

A Leadership Intervention to Further the Training of Female Faculty (LIFT-OFF) in Radiology

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Rationale and Objectives: Women are under-represented in the field of radiology, occupy a minority of leadership positions, and, at our institution, have not achieved the same level of academic success as their male counterparts. Consequently, the authors designed, implemented, and evaluated the Leadership Intervention to Further the Training of Female Faculty (LIFT-OFF) program to (1) improve access to opportunities for women's faculty development and advancement, and (2) improve clarification of expectations about the role and path of advancement.

Materials and Methods: LIFT-OFF was developed based on the results of a needs assessment survey. The results generated 14 priority topics, which served as the basis for educational modules conducted by expert speakers. Module effectiveness was assessed with pre- and postsurveys to elicit participant knowledge about the targeted subject matter. A formative program evaluation was performed at the completion of year 1 of 2 to assess outcomes and impacts to date.

Results: Seventeen of 55 (31%) educational module post-survey questions demonstrated a statistically significant ($P < 0.05$) increase in "yes" responses, indicating an improved understanding of targeted information. At year 1, 75% of the participants indicated that the program improved access to faculty development opportunities and 62% reported improved access to career advancement opportunities. Satisfaction with pace of professional advancement increased from 25% to 46% for junior women faculty ($P = 0.046$).

Conclusions: Faculty development programs such as LIFT-OFF can provide career development opportunities and executive skills necessary for women to achieve academic career success and assume leadership positions.

Key Words: Faculty development; women; leadership; radiology.

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INTRODUCTION

Data from the Association of American Medical College's Faculty Forward Engagement Survey suggest that for women faculty to be successful, they should benefit from (1) clear expectations about the role and path of advancement, (2) an equitable and diverse workplace, and (3) access to opportunities for development and advancement (1). Likewise, substantive improvements in the development of women's careers and success in retaining women faculty were demonstrated after the implementation of a "Career Development

for Women in Academic Medicine" program in the Department of Medicine at Johns Hopkins University. More importantly, this intervention was found to benefit not only the women faculty, but all faculty members (2).

Women remain under-represented in radiology (22% of radiologists are women) despite steady parity of gender enrollment in medical school over the past 10 years (46% of enrollees are women) (1,3). As an additional concern, women occupy a minority of radiology leadership positions, with only 7% of leaders being women. The last 10 years has seen a minimal increase in the number of women program directors and virtually no increase in the number of chairwomen (4,5). This lack of women in leadership positions may result in a lack of role models to attract women medical students. For many women in internal medicine and surgery, access to female role models played a large role in the determination of specialty choice (6,7). Additionally, analysis of women medical students' interest in radiology careers has demonstrated that effective role models have a direct, positive influence on interest levels in radiology careers (8). Increasing the number of women in leadership roles in radiology has the potential to generate an overall increase in the number of women faculty members, maintain perspective of women, and attract future

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generations of women radiologists. It is imperative to improve faculty development for women in radiology to retain and advance the current women in academic radiology and to attract women to the field of radiology.

The authors designed, implemented, and evaluated a faculty development program called the Leadership Intervention to Further the Training of Female Faculty (LIFT-OFF) aimed at women radiologists to (1) cultivate knowledgeable, successful, confident women prepared to achieve career success and assume leadership positions and (2) promote a departmental culture supportive of career advancement of women faculty members. We hypothesized that in the initial year this program would (1) improve access to opportunities for faculty development and advancement and (2) improve clarification of expectations about the role and path of advancement. A recent review of the literature identified no previous studies evaluating the effectiveness of implementing a faculty development program for women in radiology. To the best of our knowledge, this innovative faculty development program for women is unique for the discipline of radiology.

MATERIALS AND METHODS

The LIFT-OFF program was developed using the results of a thorough needs assessment consisting of a survey of the women faculty, current literature review, speaking with and gaining support from key stake holders within the department and institution, requesting a curriculum design and evaluation consult, and seeking out funding sources resulting in a successful application for external funding support. Evaluation of the 2-year program consisting of 14 educational modules will use the Kirkpatrick model of evaluating training programs (9). Formative evaluation has been performed at the end of year 1 to assess the need for interim change before completion of the program.

Target Audience and Study Participants

All women faculty members on the clinical and research tracks within the department of radiology were eligible for participation in LIFT-OFF. Participants include faculty (instructors, assistant professors, associate professors, and professors of radiology), nurse practitioners (faculty and staff positions), and a medical physicist.

Needs Assessment

The authors reviewed historical data and information related to promoting women physicians within the department. A needs assessment survey was developed and implemented in February 2015 to assess current attitudes and needs of women faculty within radiology. This and all other surveys were developed in REDCap (10) and sent to participants via email invitation. The survey was designed by women radiologists and reviewed for face and construct validity. Nonstructured interviews with key stakeholders were completed as part of the needs assessment. The literature was reviewed to iden-

TABLE 1. Module Topics

Topics
Understanding of Promotional Guidelines
Developing Your Educational Portfolio
Enhancing Your CV
Work-Life Balance
Time Management and Organizational Skills
Meeting the Challenges of Academic Career Building
What's Holding You Back?
Clinical Investigation
Writing/Reviewing for Medical Journals
Writing Proposals and Winning Research Grants
Conflict Management
Moving Into Administrative, Leadership, and Policy-making Roles
Maximizing Your Professional Advancement Options
The Art of Self-promotion

CV, curriculum vitae.

tify current faculty development programs supporting women faculty members within various departments and institutions. Consultation with the institution's Educator Development Program (11) provided insight and guidance into the curriculum design, implementation, and evaluation process. External funding in conjunction with financial support from the department chair was obtained to fund the program.

Program Development

The authors used a standard curriculum design and evaluation approach consisting of the Kellogg logic model (12) to define outcomes, the Oliva model of curriculum design (13), and the Kirkpatrick model for evaluating effectiveness of training programs (9). Results from the needs assessment survey were used to identify 14 priority topics for educational modules. Modules were designed to promote reflection and interaction (see Table 1). An expert speaker was identified for each module or topic. Experts were identified from within our radiology department and from other departments within our institution. An effort was made to invite both men and women as expert speakers.

Two-hour educational modules were designed to cover each of the 14 priority topics. The 2 hours was divided as follows: the first 30 minutes was reserved for informal social gathering in which food and beverages were provided, and the remaining 90 minutes was reserved for the expert speaker. The modules were held in the evening to allow for maximum attendance. Modules were interactive and involved training activities and group discussions. Module topics evolved to meet the needs of the women during the course of year 1. The meetings served as an opportunity for discussion and networking among women in the department as well as with the expert speaker.

The first module of LIFT-OFF was implemented in June 2015 with year 1 completed in May 2016. At the end of year 1, eight modules had been completed. The completed modules,

TABLE 2. Modules Completed in Year 1

Module Name	Expert Speaker	Speaker Gender	Number of Participants Completing the Premodule Survey	Number of Participants Who Attended the Module Completing the Postmodule Survey (Total Number Completing the Survey)
Understanding of Promotional Guidelines	Department of Radiology Chair	Male	29	16 (26)
Work-Life Balance	Senior Faculty, Department of Surgery	Female	n/a	n/a
Developing Your Educational Portfolio	Director, Educator Development Program	Female	29	11 (19)
Promotion and Tenure Guidelines	Assistant Dean for Faculty Development, Medical Center	Male	n/a	n/a
Writing/Reviewing for Medical Journals	Senior Faculty, Department of Radiology, Journal Editor	Female	21	12 (17)
Enhancing Your CV	Vice Chair for Faculty Affairs, Department of Pediatrics	Male	16	11 (18)
Career Paths for Nurse Practitioners	Assistant Dean for Faculty Development, Medical Center	Male	n/a	n/a
Moving into Administrative, Leadership, and Policy-making Roles	Chief of Staff and Executive Medical Director of Children's Hospital	Female	17	13 (18)

CV, curriculum vitae; n/a, not applicable.

expert speakers, pre- and postsurvey participant response numbers, and module attendance are listed in Table 2. In addition to the designed educational modules, the participants were offered the opportunity to review their curriculum vitae (CV) in one-on-one sessions with senior faculty members.

Individual Educational Module Assessment

Modules were evaluated using internal evaluation forms both before and after the discussion. Pre- and posteducational module surveys were distributed for five of the eight implemented modules. The modules evaluated with pre- and postsurveys were Understanding of Promotional Guidelines (12 survey questions), Developing Your Educational Portfolio (11 survey questions), Writing/Reviewing for Medical Journals (11 survey questions), Enhancing Your CV (10 survey questions), and Moving into Administrative, Leadership, and Policy-making Roles (11 survey questions). These “yes” and “no” survey questions were specific to each module and were designed to elicit participant understanding of the targeted subject matter. The pre- and postmodule surveys were identical, with the exception of the postmodule survey containing an additional question to assess whether the respondent attended the educational module. The postsurveys also included an opportunity for participants to provide open-ended feedback regarding the module and speaker.

Each presurvey was administered approximately 1 week before the educational module. The postsurvey was admin-

istered approximately 1 week after the educational module. The presurvey responses for each module were compared to the postsurvey responses of those who had attended the educational module. *P* values were calculated for each question in the pre- and postmodule surveys to determine if there was a statistically significant difference in the pre- and postmodule survey responses of attendees.

Three modules did not have pre- and postmodule assessments due to limitations in attendance, special populations with low numbers, and subject matters that did not lend themselves to pre- and postmodule assessment. Modules not assessed included “Promotional and Tenure Guidelines at VUMC,” “Work-Life Balance,” and “Career Paths for Nurse Practitioners.”

Formative Evaluation at the End of Year 1

A formative evaluation was performed at the completion of year 1 of LIFT-OFF to assess the to-date outcomes and to elicit feedback to improve the program. This evaluation was designed by the program leaders with the assistance of an expert from the Educator Development Program and was assessed for face and construct validity. The evaluation was developed in REDCap (10) and sent to the participants via email invitation. The participants were sent up to three email reminders to complete the evaluation in a 4-week time period.

The formative evaluation included multiple questions specifically related to our hypothesis that in the initial year this

program would (1) improve access to opportunities for faculty development and advancement and (2) improve clarification of expectations about the role and path of advancement. This evaluation assessed module attendance and attitudes on professional advancement, faculty efforts to document accomplishments, impact of LIFT-OFF, and outputs of scholarly works. Measures include numeric assessment of modules attended, nominal measures and Likert scales (frequency counts and percentages) to assess attitudes on professional advancement, documentation of accomplishments and impact of LIFT-OFF, and open-ended comment fields to assess scholarly outputs.

Statistical Analysis

Survey data were reviewed in conjunction with a colleague with extensive experience in biomedical statistics. All data were downloaded into an Excel spreadsheet and analyzed using Stata (release 14, 2015) (14). Aggregate data were analyzed using descriptive statistics, the Fischer exact test, and chi-square test. The Fisher exact test was used when the calculated expected cell frequency was less than or equal to 5, and the chi-square test was used when the expected cell frequency was greater than 5 (15). A *P* value of <0.05 was considered significant.

Ethical Considerations

The study was deemed exempt by our institutional review board (#161022).

RESULTS

Needs Assessment

The needs assessment survey was distributed to the department's women faculty members ($n = 39$) with a total of 35 surveys completed, for a response rate of 89.7%. Demographic data are presented in Table 3.

Our needs assessment indicated that whereas 89% of the department's women find professional advancement important, 80% believe fewer women than men pursue academic promotions. Forty-one percent were not satisfied with the pace of their professional advancement and 86% indicated they would support the establishment of a faculty development program for women.

Sixty-eight percent of the women faculty responded "yes" when asked if lack of academic advancement can be attributed to limited knowledge of the promotional process and 24% responded "yes" when asked if women do not pursue academic promotion due to lack of institutional or departmental support. Only 51% of the department's women radiologists believe that women faculty members have access to the same professional opportunities as men. Forty percent believe that men and women in similar positions are paid com-

TABLE 3. Needs Assessment Survey—Demographics

Characteristic	<i>n</i> (%)
Age (y)	
30–34	3 (8.8)
35–39	9 (26.5)
40–44	9 (26.5)
45–49	3 (8.8)
50–54	2 (5.9)
55–59	2 (5.9)
>60	6 (17.6)
Rank	
Instructor	0 (0)
Assistant professor	16 (47.1)
Associate professor	4 (11.8)
Professor	6 (17.6)
Nurse practitioner	3 (8.8)
Other	5 (14.7)
Appointment	
Full time	28 (82.4)
Part time	6 (17.6)
Numbers of years in academics	
0–5	8 (23.5)
6–10	9 (26.5)
11–15	9 (26.5)
16–20	3 (8.8)
>20	5 (14.7)

parable salaries, and 40% believe institutional promotions are awarded to men and women faculty in an unbiased fashion.

When queried about mentorship, only 9% of the women indicated that they have a mentor, and 73.5% indicated that greater access to more appropriate mentors would be helpful. The most common perceived obstacles to career advancement included lack of mentorship, limited understanding of promotional guidelines, and lack of protected academic time (Fig 1).

Individual Educational Module Assessment

The number of participants completing the pre- and postmodule assessment surveys (both the total number completing the postmodule assessment and the number who attended the educational module completing the postmodule assessment) can be seen in Table 2. A total of 55 questions were included in the five educational module surveys. Each question in these surveys had two answer choices, "yes" and "no." Of the 55 questions, 17 (31%) demonstrated a statistically significant ($P < 0.05$) difference with pre- vs postintervention surveys (postmodule surveys of only those who attended the module). The 17 survey items with statistical significance are listed in Table 4. In all questions with a significant difference, there was an increased proportion of "yes" responses in the postintervention survey compared to the preintervention survey.

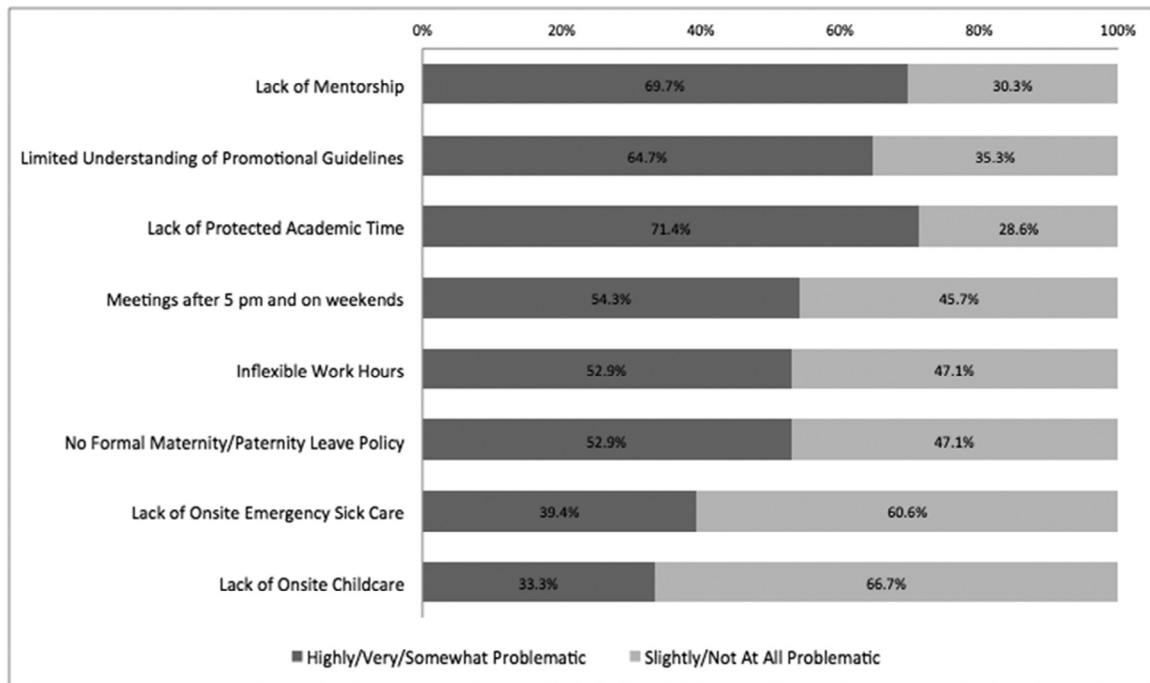


Figure 1. Percentage of participants indicating perceived obstacles to career advancement.

TABLE 4. Statistically Significant Individual Module Assessment Survey Questions

Survey Question	P Value
Understanding of Promotional Guidelines	
Do you know where to find the institution's standardized CV format?	0.0005
Do you know where to find the institution's Documentation of Teaching Form?	<0.0001
Do you know how to establish a mentorship committee?	0.0380
Developing Your Educational Portfolio	
Do you know where to find the electronic teaching portfolio?	0.0050
Do you know where to find the Documentation of Teaching Form?	0.0008
Do you understand the difference in the electronic teaching portfolio and the Documentation of Teaching Form?	0.0006
Do you know how to document your teaching activities in the electronic teaching portfolio?	0.0001
Do you know how to document your teaching activities in the Documentation of Teaching Form?	0.0300
Are you provided with a format to document your yearly progress to present at a performance review?	0.0220
Writing/Reviewing for Medical Journals	
Do you understand which types of manuscripts are generally published by the different radiology/medicine journals (<i>JACR, Radiology, RadioGraphics, Academic Radiology, NEJM, etc.</i>)?	0.0090
Do you know how to become a manuscript reviewer?	0.0220
Do you understand the manuscript review process?	0.0020
Enhancing Your CV	
Do you know what activities are appropriate to document on your CV?	0.0070
Do you know how to demonstrate your focus of interest on your CV?	0.0240
Administrative, Leadership and Policy-making Roles	
Do you know how to prepare yourself for a leadership role?	0.0002
Do you understand the leadership hierarchy of the medical center?	0.0016
Do you understand the hierarchy of the medical school?	0.0018
Do you understand who makes the medical center policies?	0.0069

CV, curriculum vitae; *JACR*, *Journal of the American College of Radiology*; *NEJM*, *The New England Journal of Medicine*.

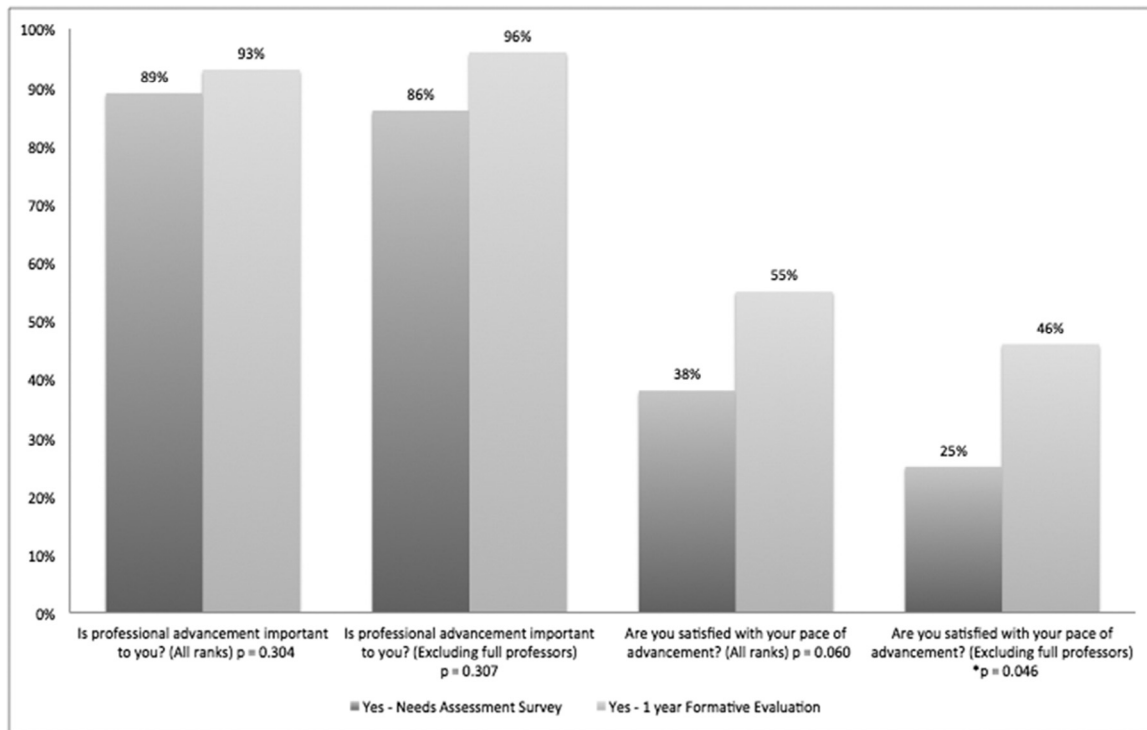


Figure 2. Comparison of needs assessment survey questions to year 1 formative evaluation survey questions: Is professional advancement important to you? Are you satisfied with your pace of advancement? Responses of all faculty and of early career faculty (excluding full professors) are demonstrated. * indicates item responses with statistical significance.

Formative Evaluation at the End of Year 1

The formative evaluation was distributed to the department's women faculty members ($n = 39$) with a total of 30 surveys completed, for a response rate of 76.9%. Results indicate that an overwhelming majority (86%) agree or strongly agree that LIFT-OFF provided a better understanding of the department's promotional guidelines compared to their understanding 1 year ago. The respondents indicated that the program improved access to faculty development opportunities (75%) and access to career advancement opportunities (62%).

Two of the questions in the formative evaluation identically repeated those in the initial needs assessment survey to assess the impact of LIFT-OFF: Is professional advancement important to you? Are you satisfied with the pace of your professional advancement? A comparative analysis was made (Fig 2). Ninety-three percent (27/29) responded that professional advancement was important to them, as compared to 89% (31/35) 1 year earlier. This change was not statistically significant ($P = 0.304$). Fifty-five percent (16/29) of all women faculty responded that they were satisfied with their pace of professional advancement as compared to 38% (13/34) 1 year earlier. While increased, this change was not statistically significant ($P = 0.060$). However, at year 1, 46% percent (11/24) of the early career women faculty (defined by exclusion of full professors) responded that they were satisfied with their pace of professional advancement as compared to

25% (7/28) 1 year earlier, which was statistically significant ($P = 0.046$).

Additionally, the majority (63%) believed that the program helped prepare them for a move into a leadership position. When queried about mentoring, 69% believed the program offered more access to mentorship opportunities than was available before its inception. The most common obstacles to increased academic productivity cited were protected time, clerical support, and research staff support.

Individual Women Faculty Achievements During Year 1

Individual participant achievements during year 1 of LIFT-OFF included promotion, leadership positions assumed, and academic successes. Since the implementation of LIFT-OFF, several women have successfully initiated the promotion process. This includes two radiologists who have been promoted from assistant professor to associate professor, one radiologist promoted from associate professor to professor, a nurse practitioner promoted from a staff to faculty position, and a medical physicist promoted from associate in radiology to assistant professor. Several participants have assumed leadership positions including Assistant Director of Lung Screening Program, Director of Alumni Relations and Development, Co-Directors of Women in Radiology (two), Associate Directors of Diversity, Equity, and Inclusion (two), Chair of state chapter ACR Women and General Diversity Committee, and

Vice Chair of Education. Additionally, two radiologists were selected for national early career professional development programs and one radiologist was selected for a national program for midcareer leadership. Academic successes include a radiologist awarded her first research grant, two early career radiologists with acceptance of first scientific abstract, one early career radiologist receiving a teaching or mentorship award, one later career radiologist receiving a university-wide mentorship award, and one radiologist receiving an institutional fellowship award for educational project development.

DISCUSSION

The present study was designed to investigate whether a faculty development program for women radiology faculty would (1) improve access to opportunities for career development and advancement, and (2) improve clarification of expectations about the role and path of advancement. Formative evaluation at year 1 of LIFT-OFF indicates that 75% of the participants perceive improved access to faculty development opportunities, 62% perceive improved access to career advancement opportunities, and 86% of the participants have a better understanding of the department's promotional guidelines compared to 1 year ago.

The overall results indicate improvement in perceptions among women faculty that career advancement is possible. Before implementation of LIFT-OFF, 89% of the women faculty indicated that professional advancement was important to them. This number increased without statistical significance at the time of the 1-year formative evaluation to 93%. However, at the time of the 1-year formative evaluation, there was a statistically significant increase in the number of early career women faculty satisfied with the pace of their professional advancement.

Fried et al. described a career development program for women in the Department of Internal Medicine at Johns Hopkins University, which used a multifaceted intervention over 5 years (2). These interventions targeted gender-based career obstacles reported by women faculty and interventions to improve faculty development, mentoring, and rewards, and to reduce isolation and structural career impediments. Their outcomes indicate that it is possible to make substantive improvements in the careers of women faculty and to decrease disparity between women's high interest in remaining in academic medicine and their low expectations that they would remain.

To our knowledge, our report describes the first such program developed for women radiology faculty. The findings of year 1 of the present study indicate a significant improvement in perceived access to faculty development and advancement opportunities, and improved clarification of expectations about the path to career advancement. We also demonstrate tangible evidence of career advancement among our women faculty in the form of promotions (both preparation for promotion and guidance through the promotion process), new leadership positions, and specific academic achievements. We attribute part of this early

success to the strong support of the department chairman, who encourages the purposeful measurement of outcomes, and recognizes that career advancement for women improves the level of excellence and competitiveness of the department and the institution.

Several challenges encountered warrant specific emphasis. We had limited numbers of senior-level mentors available for CV review and other activities requiring utilization of faculty in other departments to provide mentorship. A few of our early career women faculty were unable to attend any of the evening educational seminars due to conflicts with family responsibilities. Some of our senior faculty (full professors) did not consistently attend the educational modules and did not complete the postmodule surveys. Two of these senior faculty reported verbally that the educational modules appeared to be designed for early career faculty and were less beneficial to their respective careers. Finally, our response rate declined from the initial needs assessment survey to the formative evaluation at the completion of year 1. We attribute this in part to survey fatigue.

The authors acknowledge the limitations of a small sample size, largely a consequence of our small number of women faculty. Additionally, LIFT-OFF was implemented in a single institution and barriers to success may vary among institutions. This is a preliminary evaluation of the first year of the program, and we expect that substantive outcomes will likely take several years to manifest. We also acknowledge that other factors may have contributed to the promotion of women in year 1 of LIFT-OFF, including prior mentoring, influence of a new, supportive department chair, and recent institutional change in promotion track guidelines.

We aim to continue this work until we approach parity with male promotions in our department, achieving a critical mass of midcareer women at the associate professor level. We will continue to assess LIFT-OFF with a summative evaluation at the completion of year 2 and continual evaluation of the achievements of women faculty over subsequent years. Our long-term goal is to build a cadre of strong, confident women who will become leaders in our department and in our specialty. Future goals include improving the breadth of academic skills among our women faculty, increasing the number of research grants and peer-reviewed publications, and offering improved mentoring opportunities. We also aim to find ways to engage the senior women faculty while encouraging junior faculty to maintain their level of involvement with the educational modules. With continued effort, LIFT-OFF will be a sustainable model for other medical departments to create similar faculty development programs for women.

CONCLUSIONS

Although women remain grossly under-represented in leadership positions in academic radiology, faculty development programs such as LIFT-OFF can provide information and executive skills required for women to achieve academic career

success and assume leadership positions. Institutional support and a well-designed educational intervention are key to the success of such programs.

REFERENCES

1. Lautenberger MT, Dandar VM, Raezer CL, et al. The state of women in academic medicine—the pipeline and pathways to leadership. Washington, D.C.: Association of American Medical Colleges, 2013–2014.
2. Fried LP, Francomano CA, MacDonald SM, et al. Career development for women in academic medicine: multiple interventions in a department of medicine. *JAMA* 1996; 276:898–905.
3. Bluth EI, Bansal S, Macura KJ, et al. Gender and the radiology workforce: results of the 2014 ACR workforce survey. *J Am Coll Radiol* 2015; 12:155–157.
4. Baker SR, Bary M, Chaudry H, et al. Women as radiologists: are there barriers to entry and advancement? *J Am Coll Radiol* 2006; 3:131–134.
5. Chaudry H, Karcich J, Thomas P, et al. Women as radiologists a decade later: are there still barriers to entry and advancement? Abstract #39, ACR Summit 2015.
6. Neumayer L, Kaiser S, Anderson K, et al. Perceptions of women medical students and their influence on career choice. *Am J Surg* 2002; 183:146–150.
7. McMurray JE, Schwartz MD, Genero NP, et al. The attractiveness of internal medicine: a qualitative analysis of the experiences of female and male medical students. *Ann Intern Med* 1993; 119:812–818.
8. Roubidoux MA, Packer MM, Applegate KE, et al. Female medical students' interest in radiology careers. *J Am Coll Radiol* 2009; 6:246–253.
9. Kirkpatrick DL, Kirkpatrick JD. Implementing the four levels: a practical guide for effective evaluation of training programs. San Francisco, CA: Berrett-Koehler Publishers, Inc., 2007.
10. Harris PA, Taylor R, Thielke R, et al. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009; 42:377–381.
11. Vanderbilt University School of Medicine Educator Development Program. Available at: <https://medschool.vanderbilt.edu/ohse/educator-development-program>. Accessed August 25, 2016.
12. Kellogg WK. Foundation logic model development guide. Available at: <https://www.wkkf.org/resource-directory/resource/2006/02/wk-kellogg-foundation-logic-model-development-guide>. Updated January 2004. W.K. Kellogg Foundation. One East Michigan Avenue East. Battle Creek, Michigan 49017-4058 PDF. Accessed September 1, 2016.
13. Oliva PF. Developing the curriculum. 5th ed. New York, NY: Longman, 2001.
14. StataCorp. Stata: release 14. Statistical software. College Station, TX: StataCorp LP, 2015.
15. McDonald JH. Handbook of biological statistics. 3rd ed. Baltimore, MD: Sparky House Publishing, 2014.