



Faculty Attitudes Towards Article Processing Charges for Open Access Articles

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Abstract

Article Processing Charges (APCs) are significant charges for publishing Open Access (OA), and have no accepted standards for authors to source the funds or negotiate the charges. While there is a growing body of literature exploring academic authors' perceptions of OA publishing, there is little data on how authors pay for APCs. The aim of this study was to examine how authors prepare for and fund APCs, as well as their perceptions of these charges. In early 2021 the authors deployed a survey to Icahn School of Medicine at Mount Sinai faculty members via email. The survey was completed by 310 faculty, representing 10.6% of the active researcher population. Our findings show that about 50% of respondents include anticipated APC costs in grant applications, and that 16% of faculty will pay APCs using personal funds. Questions evaluating perception of APCs show that while the majority of respondents support the concept of Open Access, most believe that charges are too high and should not fall on authors.

Keywords Open Access · Article Processing Charges · Academic Publishing · NIH Public Access Policy · Hybrid Journals · Health Sciences Faculty

Background

During 2020, researchers at the Icahn School of Medicine at Mount Sinai (ISMMS) published 5714 articles, out of which 2860 were published as Open Access (OA). Regardless of the OA type for publication (Gold, Green, Hybrid, etc.), most of these articles required payments of Article Processing Charges (APCs). With a single article's APC ranging from \$1500 to over \$5000 and considering that most researchers publish several articles every year, the amount of money spent to publish OA

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is significant. In light of the large amount of OA publications authored by ISMMS researchers and the money spent to cover APCs every year, we sought to understand how researchers fund APCs and how they perceive them in terms of fairness, responsibility, and as necessary support to sustain OA.

Introduction

Traditionally, academic journal articles are published under a subscription model, wherein journal publishers use funds from subscribers in order to solicit article submissions, facilitate the editorial and peer review processes, and publish the journal regularly. It is worth noting that under this model, peer reviewers are often not paid for their work, and article authors typically assign copyright of their work to the publisher once accepted. Concerns over this model, the “traditional” method of academic journal publishing, are well documented and have contributed to the rise of Open Access (OA) publishing. OA publishing is a model of academic publishing in which content is made freely available via the internet, and publishers often collect Article Processing Charges (APCs) for each accepted article instead of requiring subscription fees from readers and institutions. Under this model, authors typically retain copyright to their work [18]. While there are many models of OA publishing and models continue to evolve, most OA publications in the Biomedical Sciences charge APCs.

The OA model solves the problem of article availability and paywalls for researchers, but it has created new challenges. APCs vary from journal to journal but cost on average \$2,551 and can reach as high as 5000 USD [3]. These high costs constitute a significant expense to authors who wish to make their articles freely available [3, 7]. Journals charging APCs for OA publication are often “hybrid” journals, where most articles are behind a paywall and authors have the option to publish OA. These hybrid journals charge institutions for subscriptions but also charge authors APCs if they choose to publish OA. These journals profit from subscriptions as well as APCs, often paid by the same institutions [14]. A 2017 study on the growth of hybrid journals estimated that 73% of the journals of the five major academic publishers (Elsevier, Springer Nature Group, Wiley-Blackwell, Taylor & Francis, and Sage) were hybrid [2]. Authors often use government or institutional award funds to cover APCs, resulting in a situation where taxpayer dollars are used to support for-profit publishing corporations, in addition to funding research operations [1, 19]. Institutional funds such as library budgets are also used to pay APCs, which creates a situation wherein an institution is paying subscription fees as well as APCs, often to the same publishers [4, 21].

As general awareness of the OA publishing model grows, literature exploring academic authors’ perceptions and knowledge of OA is growing as well. Studies have found that awareness of OA publishing options available to researchers is expanding [6, 8, 10, 15, 20]. However, there are still misconceptions and confusion around OA publishing and APCs. While researchers are aware of and support the concept of OA, most consider OA journals to be of lower quality and prestige [12]. While there are few studies that examine funding sources for APCs, a 2012 survey found

that 46% of Health Sciences, Biology, and Life Sciences authors used grant or contract funds [17]. A 2020 survey of authors at a public university in New York State found that the majority of authors will not pay APCs out of personal funds and feel that institutions should be responsible for paying APCs. It is worth noting that this study, while similar to our own, did not focus solely on Biomedical/Health Sciences authors, for whom APCs are often the highest [13].

As mandates for OA, such as the NIH Public Access Policy and Plan S (developed by cOAlition S), gain popular support, the nuances of OA publishing will increasingly dictate researchers' publication practices [9]. At the same time, there is no universal standard for obtaining funds to cover these charges, let alone regulation of the charges themselves [16].

Methods

The study surveyed Icahn School of Medicine at Mount Sinai (ISMMS) faculty authors using a short survey distributed via email. In January 2021, the study protocol was reviewed by the ISMMS Institutional Review Board and deemed "Exempt" (STUDY-20-01502). The study is reported in accordance with the Standards for Reporting Qualitative Research framework [11].

Our aim was to understand how frequently ISMMS authors publish OA, from where they source funds for APCs, and their perceptions of APCs more generally. Understanding this community, it was imperative that the survey be quick and easy to navigate in order to encourage participation. The authors of this survey, information professionals at ISMMS's Levy Library, developed the instrument using Survey Monkey.

The survey began by asking respondents for their department and status (professor, associate professor, etc.) and if they had published an OA article since January 2019. If they answered no, they were thanked for their time, and the survey ended. Therefore, only faculty authors who knowingly published OA in the past two years were surveyed. Respondents were then asked a series of questions about their funding sources for APCs, including if they requested APC funding as part of grant applications. Finally, attitudinal questions related to APCs were posed on a Likert scale (Strongly Disagree, Disagree, Not Sure, Agree, or Strongly Agree). Participants were given the chance to provide additional comments that they had on APCs and OA. The survey instrument can be accessed here: <https://doi.org/10.6084/m9.figshare.14718570.v2>.

Data Collection

The survey was disseminated in early February 2021 and remained open to responses until early March 2021. It was disseminated via an internal faculty listserve, with two subsequent reminders. No incentive was offered for completing the

survey. The complete survey data can be accessed here: <https://doi.org/10.6084/m9.figshare.14718585.v1>.

Findings

Participant Overview

The faculty listserv contains 12,762 members. However, the number of active researchers who continually publish is smaller: a Scopus search for active ISMMS researchers who published at least one article in 2020 revealed a list of 2875 authors. Therefore, our population baseline was derived from the smaller list of actively publishing authors.

We received 310 responses, which represents 10.6% of the active researcher population. Data were analyzed within Survey Monkey, Excel, and Tableau.

Table 1 includes the distribution of faculty participants by their academic status. The largest participating group was assistant professors, followed by professors and associate professors. Very few instructors took part in the survey, and no voluntary faculty participated.

Faculty Status

Participants by Department

Academic department was a free text field in the survey. Therefore, we needed to standardize the names of the departments, as some respondents used different name variations to indicate the same department. Overall, 297 participants indicated their department name, breaking down into 41 departments. The largest participatory groups were from the departments of Medicine, Psychiatry, Emergency Medicine, and Neuroscience (see Fig. 1).

Survey Results

Section 1: Who Publishes Open Access In this section of the survey, we asked respondents whether they had published OA since 2019. Our data show that out of 305

Table 1 Overall survey respondents by faculty status

	Responses	
Professor	31.80%	97
Associate professor	25.25%	77
Assistant professor	40.00%	122
Instructor	2.95%	9
Other (not specified)	1.6%	5
Voluntary	0.00%	0
	Answered	310

Bold indicates total respondents

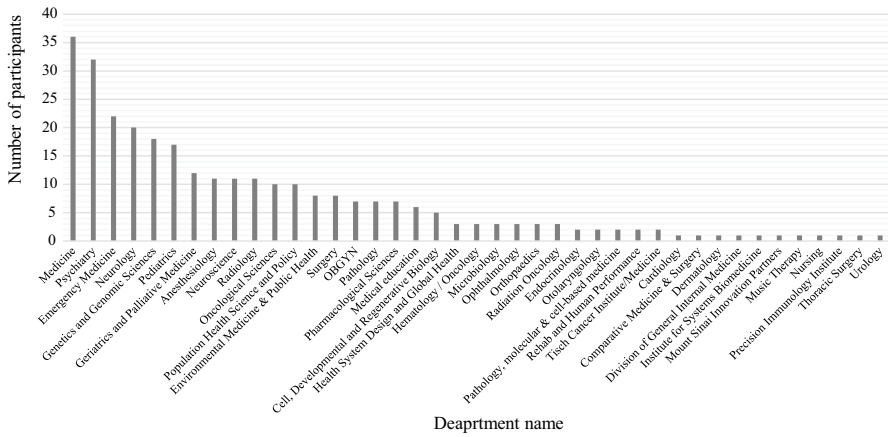


Fig. 1 Overall survey respondents by department

respondents, 99 (33.3%) of participants did not publish OA and 25 (8.42%) stated that they were unsure. As a result, these respondents were thanked for their time, and their survey closed. The main reason for excluding faculty who did not publish OA was that the entire survey focused on perceptions of and funding for OA publications. Table 2 summarizes the distribution of participants who did not publish OA by their faculty status. As seen in Table 2, assistant professors made up the largest group of respondents, followed by associate professors and professors.

Table 2 Percentage and number of participants who did not publish OA by faculty status

Faculty status	No	Unsure
Professor	27.84% 27	9.28% 9
Associate professor	38.16% 29	6.58% 5
Assistant professor	33.91% 39	8.70% 10
Instructor	44.44% 4	11.11% 1
Voluntary	0.00% 0	0.00% 0
Total	33.33% 99	8.42% 25

Table 3 Percentage and number of participants who published OA by faculty status

Faculty status	Published OA
Professor	35.26% 61
Associate professor	24.28% 42
Assistant professor	38.15% 66
Instructor	2.31% 4
Voluntary	0.00% 0
Total	173

Table 4 APC payments by faculty status

	Yes	No	Total
Professor	83.61% 51	16.39% 10	35.88% 61
Associate professor	73.81% 31	26.19% 11	24.71% 42
Assistant professor	63.49% 40	36.51% 23	37.06% 63
Instructor	75.00% 3	25.00% 1	2.35% 4
Voluntary	0.00% 0	0.00% 0	0.00% 0
Total	73.53% 125	26.47% 45	100.00% 170

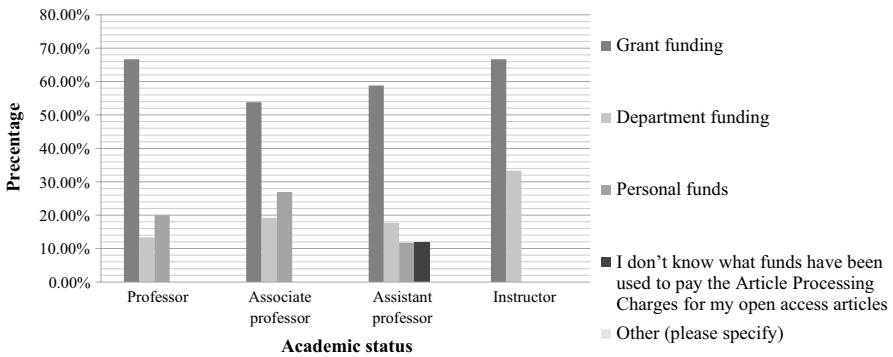


Fig. 2 APC payment source by faculty status

As seen in Table 3, the majority of faculty members who published OA were assistant professors, followed by professors. Associate professors and instructors published OA the least.

Section 2: Funding and Payments for OA Publishing In this section, we asked the respondents “Have you paid Article Processing Charges for open access articles since January 2019?” This question aimed to identify whether researchers paid APCs when they published OA since there are publishers who waive APCs for certain groups and institutions. As seen in Table 4, most faculty did pay APCs: 51 out of 61 professors; 31 out of 42 associate professors, 40 out of 63 assistant professors, and 3 out of 4 instructors had paid APCs since January 2019.

We then asked how participants paid for APCs. The purpose of the question was to investigate from where funding for APCs is commonly sourced. Figure 2 shows that most faculty paid for APCs using grant funding and department funding, but some used personal funds as well.

In the next question, we asked participants whether they include anticipated APCs in their grant applications. This question aimed to gauge whether or not faculty anticipate APC expenditure and prepare in advance. This is especially important when considering OA mandates from funding bodies and ways to meet them.

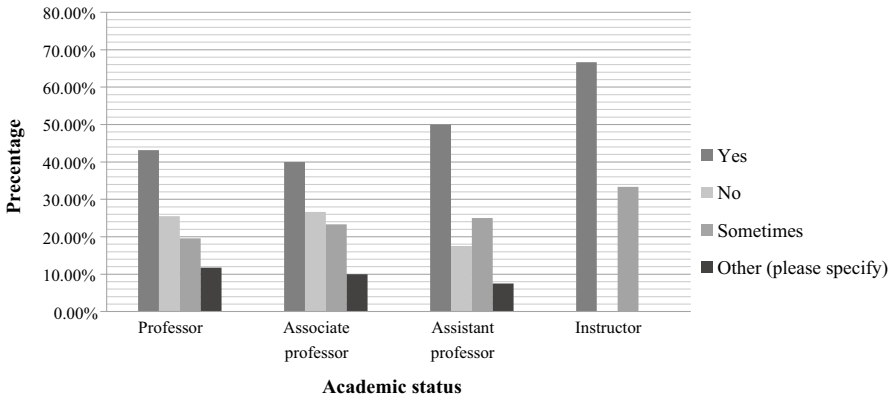


Fig. 3 APC funding requests through grant applications by faculty status

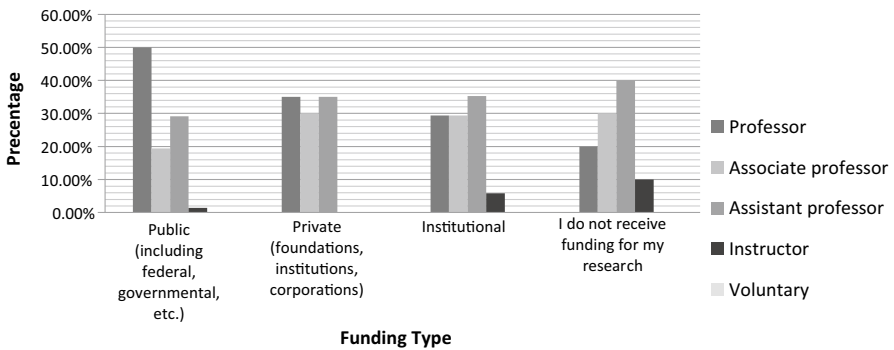


Fig. 4 Funding source by faculty status

As seen in Fig. 3, about 50% of faculty do include APCs in their applications, with instructors reporting this practice over 60% of the time. However, there are many who do not include APCs in their grant applications or do so only occasionally.

Figure 4 illustrates that the majority of funding received by our survey respondents is public. This includes federal and local government funding. Therefore, we can assume that the approximately 50% of our respondents who include APC requests in grant applications do so in public grant applications.

Section 3: Perceptions of and Opinions on APCs In this section, we presented participants with a series of statements regarding APCs and asked them to indicate their level of agreement with the statements. We chose a Likert scale of five levels of agreement, ranging from “Strongly Agree” to “Strongly Disagree”. In order to ensure that participants understood what APCs are, we created an information page that explained these charges. The link to this guide was available to participants at all times.

Table 5 Necessity of APCs by faculty status

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Total
Professor	2.00%	46.00%	30.00%	18.00%	4.00%	41.32%
Associate professor	3.57%	46.43%	21.43%	25.00%	3.57%	23.14%
Assistant professor	10.00%	32.50%	30.00%	20.00%	7.50%	33.06%
Instructor	0.00%	33.33%	0.00%	66.67%	0.00%	2.48%
Voluntary	0.00%	0.00%	0.00%	0.00%	0.00%	0
Total	4.96%	41.32%	27.27%	21.49%	4.96%	100.00%

Statement 1: Article processing charges are necessary to maintain open access publications Here, we asked participants to indicate their level of agreement with the statement that APCs are necessary to maintain OA publications. As can be seen in Table 5, the vast majority of faculty think that APCs are necessary to maintain OA publications. It should be noted that the majority of participants did not choose ‘Strongly Agree’ to depict their level of agreement, but rather chose ‘Agree’. It is also worth noting that 27% of participants chose ‘Not Sure’ and 21% chose ‘Disagree’. Although most indicated that they do not ‘Strongly Agree’ with the statement, there is a general consensus that APCs are necessary in order to maintain OA publishing.

Statement 2: Article processing charges are fair The second statement asked participants to indicate their level of agreement with APCs being fair. We did not elaborate on the term ‘fair’, letting participants make their selection based on their own perception of what ‘fair’ means. This statement measured perception of APCs rather than absolute knowledge. We assumed that some would consider APCs as fair, while some would not. This perception might be guided by academic status and availability of funding or by personal perspective, all of which are unique to each participant. When asked for their level of agreement with APCs being fair, 41.4% of the participants indicated that they disagree, while 35.5% indicated that they are not sure (see Table 6). The selection of ‘Not Sure’ might be a result of participants not knowing what are the price ranges of APCs in journals other than the ones in which they

Table 6 Fairness of APCs by faculty status

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
Professor	0.00%	8.00%	30.00%	52.00%	10.00%
Associate professor	3.57%	14.29%	32.14%	32.14%	17.86%
Assistant professor	0.00%	7.50%	45.00%	32.50%	15.00%
Instructor	0.00%	0.00%	33.33%	66.67%	0.00%
Voluntary	0.00%	0.00%	0.00%	0.00%	0.00%
Total	0.83%	9.09%	35.54%	41.32%	13.22%

Table 7 Expense Perception of APCs by faculty status

	Strongly agree		Agree		Not sure		Disagree		Strongly disagree	
Professor	38.00%	19	50.00%	25	6.00%	3	4.00%	2	2.00%	1
Associate professor	46.43%	13	42.86%	12	7.14%	2	3.57%	1	0.00%	0
Assistant professor	55.00%	22	42.50%	17	2.50%	1	0.00%	0	0.00%	0
Instructor	33.33%	1	33.33%	1	33.33%	1	0.00%	0	0.00%	0
Voluntary	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Total	45.45%	55	45.45%	55	5.79%	7	2.48%	3	0.83%	1

Table 8 APC bias by faculty status

	Strongly agree		Agree		Not sure		Disagree		Strongly disagree	
Professor	36.00%	18	46.00%	23	14.00%	7	4.00%	2	0.00%	0
Associate professor	57.14%	16	32.14%	9	3.57%	1	0.00%	0	7.14%	2
Assistant professor	60.00%	24	27.50%	11	12.50%	5	0.00%	0	0.00%	0
Instructor	0.00%	0	66.67%	2	33.33%	1	0.00%	0	0.00%	0
Voluntary	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Total	47.93%	58	37.19%	45	11.57%	14	1.65%	2	1.65%	2

normally publish. However, it is clear that the majority of participants do not think that APCs are fair.

Statement 3: Article processing charges are too expensive This statement pertained to the actual cost of APCs. In this section, we asked participants to rank their level of agreement with the statement that APCs are too expensive. The results show that there is a definitive split between ‘Strongly Agree’ and ‘Agree’, with very few indicating that they Disagree or Strongly Disagree (see Table 7). Therefore, we conclude that the majority of faculty participants think that APCs are too expensive. It is important to note that due to the nature of our institution, our survey respondents are largely publishing in Medical/Biomedical journals, where APCs are typically very high. Prior to conducting the survey, we analyzed the institution’s OA publications by journal and visited each journal website in order to see how much APCs cost. Our background research into these journals shows that they charge from \$2,500 up to \$5,200 per article.

Statement 4: Article processing charges favor well-funded researchers We asked faculty for their level of agreement with the statement that APCs favor well-funded researchers. As seen above, most faculty pay for APCs using grant or department funding (see Table 8). Here, we found that the majority of faculty either Strongly Agree or Agree that APCs favor well-funded researchers.

Table 9 APC payment by authors by faculty status

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
Professor	0.00% 0	10.00% 5	22.00% 11	38.00% 19	30.00% 15
Associate professor	0.00% 0	0.00% 0	21.43% 6	35.71% 10	42.86% 12
Assistant professor	0.00% 0	10.00% 4	22.50% 9	45.00% 18	22.50% 9
Instructor	0.00% 0	0.00% 0	33.33% 1	66.67% 2	0.00% 0
Voluntary	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Total	0.00% 0	7.44% 9	22.31% 27	40.50% 49	29.75% 36

Statement 5: Article processing charges should be paid by authors In the following sections, we asked participants to rank their level of agreement that authors, funders, or institutions should be responsible for paying for APCs. Statement 5 specifically asked if authors should pay APCs. As with the statement on cost above, we see a strong disagreement that authors should pay APCs (see Table 9). Very few faculty members agree that authors should pay, and some are unsure. Although most authors use grant money to pay for APCs, the consensus is that they should not be the ones paying these fees. We can assume that they use grant funds that otherwise would have been used for research to cover APCs; this could explain the strong level of disagreement with authors being responsible for paying APCs.

Statement 6: Article processing charges should be paid by funders Following the previous statement, we asked participants to rank their level of agreement that funders should be responsible for paying APCs. As seen in Table 10, the majority of participants agree that funders should pay APCs. Few participants either Disagree or Strongly Disagree with this statement.

Statement 7: Article processing charges should be paid by institutions The final statement asked participants to rank their level of agreement with APCs being paid by institutions. Although over 50% either Agree or Strongly Agree with the statement, it should be noted that 28% stated that they are “Not sure.” Less than 10% indicated that they either Disagree or Strongly Disagree (see Table 11).

Table 10 APC payment by funders by faculty status

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
Professor	12.00% 6	52.00% 26	26.00% 13	8.00% 4	2.00% 1
Associate professor	14.29% 4	57.14% 16	14.29% 4	7.14% 2	7.14% 2
Assistant professor	7.50% 3	50.00% 20	27.50% 11	12.50% 5	2.50% 1
Instructor	0.00% 0	33.33% 1	0.00% 0	66.67% 2	0.00% 0
Voluntary	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Total	10.74% 13	52.07% 63	23.14% 28	10.74% 13	3.31% 4

Table 11 APC payment by institutions by faculty status

	Strongly agree		Agree		Not sure		Disagree		Strongly disagree	
Professor	12.00%	6	50.00%	25	32.00%	16	4.00%	2	2.00%	1
Associate professor	21.43%	6	46.43%	13	17.86%	5	14.29%	4	0.00%	0
Assistant professor	32.50%	13	27.50%	11	32.50%	13	7.50%	3	0.00%	0
Instructor	0.00%	0	66.67%	2	0.00%	0	33.33%	1	0.00%	0
Voluntary	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Total	20.66%	25	42.15%	51	28.10%	34	8.26%	10	0.83%	1

Optional Free Text Comments

The survey's final, optional question asked participants to provide any additional comments on their experience with OA publishing and APCs. Out of 305 survey respondents, 80 (26.2%) left additional comments. The most prominent themes were the belief that funding for APCs should not come solely from authors (21.3% of those who left comments) and that APCs are simply too expensive and prohibit many researchers from publishing OA (36.3%). A total of 12 commenters (15%) referenced predatory journals or the idea that OA journals are of lesser quality than subscription journals. Finally, 14 respondents (17.5%) expressed support for OA, but almost all of these statements were paired with a follow-up statement that APCs are too expensive or that OA journals may be predatory. See four comments below:

Open access is great to get science to the public asap. Open access journals seem to have lower standard for acceptance, and perhaps correspondingly lower value for academic career advancement.

It's nice to easily access and share articles when they are published open access. However, the cost is literally insane with some journals in the \$2000-3000 range. This isn't referring to scam journals; I'm including reputable ones like BMC Neurology which is \$2500.

When I pay \$10,000 for publishing papers, I have less money to do experiments.

I would not have published if I had to pay a fee. I believe in open access, but especially for junior faculty without grant support the fees are prohibitive.

These comments illuminate the data gathered throughout the survey, where faculty respondents largely seem to agree with the necessity of APCs but believe that they are too expensive and should not be the responsibility of authors.

Discussion

In addition to understanding how frequently ISMMS authors publish OA, we aimed to gauge their perception of APCs in terms of fairness, responsibility, and cost as well as their funding sources. The survey results show that out of the 305 survey participants, 181 (59.3%) had published OA since January 2019. A small number of participants (8.1%) stated that they were “unsure” whether or not they had published OA. The survey also revealed that out of 170 participants who answered whether or not they had paid APCs, 125 (73.5%) indicated that they had paid APCs since January 2019, while 45 (26.4%) indicated that they had not paid APCs.

The analysis of participants’ rankings of their level of agreement with statements related to APC costs shows that the majority of faculty participants either Agree or Strongly Agree that APCs are necessary to maintain OA publications. Therefore, there is a consensus that OA publishing requires monetary investment and cannot be sustained without it. However, most participants believe that APCs are unfair, too expensive, and favor well-funded researchers. This is not surprising considering the fact that OA journals in the medical and biomedical fields have the most expensive APCs, ranging from \$2,500 to over \$5,000 per article. As ISMMS is a leading research institution, faculty members often publish more than one OA article each year, which can add up quickly to a significant amount. Perhaps as a result, faculty Disagree or Strongly Disagree with the statement that APCs should be paid by authors and think that they should be paid by either funders or institutions, as seen in statements 6 and 7. This is particularly relevant because many participants do not include APCs as a separate expense in their grant applications and eventually take funds away from their research to cover these charges.

Over 50% of participants indicated that they use grant funds to cover APCs. Personal fund use was reported by 16%, while use of department funding was reported by only 14.4%. The fact that 59% of participants reported government grants as their main source of funding brings the issue of public funds inadvertently being used to pay for-profit publishing corporations and increase their revenue to the forefront. While public funding is intended to sponsor medical and biomedical research to advance science and benefit the public, researchers are forced to use large portions of these funds, which would otherwise be used for research, to pay pricey APCs that benefit for-profit corporations. This incongruous situation, wherein researchers are mandated to publish OA on the one hand but need to set aside precious grant funding to do so on the other, was also addressed by our participants. Survey participants expressed their frustration with the cost and the responsibility of authors to fund APCs through their ranking of the statements presented to them and through open text comments.

Our findings in terms of how authors pay for APCs are consistent with the existing literature, as less than 20% of our respondents reported using personal funds. Similar studies also report the general sentiment that OA journals are of lower quality [12, 13], which was reflected in the free text comments left by our

faculty respondents. Finally, our results echo the disconnect reported in previous studies, where researchers and authors support the concept of OA but believe that APCs are too expensive and should not be paid by authors. Pilato & Tran [13] found that the majority of authors are unwilling to contribute any personal funds to APCs, which reflects our finding that about 70% of respondents Disagree or Strongly Disagree that APCs should be paid by authors. It is clear that despite support for the concept of OA, authors will typically publish behind a paywall when funding is not available.

Further Research/Recommendations

The burden of the increasing costs of journal subscriptions mainly falls to academic and medical libraries. Libraries are forced to pay subscription fees for journals that are partially OA and that therefore collect fees from both subscriptions and APCs. In the past couple of years, libraries have been faced with yet another challenge, namely pressure from both publishers and authors to sponsor APCs. Publishers are constantly coercing libraries to provide extra funds, in addition to subscriptions, to cover APCs. Whatever name it is called, whether “read-and-publish” or “transformative agreement”, the end result is increased payment by the library or, in the best case, cost neutral, therefore leaving the problems of increased APCs unresolved.

The idea of having scientific publications open for readers is a noble one. However, from author and librarian perspectives, OA is difficult to attain without a sustainable way to cover the costs. We believe that researchers should not be asked to spend their grant funding to pay for APCs; these funds are taxpayers’ money that should be dedicated to research and scientific advancement, and not to increasing publishing companies’ revenue. By the same token, asking libraries to cover APCs while trying to keep up with the rising costs of subscriptions is unrealistic.

Currently, publishers are not required to provide evidence of the costs incurred to them for publishing OA. APC prices vary from one publisher to another based on Impact Factor and potential revenue rather than the need to cover production costs. This creates an unregulated market driven by profit. We believe that APCs should be standardized and overseen by the government agencies that require authors to publish OA. There should also be a larger conversation about the sources of funding of OA articles. We also believe that all students and trainees, regardless of the institution that they attend, should not be charged APCs. Considering the fact that they are at the beginning of their academic careers, they should not be burdened by APC payments and should have the opportunity to enjoy the advantages of publishing OA.

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