 and 4, respectively) were defined a priori as cutoff scores on the EHS for the purpose of mapping IIEF, QEQ, SEAR, and SEX-Q scores onto the EHS (the specific algorithm is given below).

In mapping IIEF, QEQ, SEAR, and SEX-Q scores onto the EHS, the EHS was used as an anchor and components of the other questionnaires were used as outcomes. IIEF, QEQ, SEAR, and SEX-Q were collected longitudinally, which allowed for a longitudinal analysis of all available data starting with randomization up to the end of the OL phase in a consistent, integrated model. EHS was used as a categorical variable, meaning that there was no predefined functional relationship between EHS and the other PROs.

For the mapping of the other PRO scales onto the EHS to be discernible and discriminative for a “perfect” correspondence, the differences between EHS cutoff categories must be statistically significant and the difference between EHS “centers” of intervals must be statistically significant as well, according to the criteria of the mapping algorithm (as described in the footnote to Table 2). EHS categories 0 and 1 were not pooled during the calculation but pooled in interpreting the results to help arrive at a 4-point metric.

**Results**

The population consisted of 209 men (mean age, 52 years), of whom 78% were white and 11% were black. The most common (>10%) reported concomitant medical conditions were consistent with those generally associated with ED, including hypertension (39%), hypercholesterolemia (22%), benign prostatic hyperplasia (17%), and diabetes (16%). At baseline, the mean ED duration was 4 years and the mean (SD) IIEF Erectile Function domain score was 15 (6), defined as moderate ED [5], although the sample spanned the spectrum of ED severities: mild (15%), mild-to-moderate (31%), moderate (24%), and severe (30%).

Except for the QEQ total score (which was not differentiated between EHS 1 and EHS 2) and scores on the SEAR Confidence domain and its
## Table 2  Cutoff scores by EHS

<table>
<thead>
<tr>
<th>Questionnaire (score range)</th>
<th>EHS 0 and 1</th>
<th>EHS 2</th>
<th>EHS 3</th>
<th>EHS 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penis does not enlarge or penis is larger but not hard</td>
<td>≤12</td>
<td>13–17</td>
<td>18–25</td>
<td>≥26</td>
</tr>
<tr>
<td>Penis is hard but not hard enough for penetration</td>
<td>≤6</td>
<td>7–9</td>
<td>10–12</td>
<td>≥13</td>
</tr>
<tr>
<td>Orgasmic Function (0–10)</td>
<td>≤5</td>
<td>6</td>
<td>7–8</td>
<td>≥9</td>
</tr>
<tr>
<td>Sexual Desire (2–10)</td>
<td>≤6</td>
<td>7</td>
<td>8</td>
<td>≥9</td>
</tr>
<tr>
<td>Overall Satisfaction (2–10)</td>
<td>≤5</td>
<td>6</td>
<td>7–8</td>
<td>≥9</td>
</tr>
<tr>
<td>QEQ (0–100)</td>
<td>≤48 (the EHS did not differentiate the data)</td>
<td>49–79</td>
<td>≥80</td>
<td></td>
</tr>
<tr>
<td>QEQ total score</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEX-Q (0–100)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erection domain</td>
<td>≤24</td>
<td>25–38</td>
<td>39–67</td>
<td>≥68</td>
</tr>
<tr>
<td>Individual Satisfaction domain</td>
<td>≤45</td>
<td>46–52</td>
<td>53–72</td>
<td>≥73</td>
</tr>
<tr>
<td>Couples Satisfaction domain</td>
<td>≤30</td>
<td>31–36</td>
<td>37–57</td>
<td>≥58</td>
</tr>
<tr>
<td>Total score</td>
<td>≤30</td>
<td>31–40</td>
<td>41–64</td>
<td>≥65</td>
</tr>
<tr>
<td>SEAR (0–100)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sexual Relationship Satisfaction domain</td>
<td>≤38</td>
<td>39–47</td>
<td>48–70</td>
<td>≥71</td>
</tr>
<tr>
<td>Confidence domain</td>
<td>≤80 (the EHS did not differentiate the data)</td>
<td></td>
<td></td>
<td>≥81</td>
</tr>
<tr>
<td>Self-Esteem subscale</td>
<td>≤79 (the EHS did not differentiate the data)</td>
<td></td>
<td></td>
<td>≥80</td>
</tr>
<tr>
<td>Overall Relationship Satisfaction subscale</td>
<td>≤83 (the EHS did not differentiate the data)</td>
<td></td>
<td></td>
<td>≥84</td>
</tr>
<tr>
<td>Total score</td>
<td>≤47</td>
<td>48–53</td>
<td>54–73</td>
<td>≥74</td>
</tr>
</tbody>
</table>

*For another PRO (IIEF, QEQ, SEX-Q, SEAR) to be “cleanly” or perfectly mapped to EHS 1 and EHS 2, the estimated (modeled) difference in the mean scores of that PRO must be statistically significant (at the 0.05 level of significance) between EHS cutoff categories 1.5 and 2.5 and between EHS 1 (the center of the EHS interval 0 to 1.5) and EHS 2 (the center of the EHS interval 1.5 to 2.5); similarly, for perfect mapping to EHS 2 and EHS 3, the estimated difference in the mean scores of a PRO must be statistically significant between EHS cutoff categories 1.5 and 2.5, between EHS cutoff categories 2.5 and 3.5, and between EHS 2 (the center of the EHS interval 1.5 to 2.5) and EHS 3 (the center of the EHS interval 2.5 to 3.5).

EHS = Erection Hardness Score; IIEF = International Index of Erectile Function; QEQ = Quality of Erection Questionnaire; SEAR = Self-Esteem And Relationship questionnaire; SEX-Q = Sexual Experience Questionnaire.
Self-Esteem and Overall Relationship Satisfaction subscales (which was only differentiated by EHS 4), each EHS cutoff category differentiated scores on all other PRO components (Table 2). Using the IIEF Erectile Function domain score as an example, on average, men with EHS 0 or 1 were more likely to have a score of ≤12, men with EHS 2 were more likely to have a score of 13 to 17, men with EHS 3 were more likely to have a score of 18 to 25, and men with EHS 4 were more likely to have a score of 26 to 30. In contrast, a QEQ total score of ≤48 was not differentiated by EHS, but a score of 49 to 79 mapped onto EHS 3 and a score of 80 to 100 mapped onto EHS 4. The remaining results share the same type of interpretation.

The model did not impose any functional relationship between PRO component score and EHS. However, a strong and approximately linear relationship existed between each mean PRO score and EHS, which was especially pronounced for those scales that were more directly related to erectile quality or function (Figures 1–4). Also, at each assessment time, there was a positive correlation between each mean PRO component score and EHS, with the range of r values across assessments being ≥0.75 for scores on the IIEF Erectile Function domain; ≥0.5 for scores on the IIEF Intercourse Satisfaction domain, QEQ, and SEX-Q Erection domain; and ≥0.25 for scores on all other PRO components except the IIEF Sexual Desire domain, for which the r range was 0.19–0.49.

Discussion

The EHS, IIEF, QEQ, SEX-Q, and SEAR complement and supplement each other in assessing the multiple dimensions of sexual dysfunction and its treatment [11]. Each represents a significant contribution to sexual medicine research and, when used judiciously and appropriately, can help provide optimal patient care.

The relationship between discrete EHS categories and scores on the components of the IIEF, QEQ, SEX-Q, and SEAR demonstrates the close correspondence between erection hardness and erectile function, satisfaction with erection quality, the sexual experience, and emotional well-being in men with ED. This supports previously published data in men with ED, which showed that achievement of the maximal EHS (EHS 4) was associated with improvement in erectile function assessed with the IIEF and in emotional well-being assessed with the SEAR [15], and correlated positively with erectile function assessed with the IIEF [29], satisfaction with erection quality assessed with the QEQ [24], the sexual experience assessed with the SEX-Q [22], emotional well-being assessed with the SEAR [29], and sexual satisfaction (intercourse, sexual relationship, and overall sex life) assessed with the IIEF [19,29].

The National Institutes of Health define ED as the inability to attain or maintain an erection sufficient for satisfactory sexual performance [30]. While items on the Erectile Function domain of the IIEF directly address maintenance of erection at a single assessment, as well as over time [3,5,23], the EHS captures the maintenance of erection by measuring changes in erection hardness over regular time assessments, across sexual encounters with a daily event log [11]. Loss of erection hardness impairs a man’s ability to achieve or maintain vaginal penetration, and the ability to attain a firm and sustained erection is fundamental to satisfactory and acceptable sexual function [15].

Our results show a very close correspondence between the IIEF Erectile Function domain score cutoffs that mapped onto the different EHS categories and those that are well recognized as defining ED severity categories [5]. This suggests that the EHS can be used to diagnose ED severity: the IIEF Erectile Function domain score that mapped onto EHS 0 and 1 (≤12) corresponds to that for severe ED (6–10); the score for EHS 2 (13–17) corresponds to that for moderate ED (11–16); the score for EHS 3 (18–25) corresponds to that for mild-to-moderate ED (17–21) and mild ED (22–25); and a score of ≥26 indicates both EHS 4 and no ED.

With each increase in EHS from EHS 1 to EHS 4, we expected and found that the associated score for each component of the tested PROs would either remain unchanged or increase. It was also expected and found that some component scores would overlap between EHS categories. The data suggest the degree to which the selected PRO score can be cleanly mapped onto the four points of the EHS (SCORE-4). Comparison of the degree of clean mapping between the four measures (IIEF, QEQ, SEX-Q, and SEAR) shows variation across the measures in sensitivity to erection hardness. For example, the Erectile Function domain of the IIEF showed high sensitivity to the EHS, demonstrated by the differentiation of its score into four mutually exclusive or distinct levels, each corresponding to an EHS category. In contrast, although the QEQ total score was also sensitive to the EHS, it was not differentiated by the lower categories of the EHS, suggesting that an erection must be achieved to...
Figure 1 IIEF domains vs. EHS categories (modeled least squares means). IIEF score ranges: 1–30 (Erectile Function domain [A]); 0–10 (Orgasmic Function domain [B]); 2–10 (Sexual Desire domain [C]); 0–15 (Intercourse Satisfaction domain [D]); and 2–10 (Overall Satisfaction domain [E]). EHS = Erection Hardness Score; IIEF = International Index of Erectile Function.
quantify its quality and that satisfaction with erection quality may be uniformly low unless it is sufficient for penetration.

An increase in PRO score with no overlap at each discrete EHS category up to EHS 4 was found for all domains of the IIEF and SEX-Q, as well as for the Sexual Relationship Satisfaction domain and total score of the SEAR. This suggests that these PROs are highly sensitive to changes in erection hardness.

The scores of the Confidence domain, Self-Esteem subscale, and Overall Relationship Satisfaction subscale of the SEAR were only differentiated by EHS 4, suggesting that, compared with the other tested PROs, these psychosocial factors of emotional well-being have a broader relationship with erection hardness other than for a distinct improvement when completely hard and fully rigid erections are achieved. Although the scores of the Confidence domain, Self-Esteem subscale, and Overall Relationship Satisfaction subscale of the SEAR could not be mapped unambiguously onto the EHS, we still observed an approximately linear relationship between these scores and the EHS, thereby demonstrating that erection hardness also plays an important role in these psychosocial factors of emotional well-being.

The results of the SCORE-4 analyses are important because they relate the EHS categories, which have clinical importance and ease of interpretation, to scores on four key PROs (IIEF, QEQ, SEX-Q, and SEAR). This relationship enriches the interpretation of these four PROs. The relationship also enables a simple, single-item PRO—the EHS—to be used to capture ED symptoms and to monitor treatment outcome across multiple domains or different aspects of ED, thus lending encouragement to the use of the EHS in clinical practice. The results of the current investigation provide independent confirmation to support the findings of an observational study of 1,492 men with ED who consulted a general practitioner or urologist—namely that erection hardness is “very important” to most (89%) men with ED and a structured questionnaire, including the EHS, is useful to facilitate discussion about ED in general practice [12].

There are several possible limitations of the SCORE-4 analyses. The data were from men who had little or no previous experience with PDE5i treatment for their ED. However, given that the data were collected across a 16-week period of active PDE5i treatment, the inferences of the model are unlikely to differ substantially in men who have experience using PDE5i therapy on a regular or routine basis because the last 6 weeks of the treatment (OL extension) can be viewed as a proxy for men who have experience using PDE5i therapy on a regular or routine basis. The data set was not internationally diverse but was limited to men enrolled at 20 centers in the United States. Nonetheless, the consistency of response on
the EHS across different geographic regions [17,24,29] suggests that the inferences from the model are unlikely to differ substantially by region. Although the data were from men with a wide range of comorbidities common to men with ED, the inferences of the model cannot be attributed to men with a specific comorbidity, which would require a prospectively planned study (e.g., a study of men with ED who have diabetes). Worthwhile for future research would be the study of patient and physician attitudes about the EHS in comparisons with other PROs.

In conclusion, this research provides further empiric testimony to the importance of the assessment of erection hardness (and the other PRO measures) in evaluating ED and as a treatment outcome in ED via the four scores on the EHS. Furthermore, because EHS 4 corresponded to the best outcome on the other PRO measures, this research lends further support to recognizing EHS 4 as the optimal goal of an ED therapy. The EHS can be considered a proxy for other PRO measures, namely IIEF, QEQ, SEX-Q, and SEAR, which indicates that the usefulness of the EHS goes beyond just assessing hardness. Although the EHS was developed for and has been used as a measurement tool in clinical trials, it can also play an important role in ED management.
Figure 4 SEAR Sexual Relationship Satisfaction domain (A), Confidence domain (B), Self-Esteem subscale (C), Overall Relationship Satisfaction subscale (D), and total score (E) vs EHS categories (modeled least squares means). SEAR questionnaire transformed score range, 0–100. EHS = Erection Hardness Score; SEAR = Self-Esteem And Relationship Questionnaire.
Acknowledgments

This study was funded by Pfizer Inc., the manufacturer of sildenafil. All authors are employees and shareholders of Pfizer. The data for these analyses were obtained from a clinical trial sponsored by Pfizer Inc. (NCT00147628). Editorial support was provided by Deborah M. Campoli-Richards, BSPHA, RPh, of Complete Healthcare Communications, Inc., and was funded by Pfizer Inc.

Corresponding Author: Joseph C. Cappelleri, PhD, MPH, Pfizer Inc.—Global Research & Development, New London, CT 06320, USA. Tel: (860) 732-8668; Fax: (860) 715-7879; E-mail: joseph.c.cappelleri@pfizer.com

Conflict of Interest: Andrew G. Bushmakin, Joseph C. Cappelleri, Tara Symonds, and Gabriel Schnetzler are employees of Pfizer.

Statement of Authorship

Category 1

(a) Conception and Design
Joseph C. Cappelleri; Andrew G. Bushmakin; Tara Symonds; Gabriel Schnetzler

(b) Acquisition of Data
Joseph C. Cappelleri; Andrew G. Bushmakin; Tara Symonds; Gabriel Schnetzler

(c) Analysis and Interpretation of Data
Joseph C. Cappelleri; Andrew G. Bushmakin

Category 2

(a) Drafting the Article
Joseph C. Cappelleri; Andrew G. Bushmakin; Tara Symonds; Gabriel Schnetzler

(b) Revising It for Intellectual Content
Joseph C. Cappelleri; Andrew G. Bushmakin; Tara Symonds; Gabriel Schnetzler

Category 3

(a) Final Approval of the Completed Article
Joseph C. Cappelleri; Gabriel Schnetzler

References


