Modeling Demographic and Trainee Research Productivity Predictors of K-to-R Transition for Otolaryngology-Scientists: Preliminary Survey Results

Garrett Forman[1], Soumil Prasad[1], Tonya Aaron[1], Elizabeth Franzmann[1]
University of Miami Miller School of Medicine, Miami, FL (1)

MIAMI MILLER SCHOOL of MEDICINE

Introduction

- Physician-scientists are vital tor translating basic science into clinical advances, but their workforce is shrinking across specialties, including otolaryngology.[1]
- K awards, such as the K01 and K08, provide structured funding and mentorship to support early career physician-scientists.
- R awards, such as the R01, are the largest category of NIH funding for independent research.
- The transition from K to R awards is an important milestone which can predict researcher success.[2]
- Gender differences in NIH funding noted among otolaryngology principal investigators.[3]
- Research productivity is an important metric for researchers; studies have demonstrated associations post R grant funding.[4]
- This study explored associations of age and early career research productivity on K-to-R transition in Otolaryngology scientists.

Methods/Materials

- Surveys were emailed to NIH-funded otolaryngology-scientists.
- Questions included demographics, training information, and research productivity.
- Ages at key milestones were compared between K-to-R transitioners and non-transitioners using independent samples T-tests.
- Publication counts across training stages were compared between groups using the Mantel-Haenszel test.
- Chi square tests of independence compared research types between groups.
- Due to low sample size (n=5), participants with race other than ”White” or ”Asian” were grouped into an “Other” category for regression.
- Logistic regression assessed predictors of K-to-R transition.
- Likelihood ratio stepwise regression was used to create a multivariate model assessing race, sex, age, and research productivity predictors of transition.
- We included the best-performing multivariate model (best overall % predicted correctly).
- SPSS v31.0 was used for statistical analysis.

Results

- 47 participants with complete responses were included in analysis.
- 23 (48.9%) underwent K-to-R transition.

Publication count at various stages of training

	Overall (n=47) N (%)	No (n=24) N (%)	Yes (n=23) N (%)	P-value
Medical School Publications				0.150
0	7 (14.9)	2 (8.3)	5 (21.7)	
1-5	31 (66.0)	16 (66.7)	15 (65.2)	
5-10	6 (12.8)	4 (16.7)	2 (8.7)	
10-15	2 (4.3)	1 (4.2)	1 (4.3)	
>15	1 (2.1)	1 (4.2)	0 (0)	
Residency Publications				0.510
0	1 (2.1)	1 (4.2)	0 (0)	
1-5	14 (29.8)	7 (29.2)	7 (30.4)	
5-10	9 (19.1)	6 (25.0)	3 (13.0)	
10-15	13 (27.7)	5 (20.8)	8 (34.8)	
>15	10 (21.3)	5 (20.8)	5 (21.7)	
Fellowship Publications				0.836
0	6 (12.8)	1 (4.2)	5 (21.7)	
1-5	25 (53.2)	16 (66.7)	9 (39.1)	
5-10	9 (19.1)	5 (20.8)	4 (17.4)	
10-15	5 (10.6)	1 (4.2)	4 (17.4)	
>15	2 (4.3)	1 (4.2)	1 (4.3)	

- Compared to non-transitioners, transitioners more often performed basic science (56.5% vs 29.2%) and translational research (86.9% vs 62.5%), although this only approached significance (p=0.58 and 0.055, respectively).
- No such differences for clinical epidemiology or clinical trials research between transitioners (17.4% and 21.7%, respectively) and non-transitioners (12.5% and 37.5%, respectively; p<005 for both)
- T-tests and univariable logistic regression revealed association of K-to-R transition with age at first grant (p<0.05).
- Mantel-Haenszel tests and logistic regression: no differences in research productivity between transitioners and non-transitioners (p>0.05).
- After adjusting for covariates, K-to-R transition was:
  - Positively associated with Other (vs. White) race and higher residency publication counts (p<0.05).
  - Negatively associated with older age at first grant and higher medical school publication count (p<0.05)
- This multivariate model was able to correctly predict 80.0% of cases (88.2% sensitivity, 72.2% specificity).

Demographic Characteristics

		K-to-R Transition Status		P-value
	Overall (n=47)	**Yes (n=23)**	**No (n=24)**	
Sex				0.680
Male, frequency (%)	32 (68.1)	15 (65.2)	17 (70.8)	
Female, frequency (%)	15 (31.9)	8 (34.8)	7 (29.2)	
Race				0.654
Asian, frequency (%)	12 (25.5)	6 (26.1)	6 (25.0)	
White, frequency (%)	30 (63.8)	14 (60.9)	16 (66.7)	
Black, frequency (%)	1 (2.1)	1 (4.3)	0 (0)	
More than 1, frequency (%)	1 (2.1)	0 (0)	1 (4.2)	
Prefer not to say, frequency (%)	3 (6.4)	2 (8.7)	1 (4.2)	
Medical School Graduation age, mean age in years (STDEV)	27.64 (2.53)	27.77 (3.01)	27.50 (2.02)	0.726
Residency Graduation age, mean age in years (STDEV)	33.40 (3.13)	33.48 (3.19)	33.33 (3.14)	0.876
Fellowship Graduation age, mean age in years (STDEV)	34.66 (2.74)	34.39 (2.55)	34.87 (2.93)	0.584
Age at first grant, mean age in years (STDEV)	35.22 (5.49)	33.35 (4.02)	37.09 (6.18)	**0.019**
Age at independent funding, mean age in years (STDEV)	40.26 (5.32)	39.05 (5.30)	41.60 (5.15)	0.122

Univariate and Multivariate Logistic Regression

	Univariate			Multivariate		
Variable	**OR**	**95% CI**	**P-value**	**OR**	**95% CI**	**P-value**
Sex	0.77	0.23-2.64	0.680			
Asian (vs. White) Race	1.14	0.30-4.36	0.845	2.73	0.29-25.55	0.378
Other (vs. White) Race	1.71	0.25-11.78	0.584	70.15	2.03-2,420.74	**0.019**
MD Age	1.05	0.82-11.32	0.719			
Residency Completion Age	1.02	0.84-1.22	0.873			
Fellowship Completion Age	0.94	0.74-1.18	0.575			
First Grant Age	0.86	0.74-0.99	**0.032**	0.77	0.62-0.96	**0.023**
Independent Funding Age	0.91	0.80-1.03	0.124			
Medical School Publications	0.55	0.24-1.27	0.551	0.14	0.03-0.67	**0.014**
Residency Publications	1.18	0.72-1.93	0.507	3.52	1.19-10.43	**0.023**
Fellowship Publications	1.06	0.59-1.91	0.835			

Discussion and Conclusions

- While age at training milestones did not differ between transitioners vs non-transitioners, younger age at first grant was associated with K-to-R transition.
- While increased residency publication counts was associated with increased odds of K-to-R transition, medical school publication counts had the opposite effect.
- Utilizing ORs, residency publications was one of the more important predictors tested.
- Observed differences among groups less likely impacted by research type (basic science, etc.).
- Conclusions about race are limited to due to a racially/ethnically homogenous cohort.
- Limitations include a racially/ethnically homogenous cohort and less precise publication info (vs continuous data).
- This study would benefit from higher statistical power and cohort diversity.
- Despite limitations, our model was able to predict K-to-R transition with 80% accuracy.

References

1. Salata RA, Geraci MW, Rockey DC, Blanchard M, Brown NJ, Cardinal LJ, Garcia M, Madaio MP, Marsh JD, Todd RF III. U.S. physician-scientist workforce in the 21st century: Recommendations to attract and sustain the pipeline. Acad Med. 2018;93(4):565-573. doi:10.1097/ACM.0000000000001950
2. Eloy JA, Svider PF, Kovalerchik O, Baredes S, Kalyoussef E, Chandrasekhar SS. Gender differences in successful NIH grant funding in otolaryngology. Otolaryngol Head Neck Surg. 2013;149(1):77-83. doi:10.1177/0194599813486083
3. Yin HL, Gabrilove J, Jackson R, Sweeney C, Fair AM, Toto R; Clinical and Translational Science Award “Mentored to Independent Investigator” Working Group Committee. Sustaining the clinical and translational research workforce: training and empowering the next generation of investigators. Acad Med. 2015;90(7):861-865. doi:10.1097/ACM.0000000000000758
4. Bajaj SS, Wang H, Williams KM, Pickering JM, Heiler JC, Manjunatha K, O'Donnell CT, Sanchez M, Boyd JH. Contemporary management of acute pulmonary embolism. Semin Thorac Cardiovasc Surg. 2020;32(3):396-403. doi:10.1053/j.semtcvs.2020.12.002