Importance: Communication between applicants, mentors, and training programs is common before the residency and fellowship match. Few studies have examined the association of prematch communication on final match outcomes.

Objectives: To report various characteristics of the vitreoretinal surgery fellowship match and to examine the association of mentor-to-program communication and applicant disclosure of their number 1 ranking with the probability of matching number 1.

Design, Setting, and Participants: In this cross-sectional study of the 2016 and 2017 vitreoretinal surgery fellowship matches, an online survey examined (1) number of applications submitted, (2) number of programs ranked, (3) rank order of final match, (4) total application and interview-related costs, (5) mentor-to-program contact, (6) applicant disclosure of number 1 ranking, and (7) mentor disclosure of number 1 ranking. A link to an anonymous online survey was sent to 198 matched fellows (105 fellows from the 2016 match and 93 from the 2017 match).

Main Outcomes and Measures: Survey responses regarding the vitreoretinal surgery fellowship application process.

Results: The survey was sent to 198 matched fellowship applicants, and 152 (77%) completed the survey. Of the 105 matched applicants in 2016, 21 (20%) were women. Of the 93 matched applicants in 2017, 24 (26%) were women. Matched applicants applied to a mean (SD) of 34 (17) programs (range, 1-85) and ranked a mean (SD) of 12 (4) programs (range, 1-27). Of 152 applicants, 66 (43%) matched at their number 1 ranked program, 23 (15%) matched number 2, and 21 (14%) matched number 3. The mean (SD) total cost was $5500 ($2776) (range, $500-$13 500). Two-sided $\chi^2$ testing found no association (odds ratio, 0.70; 95% CI, 0.34-1.4; P = .33) between mentor-to-program contact and the probability of applicants matching at their number 1 ranked program. Matched applicants who revealed their number 1 ranking either personally or via a mentor matched at a program ranked lower (more desirable) on their rank list (mean match ranking, 2.8) compared with those who did not reveal their number 1 ranking (mean match ranking, 4.2; 95% CI, 0.2-2.5; P = .01).

Applicant disclosure of their intention to rank a program number 1, either personally or via a mentor, was associated with matching number 1 (odds ratio, 2.6; range, 1.1-6.0; P = .03).

Conclusions and Relevance: Vitreoretinal fellowship applicants who disclosed their number 1 ranking, either personally or via a mentor, were associated with improved match outcomes compared with their cohorts who did not make such disclosures.

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The National Residency Match Program was established in 1952 to “provide an orderly and fair mechanism for matching the preferences of applicants for U.S. residency positions with the preferences of residency program directors.” ⁴ In 1977, the Association of University Professors of Ophthalmology designated the San Francisco Matching Program (SF Match) to oversee the match. ⁵ To allow applicants and programs to make selection decisions “without coercion or unwarranted pressure,” both the National Residency Match Program and SF Match require participants to abide by standardized match rules, which forbid programs from requesting that applicants reveal ranking preferences or suggest that ranking is contingent on a commitment to rank the other party highly. ³ However, communication between applicants and programs, including before, during, and after interviews and before the match, is clearly allowed. The National Residency Match Program states that “both applicants and programs may express their interest in each other,” and the SF Match counsels, “statements of intent must be unilateral, voluntary, and unconditional.” ⁶, ⁷ Communication before the match may have the potential to greatly influence match ranking and final match outcomes by defining the likely behavior of the other party, minimizing uncertainty, and maximizing the probability of a successful match.

Communication between applicants and programs is very common, with 69% to 95% of programs and 71% to 97% of applicants initiating postinterview communication. ⁵, ⁶ This communication may influence applicant ranking, as 67% of urology and 82% of family medicine residency programs report telling applicants to keep in touch after the interview if they are interested in matching to their program. ⁶, ⁷ Overall, 29% to 36% of obstetrics and gynecology residency program directors admit they would consider ranking an applicant higher on their rank list if the applicant expressed interest beyond a simple thank you, disclosed their intention to rank a program highly or number 1, or if a faculty member personally known to the program director called to state the applicant’s intention to rank them number 1. While it is known that prematch communication is extremely common, the association of prematch communication on the final match outcome has not, to our knowledge, been carefully examined. In this study, we used the 2016 and 2017 vitreoretinal surgery fellowship matches to examine various match characteristics, including the potential influence of mentor-to-program communication and an applicant revealing their intention to rank a program number 1 on the final fellowship match outcome.

**Methods**

After the 2016 and 2017 vitreoretinal surgery fellowship matches, the primary study author (S.M.C.) compiled a list of all vitreoretinal surgery fellowship programs offering fellowship positions and the respective individual(s) who matched at each fellowship. Personal communication among colleagues was used to identify most matched fellows, and programs whose matched fellow(s) could not be identified were contacted via personal email/telephone to request contact information. Published postmatch vacancies and personal communication with fellowship programs were used to determine programs that had not successfully matched a fellow. An anonymous online survey (Survey Monkey) was distributed using email, text message, and online social media platforms to matched vitreoretinal surgery fellowship applicants whose contact information could be obtained. Efforts were made to maximize survey completion via several email reminders, and matched applicants from the 2017 match were incentivized with a drawing for a $50 gift card based on their reporting of survey completion. Questions included in the survey can be seen in the Box. Survey responses were entered into a single database using Excel (Microsoft Corp). Answers to question 5, listed as intervals of $1000, were adjusted to discrete values (ie, $2001-$3000 adjusted to $2500) to facilitate the reporting of application and interview costs. Fellows who obtained their position outside the match, such as via internal applications before the match or postmatch application to unmatched positions, were excluded from further analysis. To avoid making a type I error, applicants who answered “I don’t know” in response to question 9 were assumed to have had no mentor disclosure of number 1 ranking. χ² and independent t tests were performed, with significance assessed at α = .05. This study was exempt from institutional review board review. Respondents provided written informed consent.

**Survey Distribution**

A total of 117 vitreoretinal surgery fellowship positions from 91 programs and 124 positions from 91 programs were listed on the SF Match website as being offered in the 2016 and 2017 vitreoretinal surgery fellowship matches, respectively. A list of matched fellows was compiled as previously described. All programs that did not match a fellow were contacted, with 10 positions from the 2016 match and 17 from the 2017 match confirmed as not being filled, either owing to an unsuccessful match or the program choosing not to participate in the match, often for unknown reasons. Several email and telephone messages to fellowship coordinators to determine the match status for 2 positions in the 2016 match and 14 in the 2017 match were not returned. Surveys were sent to 105 and 93 individuals participating in the 2016 and 2017 matches, respectively,

**Key Points**

**Questions** What is the association of mentor-to-program contact before Match Day with an applicant’s final match outcome, and do fellowship applicants revealing their intention to rank a program number 1 have a higher probability of matching number 1?

**Findings** This cross-sectional study of the 2016 and 2017 vitreoretinal fellowship matches examined applicant characteristics and prematch communication between applicants/mentors and the applicant’s top-ranked fellowship program. Applicants’ number 1 ranking disclosure was associated with increased probability of matching number 1.

**Meaning** Applicants who disclosed their number 1 ranking, either personally or via a mentor, experienced improved match outcomes compared with their cohorts who did not make such disclosures.
comprising 98% (105 of 107) of 2016 matched applicants and 87% (93 of 107) of 2017 matched applicants. Seventy-seven of 105 surveys (73%) were completed from the 2016 match, and 79 of 93 were completed (85%) for the 2017 match. Three applicants from the 2017 match obtained fellowship positions outside the match, 1 via internal application and 2 by contacting unmatched programs with published vacancies; 1 matched survey respondent did not answer the question about the rank number at which they matched; these 4 responses were excluded inasmuch as the primary focus was on applicants successfully matching in the initial, main fellowship match. Fellowship match survey participants can be seen in Figure 1 and Figure 2.

Results

Applications Submitted, Programs Ranked, and Match Outcomes
Successfully matched applicants who responded to the survey applied to a mean (SD) of 33 (17) programs (range, 1-83) in 2016 and 36 (17) programs (range, 3-85) in 2017, with no significant difference in the mean number of applications submitted between the 2 years (95% CI, −2.3 to 8.8; \( P = .25 \)). Matched applicants who responded ranked a mean (SD) of 11 (4) programs (range, 1-23) in 2016 and 12 (4) (range, 2-27) in 2017 (\( P = .17 \); 95% CI, −0.41 to 2.34). Applicants who responded matched at their mean number 3 ranked program in both 2016 (mean [SD], 3 [3]; range, 1-13) and in 2017 (mean [SD], 3 [3]; range, 1-17), with no significant difference between the 2 groups (\( P = .65 \); 95% CI, −0.77 to 1.22). Sixty-six applicants (43%) who responded matched at their number 1 ranked program; 23 (15%), at their number 2 ranked program; and 21 (14%), at their number 3 ranked program, with other matched applicant rankings as seen in Figure 3.

Total Application and Interview Cost
Matched applicants who responded to the survey spent a mean (SD) of $5447 ($2756) (range, $500-12500) in 2016 and $5553 ($2814) (range, 1500-13500) in 2017, with no difference between the 2 groups (\( P = .82 \); 95% CI, −795 to 1008). The median cost for all matched applicants who responded was $5500. Applicants matching number 1 spent a median of $4500, with a mean (SD) of $5167 ($2697) (range, $500-11500).

Postresidency Training and Demographics
Seventy-six percent (57 of 75) of matched applicants who responded from the 2017 fellowship match reported being
ophthalmology residents at the time of the match, 16% (12 of 75) were currently completing a fellowship or chief year, and 8% (6 of 75) had completed training and were practicing ophthalmology independently as attending ophthalmologists. Among all matched applicants surveyed, both those obtaining fellowship positions in the match and those obtaining positions via other arrangements outside the match, 7% (7 of 105) from the 2016 match class and 16% (15 of 93) from the 2017 match class matched at the same institution where they had completed or would complete residency. Eight percent (8 of 105) of 2016 applicants and 3% (3 of 93) of 2017 applicants surveyed completed ophthalmology residency outside the United States or Canada, with an additional 3 matched applicants (3%) surveyed in 2016 and 2 (2%) surveyed in 2017 having completed residency in Puerto Rico. Twenty percent (21 of 105) of 2016 matched applicants were women, and 80% (84 of 105) were men. Twenty six percent (24 of 93) of 2017 matched applicants were women, and 74% (69 of 93) were men.

Mentor-to-Program Contact
Seventy-four percent (112 of 152) of all 2016 and 2017 matched applicants who responded to the survey reported having a mentor contact a program to express their interest in a specific program. Twenty-two (14%) reportedly did not have a mentor contact a program on their behalf, and 18 (12%) did not know if a mentor had made such contact. No significant association was found between mentor-to-program contact and the probability of matching to an applicant’s number 1 ranked program (odds ratio, 0.70; P = .33; 95% CI, 0.3-1.4).

Applicant Disclosure of Number 1 Ranking
Seventy percent (54 of 77) of 2016 matched applicants and 73% (55 of 75) of 2017 matched applicants who completed the survey reported having personally revealed to their number 1 ranked program of their intention to rank them number 1. No association was found between applicant disclosure of number 1 ranking and the probability of matching number 1 (odds ratio, 1.64; P = .18; 95% CI, 0.8-3.4). Recognizing that communication between mentors and fellowship programs may have included disclosure of an applicant’s intention to rank a program number 1, the 2017 fellowship match survey included question 9, asking if a mentor did, in fact, disclose an applicant’s intention to rank a program number 1. An association was found between disclosure of an applicant’s intention to rank a program number 1, whether by the applicant or by their mentor, and the probability of matching number 1 (odds ratio, 2.6; P = .03; 95% CI, 1.1-6.0). Matched applicants who revealed their number 1 ranking either personally or via a mentor, matched at a fellowship program ranked lower (ie, a more desirable outcome) on their rank list (mean match ranking, 2.8) compared with those who did not reveal their number 1 ranking (mean match ranking, 4.2; P = .01; 95% CI, 0.2-2.5).

Discussion
This study reports various application and demographic characteristics of the vitreoretinal surgery fellowship match. The study also examines the association between an applicant revealing their intention to rank a program number 1 and the probability of matching number 1.

Applications Submitted, Programs Ranked, and Match Outcomes
The increasing number of applications submitted is a well-established trend within graduate medical education, as applicants apply to increasingly more programs each year to achieve the perceived number of interviews to maximize their chances of matching.9,10 A 2012 study by Yousuf et al11 determined that ophthalmology residency applicants ranking more than 10 programs had a greater than 90% chance of matching. In this study, we found that matched vitreoretinal surgery applicants applied, on average, to 33 programs in 2016, ranking 11 of these programs, and applied to 36 programs in 2017, ranking 12. Overall, 110 respondents (72%) matched to 1 of their top 3 programs, similar to published ophthalmology residency match outcomes.12

Total Application and Interview Cost
As expected, the costs associated with the fellowship application process (eg, applications, travel, food) increased with the increase from 2016 to 2017 in applications submitted and
programs ranked. Matched applicants spent a mean (SD) of $5500 ($2776) (range, $500-13 500) to secure a fellowship position. These cost data are similar to that in other fields, such as within the orthopedic surgery fellowship match, where applicants interview at a mean of 10 programs, spending a mean (SD) of $4671 ($2454) and a median of 10 days off service to complete the interview process. Several studies have suggested needed reform to the ever increasing number of applications submitted, costs, and missed work.

Postresidency Training and Demographics
This study examines several demographic characteristics of matched vitreoretinal surgery fellows, which may be helpful for future applicants interested in pursuing vitreoretinal surgery as a subspecialty career choice. The 2017 match survey specifically queried applicants regarding their current training status, with 57 (76%) applying while in residency, 12 (16%) while completing a fellowship or chief year, and 6 (8%) practicing as attending ophthalmologists. Notably, successful applicants from the 2017 match who were completing fellowships or postresidency chief years were doing so in various subspecialties, including, from most to least common: uveitis (5), ocular oncology (4), chief year (2) medical retina (1), international ophthalmology (1), and research (1).

This study also highlights the gender disparity within vitreoretinal surgery. This disparity is not unlike that facing ophthalmology in general. In 2014, 23% of American Academy of Ophthalmology members in the United States were women, but only 14% of American Academy of Ophthalmology members practicing as retina subspecialists in the United States were women. While the disparity among matched vitreoretinal surgery applicants trended toward greater equality from 2016 to 2017, vitreoretinal surgery remains predominately composed of male vitreoretinal surgeons. Our data set does not address the reasons for these differences, but further study is warranted. With medical school matriculation now comprising more women than men, great future opportunity exists to decrease the gender gap within ophthalmology and vitreoretinal surgery.

Mentor-to-Program Contact
Letters of recommendation play an important role in the matching process but may not tell the whole story. Several studies have examined the role of letters of recommendation, including a study of hand surgery fellowship directors, which found that the quality of letters of recommendation was the most heavily weighted criterion used by hand surgery fellowship directors in selecting fellows. The quality and content of the letter is important, but the letter writer’s position and perceived reputation is also important, as studies found that letters on which the highest value was placed were from either the division chief or another surgeon within the division. An opposing viewpoint is offered by a 1984 study that found letters of recommendation often lack reliability or validity, which may be why it is common for program directors to obtain more information about an applicant from telephone calls and other personal communication with friends and colleagues. The specific nature of a personal relationship between colleagues is important, as great difference exist between an email to a fellowship director who is a stranger and a call to a trusted longstanding friend. Fellowship programs may even call several trusted colleagues at an applicant’s home institution to gain a more complete understanding of the applicant and their application. These additional points of contact between a fellowship program and the applicant’s program may not be disclosed and were not formally assessed in this study but may be paramount in the outcome of the match.

Applicants also recognize that mentor contact with potential programs is important to a successful match. In a study examining the 2015 radiation-oncology match, 50% of matched applicants agreed and 22.3% strongly agreed that applicants can improve their rank position by having senior faculty place telephone calls or emails on their behalf. Furthermore, 39% of gynecologic oncology fellowship directors rated a telephone conversation from a colleague as being essential to a successful fellowship match, and another supporting study indicated that 52% of obstetrics and gynecology residency program directors would consider ranking an applicant more highly if contacted by a mentor known to them endorsed the applicant as outstanding.

In this study, we found no association between an applicant’s mentor contacting a specific program to communicate their interest in the program and the probability of the applicant matching number 1. Perhaps having a mentor contact a program on an applicant’s behalf has become an essential, unofficial component of the fellowship application, providing little differentiation between applicants, therefore not influencing applicant ranking. While a mentor contacting a program to solely express an applicant’s interest may not be associated with the final match outcome, the content of these conversations may have an effect, such as a mentor not only expressing interest, but also disclosing an applicant’s intention to rank a program number 1.

Number 1 Rank Disclosure
Communicating with potential training programs after the interview may be a stressor for residency and fellowship applicants, despite National Residency Match Program and SF Match rules designed to protect applicants from feeling pressured to disclose their rank lists. These match rules are often violated, evidenced by a survey of 7028 medical students reporting that 1380 (20%) applicants were asked by at least 1 program for a list of programs they intended to rank, and another supporting study indicated that 1400 applicants agreed and 1200 strongly agreed that applicants can improve their rank position by having senior faculty place telephone calls or emails on their behalf. While programs or applicants requesting rank list information from the other party is clearly a violation of match rules, the unilateral and voluntary disclosure of rank intentions is perfectly acceptable and has great potential to influence match outcomes. In a study, 62.9% of applicants informed a single program it would be ranked first, based on advice from fellow applicants (37.8%), residents in the specialty (33.7%), and faculty advisors (28.9%). While 64% of family medicine residency program directors reported this information did not affect their rank-order decision, the remaining 36% of program directors may have altered their rankings. Similarly, 26% of US dermatology residents reported changing their rank lists based on knowledge received about their rank order from programs.

It is clear that applicants and program directors engage in prematch communication, often to the extent of revealing their
Conclusions

This study of the 2016 and 2017 matches suggests that vitreoretinal fellowship applicants who disclose their number 1 ranking, either personally or via a mentor, experience improved match outcomes compared with their cohorts who do not make such disclosures.