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Survey article

# Survey of trends in authorship assignment in gynecologic oncology: Keeping score and playing fair

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ABSTRACT

Authorship confers credit to those responsible for a publication. In 1985, the International Committee of Medical Journal Editors criteria were founded to standardize authorship assignment. We sought to investigate practices and values in authorship assignment in Society of Gynecologic Oncology (SGO) members. An anonymous online survey was distributed to SGO members from 09/2018–10/2018. Three multivariable logistic regression models were fit to predict ICJME authorship acceptance, assignment and denial. Of 1111 members surveyed, 266 responses were received (23.9%); 30.6% reported prior authorship assignment that did not meet ICMJE criteria, and 18.8% (n = 50) reported a history of accepting authorship not meeting ICJME criteria. Reasons for non-adherence included: inclusion of the author's patients in the study (59.3%), resumé building (45.7%), and networking for career advancement (22.2%). The majority responded that ICJME criteria were generalizable (91.3%), helpful (83.8%), and considered non-adherence as scientific misconduct (66.0%). On multivariable analysis, practice duration of 5–20 years (HR 0.40, 95% CI 0.16, 0.99, $p < 0.05$) or > 20 years (HR 0.22, 95% CI 0.08, 0.59, $p < 0.05$) were significant predictors for adherence with ICMJE authorship assignment compared to fellows and those in practice < 5 years. Similarly, practice duration of 5–20 years (HR 10.0, 95% CI 2.0, 49.2, $p < 0.05$) or > 20 years (HR 25.9, 95% CI 1.06, 3.9, $p < 0.05$) were significant predictors for denial of authorship assignment compared to fellows and those in practice < 5 years. While the majority of respondents report that ICJME criteria are helpful, adherence to these criteria is a concern, especially in fellows and early-career faculty.

## 1. Introduction

Authorship confers credit and accountability to those responsible for a published work and has implications for academic advancement (Anonymous Uniform requirements for manuscripts submitted to biomedical journals. International Committee of Medical Journal Editors, JAMA. 277, 1997; International Committee of Medical Journal Editors, xxxx). Concerns regarding the frequency and consequences of improper authorship assignments have been reported for decades (Flanagin et al., 1998; Bates et al., 2004; Khan et al., 1999; Shapiro et al., 1994). In 1985, the International Committee of Medical Journal Editors (ICMJE) founded criteria to standardize authorship assignment with four components: 1) participating substantially in project design, data extraction or analysis, 2) drafting of the manuscript, 3) revision of the document and 4) approval of and willingness to be held accountable for the final published work (Anonymous Uniform requirements for manuscripts submitted to biomedical journals. International Committee of Medical Journal Editors, JAMA. 277, 1997; International Committee of Medical Journal Editors, xxxx). Despite guidelines designed to help with authorship allocation, studies have demonstrated that non-adherence to authorship criteria is frequent (Flanagin et al., 1998; Bates et al., 2004; Khan et al., 1999; Shapiro et al., 1994; Vera-Badillo et al., 2016; Momeni

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et al., 2018; Rajasekaran et al., 2015; Moulton et al., 2017).

High rates of non-adherence to authorship criteria have been reported in postgraduate medical trainees, related primarily to lack of knowledge of guidelines and resources (Momeni et al., 2018; Rajasekaran et al., 2015). In a survey of resident physicians, non-adherence to ICJME criteria was 38.1%, with 90.1% unaware of the criteria (Rajasekaran et al., 2015). In a study by Moulton et al., gynecologic oncology fellows were surveyed regarding their research experiences and practices, including authorship assignment (Moulton et al., 2017). Approximately one-half endorsed prior authorship assignment not meeting authorship criteria, with lack of knowledge reported in only 10% of cases (Moulton et al., 2017). Understanding current authorship assignment practices and the perceived utility of authorship criteria within the gynecologic oncology research community is essential to ensuring the publication of high quality, ethical research with appropriate credit. This study was designed to investigate perceptions regarding the applicability and generalizability of ICJME criteria and the current practice in authorship assignment, acceptance, and denial within the gynecologic oncology community.

## 2. Methods

### 2.1. Study design, survey creation, and variables

In collaboration with all authors, we designed an anonymous electronic survey to investigate perceptions regarding the applicability and generalizability of ICJME criteria and current practices with authorship assignment within the gynecologic oncology community (Anonymous Uniform requirements for manuscripts submitted to biomedical journals. International Committee of Medical Journal Editors, JAMA. 277, 1997; International Committee of Medical Journal Editors, xxxx). This study was approved by the Institutional Review Board at the Cleveland Clinic and the Society of Gynecologic Oncology (SGO). An informed consent waiver was included at the beginning of the survey.

The 17 question survey was designed to assess demographics, perceptions, and values of ICJME criteria and prior authorship assignment and acceptance practices. (Supplement 1). Demographic information queried included duration of practice, gender, practice setting, geographical region, teaching responsibilities, and the number of total and career publications. Participants were queried about the generalizability and usefulness of ICJME criteria, whether authorship should be adjusted dependent on level of practice and research experience, and if non-compliance with authorship assignment criteria should be viewed as scientific misconduct. Finally, prior authorship practices were assessed through the respondent's personal history of assignment and authorship acceptance not meeting ICJME criteria. Among those reporting non-adherence, the reasons were determined. Also, respondents were queried regarding the timing of authorship role assignment and whether they had previously turned down authorship that did not meet criteria and reason for non-acceptance.

## 3. Study participants

An electronic mail invitation to participate in the anonymous study was distributed to all fellow, candidate, and full members of the SGO in September and October of 2018. Members were invited to participate in a voluntary, confidential online survey via the RedCAP website and were given the option to opt-out of the study and receive no further email invites (Harris et al., 2009). Non-responding members were sent two additional automated email requests to participate at 2-week intervals with completion of study recruitment in early October of 2018. No identifying data was collected. The survey response rate was calculated by number of surveys received divided by invited participants.

### 3.1. Data analysis

All surveys were used for the final analysis. Survey responses were analyzed via descriptive statistics and Fisher's exact test, and Chi-Square tests. Selected co-variates used to compare survey responses included duration of practice, gender, location of practice, and ongoing research participation. Two-tailed p-values $< 0.05$ were considered significant. Three multivariable logistic regression models were fit separately to predict authorship assignment, acceptance, and denial.

## 4. Results

### 4.1. Respondent demographics and research activities

Of the 1111 members surveyed, 266 responses were received (23.9%), 25 members had non-functional email addresses, and 6 declined participation; 54.1% (n = 144) were female and 45.5% (n = 121) were male. Approximately one-third of the cohort (36.4%; n = 97) were in their fellowship or first five years of practice, and one third (29.3%; n = 78) reported at least 20 years of experience. The majority of responding members practiced in an academic (65.9%; n = 174) or hybrid academic (21.2%; n = 56) practice settings. Participation in the education of either residents (86.5%; n = 230), medical students (85.0%; n = 226) or fellows (46.6%; n = 124) was frequently reported (Table 1). The majority reported one or more publication(s) within the past year (78.9%, n = 210).

## 5. Authorship assignment and acceptance practices

The majority of responding members felt that the ICJME criteria were generalizable (91.3%; n = 242) and helpful (83.8%; n = 233) in delineating authorship roles in gynecologic oncology. However, approximately one-half felt that authorship criteria should be individualized for years in practice (47.7%; n = 127) or type of research performed (52.8%; n = 140). Notably, 66.0% (n = 173) felt that non-adherence to authorship criteria was a type of scientific misconduct. Perceived pressure to add authors not meeting criteria to a study for academic advancement was reported by 42.5% (n = 113) of respondents (Table 2). Only 21.7% of respondents (n = 57) endorsed discussing authorship roles before Institutional Review Board submission.

Approximately one-third of respondents (30.6%; n = 81) reported assigning authorship not meeting ICJME criteria. Furthermore, an additional 30.6% (n = 81) reported awareness of this practice occurring within the field (Fig. 1A). Leading reasons for guideline non-adherent assignment of authorship were the inclusion of that author's patients in the study (59.3%; n = 48), resume building (45.7%; n = 37), networking for career advancement (22.2%; n = 18), meaningful contributions outside of the authorship criteria (40.7%; n = 33), and the co-author being an important career mentor (29.6%; n = 24).

Among responding members, 18.8% (n = 50) reported accepting authorship not meeting ICMJE criteria; an additional 28.6% (n = 76) acknowledged awareness of this practice. Reported reasons included making meaningful contributions to the study aside from the authorship guidelines (48.0%; n = 24), use of their patients in the study (20.0%; n = 10), and improving their curriculum vitae (14.0%; n = 7). Approximately one-third (33.6%; n = 89) reported a history of declining authorship on a paper when they felt they did not meet the criteria. Reported reasons for authorship denial included not contributing significantly (67.9%; n = 55) and disagreement with study methods/conclusions (9.9%; n = 8) or conduct (3.7%; n = 3). When queried regarding components of ICMJE authorship criteria, the majority felt that "substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work" was the most important regardless of study type.

**Table 1**
Demographic Information for Survey Respondents.

| Variable | N (%) |
|---|---|
| **Practice Duration** | |
| Fellow-in-training | 45 (17.0) |
| <3 years | 32 (12.1) |
| 3–5 years | 20 (7.5) |
| >5–10 years | 36 (13.6) |
| >10–15 years | 29 (10.9) |
| >15–20 years | 25 (9.4) |
| >20–25 years | 18 (6.8) |
| >25 years | 60 (22.6) |
| **Practice Location** | |
| US - Midwest - IL, IN, MI, OH, WI | 39 (14.7) |
| US - East South Central - AL, KY, TN, MS, MO, NC, SC | 18 (6.8) |
| US - Middle Atlantic - NJ, NY, PA | 45 (16.9) |
| US - Northeast - CT, ME, MA, NH, RH, VT, RI | 30 (11.3) |
| US - Pacific - CA, HI, OR, WA | 26 (9.8) |
| US - South Atlantic - DE, DC, FL, GA, MD, MC, SC, VA, WV | 51 (19.2) |
| US - West North Central - IA, KS, MN, NE, ND, SD, CO, MT, WY | 16 (6.0) |
| US - West South Central - AK, LA, OK, TX, AR, ID | 29 (10.9) |
| US – Southwest -AZ, NM, UT, NV | 3 (1.1) |
| Canada | 4 (1.5) |
| Europe | 3 (1.1) |
| Australia | 0 (0.0) |
| Africa | 0 (0.0) |
| Asia | 2 (0.7) |
| **Gender** | |
| Female | 144 (54.1) |
| Male | 121 (45.5) |
| Prefer to not answer | 1 (0.3) |
| **Practice Setting** | |
| Academic | 174 (65.9) |
| Private Practice | 22 (8.3) |
| Hybrid | 56 (21.2) |
| Military | 4 (1.5) |
| Other | 8 (3.0) |
| **Teaching Duties** | |
| Fellows | 124 (46.6) |
| Residents | 230 (86.5) |
| Medical Students | 226 (85.0) |
| Other | 32 (12.0) |
| Current Research Participation | |
| Single institution prospective studies/clinical trials | 146 (54.9) |
| Multicenter prospective studies/clinical trials | 150 (56.3) |
| Retrospective studies | 186 (69.9) |
| Basic Science/Translational | 106 (39.9) |
| None | 25 (9.4) |
| **Career Total Publications** | |
| 0 | 5 (1.9) |
| 1–10 | 83 (31.4) |
| 11–20 | 51 (19.3) |
| 21–30 | 26 (9.8) |
| 31–50 | 18 (6.8) |
| 51–100 | 34 (12.9) |
| 101–200 | 31 (11.7) |
| >200 | 16 (6.1) |
| **Career First Author Publications** | |
| 0 | 11 (4.1) |
| 1–10 | 147 (55.3) |
| 11–20 | 54 (20.3) |
| 21–30 | 14 (5.3) |
| 31–50 | 18 (6.8) |
| 51–100 | 14 (5.3) |
| 101–200 | 6 (2.3) |
| >200 | 2 (0.8) |

Statistics presented as N (%).

**Table 2**
Provider Trends and Values Towards Authorship Assignment Practices.

| Variable | N (%) |
|---|---|
| **The ICMJE authorship criteria are generalizable and appropriate to the gynecologic oncology publishing culture** | |
| True | 242 |
| False | (91.3) |
| | 23 (8.7) |
| **The ICMJE authorship criteria are helpful in delineating authorship roles in gynecologic oncology** | |
| True | 233 |
| False | (83.8) |
| | 43 (16.2) |
| **Criteria for authorship roles should be individualized by each publisher or journal** | |
| True | 63 (24.1) |
| False | 198 |
| | (75.9) |
| **Non-adherence to ICMJE authorship criteria is always a type of scientific misconduct.** | |
| True | 173 |
| False | (66.0) |
| | 89 (34.0) |
| **Authorship criteria should be adjusted for level of practice (ie: resident/fellow versus attending)** | |
| True | 127 |
| False | (47.7) |
| | 139 |
| | (52.3) |
| **Authorship criteria should be individualized for the type of research being performed (basic science research, retrospective, clinical trials or prospective research)** | |
| True | 140 |
| False | (52.8) |
| | 125 |
| | (47.2) |
| **I feel pressure to add authors to my study who may not meet ICMJE criteria for academic advancement.** | |
| True | 113 |
| False | (42.5) |
| | 153 |
| | (57.5) |

Statistics presented as N (%).

## 6. Predictors of ICMJE criteria non-adherence

Responses to survey questions were compared by demographic characteristics (Table 3). Fellows in training (n = 16; 19.8%) and those in practice less than three years (n = 20; 24.7%) reported significantly higher rates of assigning authorship to those not meeting criteria compared to those in later stages of practice (3–5 years – n = 6, 7.4%; 5–10 years – n = 11, 13.6%, 10–15 years – n = 5, 6.2%, 15–20 years – n = 9, 11.1%, 20–25 years – n = 4, 4.9%, >25 years – n = 10, 12.4%, $p < 0.001$). Female gynecologic oncologists were more likely to report assigning authorship not meeting ICMJE criteria (55.6% vs. 43.2%, $p = 0.01$). The incidence of accepting authorship not meeting authorship criteria was higher among fellows and those in their first ten years of practice (62.0%; n = 31) compared to those in practice for greater than ten years (38.0%; n = 19) ($p = 0.03$).

Among members who reported declining authorship not meeting ICMJE criteria, those in practice>25 years were more likely to report having turned down authorship (n = 35; 40.0%) compared to those earlier in practice (fellows – n = 2, 2.3%; <3 years – n = 4, 4.6%; 3–5 years – n = 5, 5.7%; 5–10 years – n = 11, 12.5%; 10–15 years – n = 11; 12.5%, 15–20 years – n = 13, 14.8%; 20–25 years – n = 7, 8.0%; $p < 0.001$). Similarly, those reporting teaching fellows were significantly more likely to have turned down authorship (71.9%; n = 64) compared to those not teaching fellows (28.1%; n = 25) ($p < 0.001$).

On multivariable analysis controlling for length of practice duration, academic practice, and gender, practice duration of 5–20 years (HR 0.40, 95% CI 0.16, 0.99, $p < 0.05$) or>20 years (HR 0.22, 95% CI 0.08, 0.59, $p < 0.05$) were significant predictors for non-adherence with authorship assignment compared to fellows and those in the first five years of training. Similarly, when controlling for length of practice duration, academic practice, and gender, practice duration of 5–20 years (HR 10.0, 95% CI 2.0, 49.2, $p < 0.05$) or>20 years (HR 25.9, 95% CI 1.06, 3.9, $p < 0.05$) were significant predictors for denial of authorship assignment compared to fellows and those in the first five years of training. Also, participation in basic science or translational research

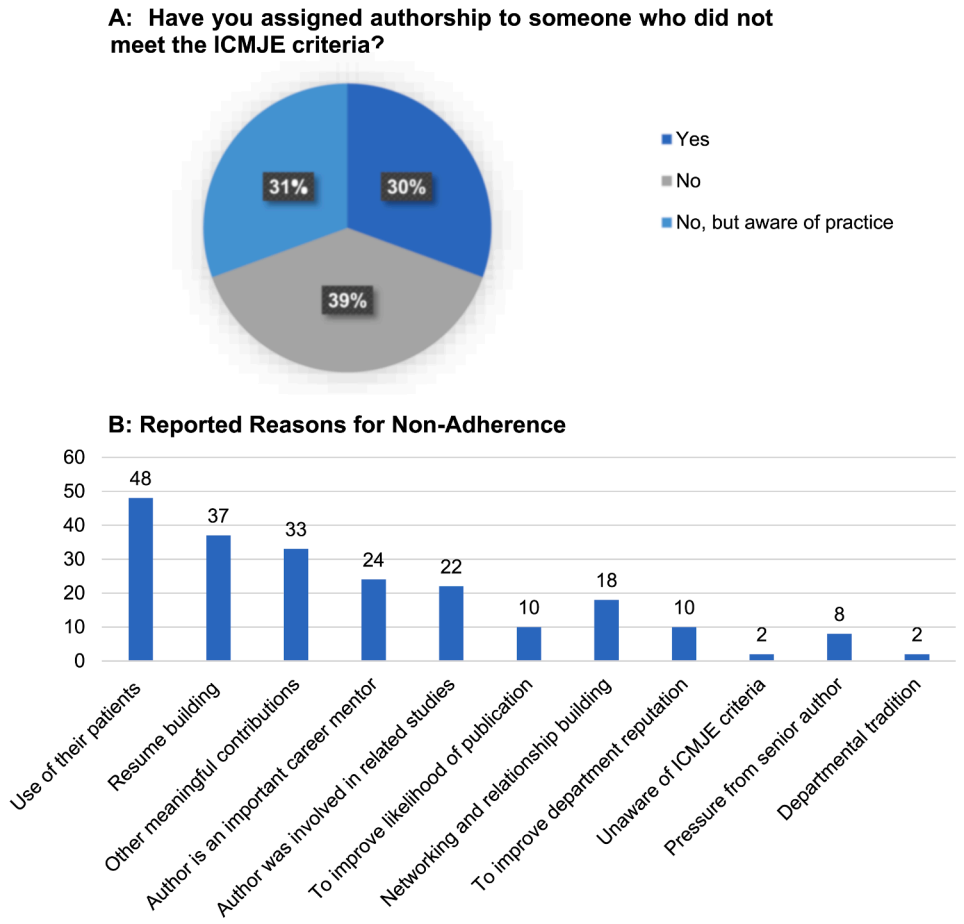


**Fig. 1.** Incidence of Perceived Non-Adherence with Assignment of Authorship using ICMJE Criteria (A) and Reasons (B) For Non-Adherence among Gynecologic Oncologists (B).

(HR 2.0, 95% CI 1.06, 3.9, $p < 0.05$) and teaching fellows (HR 2.6, 95% CI 1.06, 3.9, $p < 0.05$) were significant predictors for denial of authorship.

## 7. Discussion

Following our survey study results demonstrating a high rate of perceived non-compliance with ICMJE authorship criteria among gynecologic oncology fellows, this study was designed to assess current practice for authorship assignment and perceptions regarding the applicability of these guidelines within the larger gynecologic oncology community (Moulton et al., 2017). We identified that approximately one-third of responding SGO members reported non-adherence to ICJME criteria, with an additional one-third reporting awareness.

We identified that those in their early career were significantly more likely to assign and accept authorship not adhering to ICMJE criteria, which retained significance on multivariable analysis. Those in seniority positions were more likely to decline authorship when they felt they did not meet the criteria. Additionally, authorship assignment for career advancement via resumé building and building professional relationships was frequently reported. Our findings suggest that a culture exists in gynecologic oncology, and perhaps in other areas of medicine, where authorship assignment decisions may represent more than the published work, also utilized for acknowledgment of patient care, gratitude for mentorship and research collaboration, and academic promotion and networking. Our findings suggest that those in training and early career may be most vulnerable to lapses in best research practices. Therefore, training and support, and mentorship are needed to lay the framework for a productive research career.

It is the responsibility of academic leaders and institutions to ensure that faculty and trainees are educated and supported in best research practices to ensure the publication of high-quality, valid scientific work. In addition, fellows and junior faculty should be encouraged and supported in alternative strategies to advance their careers and network, including multi-center research collaboration, scientific meeting attendance, and committee participation. Although the ICMJE recommends that decisions regarding authorship be made before starting the study, only 21.7% of respondents reported having discussions regarding authorship allocation before the study began. The authors advocate for early and honest discussions, where feasible, led by senior faculty regarding authorship to ensure that all potential authors are given adequate opportunity to contribute to the study and that participation expectations are clear.

Significant limitations of the study include the response rate of 23.9%. Despite all efforts to ensure confidentiality, the sensitive subject matter may have adversely impacted willingness to participate in the survey or biased given responses. Furthermore, despite the succinct design of the survey instrument, taking<10 min to complete, we acknowledge that the busy work-load of a practicing gynecologic oncologist may influence, and potentially prohibit, their ability to take a web-based survey study. Notably, the response rate is comparable to recent surveys performed in Society of Gynecologic Oncology members, but the small sample size must be considered in interpretation of the study findings (Moulton and Falcone, 2018; Stasenko et al., 2020). Among the responding cohort, gynecologic oncologists practicing in an academic setting are relatively over-represented, which may introduce selection bias to the results. However, those in academic practices more frequently contribute to the scientific literature, and, in turn, these

**Table 3**
Survey Responses Comparing Year of Practice, Gender, Practice Setting, Location, Teaching Responsibilities and Research Involvement.

| | Authorship Assignment Not Meeting ICMJE Criteria | P value | Authorship Acceptance Not Meeting ICMJE Criteria | P value | History of Authorship Denial | P value |
|---|---|---|---|---|---|---|
| *Practice Duration* | | **<0.0001** | | 0.04 | | **<0.0001** |
| Fellow in Training | | | | | | |
| <3 years | 16 (19.8) | | 8 (16.0) | | 2 (2.3) | |
| 3–5 years | | | | | | |
| 5–10 years | 20 (24.7) | | 7 (14.0) | | 4 (4.6) | |
| 10–15 years | 6 (7.4) | | 4 (8.0) | | 5 (5.7) | |
| 15–20 years | 11 (13.6) | | 12 (24.0) | | 11 (12.5) | |
| 20–25 years | 5 (6.2) | | 3 (6.0) | | 11 (12.5) | |
| >25 years | 9 (11.1) | | 5 (10.0) | | 13 (14.8) | |
| | 4 (4.9) | | 3 (6.0) | | 7 (8.0) | |
| | 10 (12.4) | | 8 (16.0) | | 35 (39.8) | |
| *Gender* | | **0.02** | | 0.12 | | 0.06 |
| Male | 35 (43.2) | | 26 (52.0) | | 50 (56.2) | |
| Female | 41 (55.6) | | 23 (46.0) | | 38 (42.7) | |
| Prefer not to answer | 1 (1.2) | | 1 (2.0) | | 1 (1.1) | |
| *Practice Setting* | | 0.43 | | 0.99 | | **0.02** |
| Academic practice | 52 (65.0) | | 34 (68.0) | | 70 (78.7) | |
| Private practice | | | | | | |
| Combined academic private | 7 (8.8) | | 4 (8.0) | | 5 (5.6) | |
| practice | 19 (23.8) | | 10 (20.0) | | 10 (11.2) | |
| Military | | | | | | |
| Other | | | | | | |
| | 1 (1.25) | | 1 (2.0) | | 0 (0.0) | |
| | 1 (1.25) | | 1 (2.0) | | 4 (4.5) | |
| *Research participation* | | | | | | |
| Basic science | | | | | | |
| Retrospective | 30 (37.0) | 0.81 | 19 (38.0) | 0.86 | 44 (49.4) | **0.04** |
| Single institutional | 62 (59.2) | **0.01** | 39 (78.0) | 0.05 | 65 (73.0) | 0.33 |
| prospective | 43 (53.1) | 0.29 | 30 (60.0) | 0.70 | 53 (59.6) | 0.39 |
| Multi-center clinical trials | | | | | | |
| None | | | | | | |
| | 42 (51.9) | 0.53 | 26 (52.0) | 0.77 | 56 (62.9) | 0.09 |
| | 6 (7.4) | 0.59 | 4 (8.0) | 0.92 | 6 (6.7) | 0.30 |
| *Teaching* | | | | | | |
| *Involvement* | | | | | | |
| Fellows | 41 (50.6) | 0.65 | 26 (52.0) | 0.64 | 64 (71.9) | **<0.0001** |
| Residents | 71 (87.7) | 0.53 | 44 (88.0) | 0.53 | 78 (87.6) | 0.63 |
| Medical Students | 70 (86.4) | 0.86 | 43 (86.0) | 0.95 | 77 (86.5) | 0.64 |

Statistics presented as N (%).

results may be more representative of those participating in research. While the response rate was lower than hoped, the respondents of the survey are comparable to what was recently reported in the 2020 Society of Gynecologic Oncology State of the Society Survey, and therefore, we believe is an appropriate representation of the surveyed population (Society of Gynecologic Oncology, Gynecologic oncology, State of the Subspecialty, 2020).

In conclusion, in this sample of Society of Gynecologic Oncology members, approximately one-third reported a history of authorship assignment not meeting ICMJE criteria. Those in the beginning stages of their career appear to be at increased risk for perceived non-adherence to authorship assignment and acceptance. The authors advocate for early and honest discussions about authorship and consideration of evolved authorship criteria that are more inclusive of all who meaningfully contribute to a work.

## CRediT authorship contribution statement

**Laura M. Chambers:** Conceptualization, Data curation, Methodology, Project administration, Investigation, Writing - original draft, Writing - review & editing. **Catherine H. Watson:** Data curation, Writing - original draft, Writing - review & editing. **Meng Yao:** Formal analysis, Writing - original draft, Writing - review & editing. **Kimberly Levinson:** Conceptualization, Data curation, Writing - original draft, Writing - review & editing. **Ronald D. Alvarez:** Conceptualization, Data curation, Writing - original draft, Writing - review & editing. **Ramez N. Eskander:** Conceptualization, Data curation, Writing - original draft, Writing - review & editing. **Megan Buechel:** Data curation, Writing - original draft, Writing - review & editing. **Chad M. Michener:** Conceptualization, Data curation, Writing - original draft, Writing - review & editing. **Amelia Jernigan:** Conceptualization, Data curation, Methodology, Project administration, Investigation, Writing - original draft, Writing - review & editing.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.gore.2021.100755.

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