# Residents' and Program Directors' Attitudes Toward Research During Anesthesiology Training: A Canadian Perspective

Lisa C. Silcox, MD, FRCPC, Ted L. Ashbury, MD, FRCPC, Elizabeth G. VanDenKerkhof, RN, DrPH, and Brian Milne, MD, FRCPC

Queen's University, Department of Anesthesiology, Kingston General Hospital, Kingston, Ontario, Canada

We assessed the attitudes of residents and program directors (PD) toward research training in Canadian anesthesiology residency programs. Questionnaires were sent to all 476 anesthesiology residents in Canada and a modified questionnaire was sent to the PD of each of the 16 anesthesiology programs between November 2003 and April 2004. There was a 60% response rate to the resident questionnaire and 95% from the PDs. Eighty-one percent of programs have mandatory research activity, although only 41% of residents think research should be mandatory. A majority of residents were recently involved in a research project. There was a discrepancy between PDs' and residents' views about the availability of some resources to facilitate research. Residents regard the time needed to learn clinical anesthesia, schedule conflicts, inadequate faculty support, and a lack of protected research time as the top barriers to undertaking a research project. PDs do not consider schedule conflicts or a lack of time as important barriers for resident research. Seventy-five percent of residents would prefer to do another academic activity, such as learning transesophageal echocardiography or taking postgraduate programs in education, rather than completing a research project during their residency.

(Anesth Analg 2006;102:859–64)

Anesthesiology may be in danger of becoming a "trade union" of technicians unless there is a continual rejuvenation and development of new clinically relevant knowledge (1). However, controversy continues regarding the role of research as an element of specialty training (2). The Royal College of Physicians and Surgeons of Canada (RCPSC) has adopted an innovative framework to define physician competencies (called the "CanMEDS Roles") during residency education (3). One of these competencies is that of "Scholar," where there is the expectation of resident contribution to the development of new knowledge. This implies that each resident training program in Canada should have in place a program to develop resident skills to facilitate and/or conduct a research project (3). However, from discussions with the program directors (PDs) from the 16 anesthesiology training programs in Canada at meetings of the Academic Canadian University Departments of Anesthesiology, it was clear that not all programs considered research a mandatory postgraduate residency activity. In addition to our own anecdotal observations, published data about resident attitudes toward research during training in other specialties suggested that not all residents are enthusiastic about doing research during residency and some do not value research as a useful academic exercise (4–12).

The purpose of this study was to compare residents' and PDs' attitudes and perceptions about the barriers to involvement in research projects during residency training. A secondary objective of the study was to discover whether there were alternate forms of academic activity residents would prefer in place of a research project.

## Methods

With approval of the Queen's University Faculty of Health Sciences Ethical Research Review Board, an anonymous, cross-sectional, self-report questionnaire was mailed to each of the 16 administrative assistants of the Canadian anesthesiology programs for distribution to the residents between November 2003 and

Supplemental data available at www.anesthesia-analgesia.org.
Accepted for publication September 22, 2005.

Address correspondence to Ted Ashbury, MD, FRCPC, Department of Anesthesiology, Queen's University, Kingston General Hospital, 76 Stuart St., Kingston, Ontario, Canada K7L 2V7. Address e-mail to ashburyt@kgh.kari.net.

DOI: 10.1213/01.ane.0000194874.28870.fd


0003-2999/06

**Table 1.** Demographic Characteristics of Postgraduate Residents Stratified by Year of Postgraduate training (PGY1 - PGY5)

| | PGY1 ($n$ = 49) | PGY2 ($n$ = 58) | PGY3 ($n$ = 60) | PGY4 ($n$ = 63) | PGY5 ($n$ = 49) | Total ($n$ = 283) |
|---|---|---|---|---|---|---|
| Partner/Spouse | 37 (75) | 45 (78) | 48 (80) | 48 (76) | 44 (90) | 222 (80) |
| Dependents* | 8 (16) | 11 (19) | 18 (30) | 28 (44) | 20 (40) | 85 (31) |
| Past Research Experience | 26 (53) | 28 (48) | 30 (50) | 35 (55) | 26 (53) | 145 (52) |
| Graduate degree (MSc/PhD) | 11 (22) | 8 (14) | 5 (8.3) | 11 (18) | 6 (12) | 41 (15) |

Values are $n$ (%).
* $\chi^2$ for trend = 15.9; $P < 0.001$

April 2004. A pre-paid return envelope was provided with all questionnaires. Each of the 476 residents enrolled in the RCPSC anesthesiology program and all 16 PDs were sent the appropriate questionnaire (Appendices 1 and 2; questionnaires available at www.anesthesia-analgesia.org). All trainees and PDs were approached for inclusion in the study. Other trainees in anesthesiology, such as those in a 1-yr family medicine program or anesthesiology fellows, were excluded. An email reminder was sent 2 mo after the initial distribution, and administrative assistants mailed replacement questionnaires for distribution 1 mo after the email reminder. Investigators remained blinded as to the sources of the returned questionnaires. Resident and PD questionnaires were coded so institutions could be linked for the purpose of data analysis. The resident questionnaire consisted of 41 questions covering demographics, availability of resources, attitudes toward research, possible benefits of research activity, and perceived barriers to performing research during residency. The PD questionnaire was a modification of the resident questionnaire and consisted of 24 questions directed mainly at availability of resources, attitudes towards research, and perceived barriers to residents performing research.

Questionnaire development was based upon a modified Dillman design (13). The PD questionnaire was pilot-tested by several staff members who offered comments as to the clarity of the questions in the survey. Recent graduates of our anesthesiology program were asked to pilot-test the resident survey and offer suggestions. "Research" was defined as "any activity designed to answer a question, whether this involves basic science activity, a clinical question, or a quality assurance activity." Questions were primarily closed-ended. The questionnaires consisted of Yes/No/Don't know responses and Likert scales. Three questions on the resident questionnaire and one on the PD questionnaire were open-ended and allowed for qualitative analysis.

Postgraduate Year 1 (PGY1) residents were excluded from the analysis whenever there were questions regarding knowledge of the anesthesiology curriculum because PGY1 residents do not usually have a chance to become familiar with the research infrastructure in their anesthesiology department. Data were entered into an Excel Spreadsheet (Microsoft, Redmond, WA) and imported into SPSS Version 12.0 (SPSS, Chicago, IL) for analysis. Descriptive statistics included frequencies and percentages. In bivariate analysis the $\chi^2$ statistic was used to compare responses between residents and PDs, and responses between residents with and without a MSc ± PhD. The one-sample Kolmogorov-Smirnov test was used to test the distribution of Likert scale responses. The Mann-Whitney $U$-test was used to compare Likert scale scores between respondents with and without a MSc ± PhD. Open-ended comments about alternatives to research activities were reviewed independently by two authors (LCS, TLA) for coding and descriptive reporting of the comments. All residents and PDs were included in the study; therefore a sample size calculation was not performed. Tests were conducted using a $P$ value $\leq 0.05$.

## Results

The overall response rate was 60% (283 of 476) for residents and 94% (15 of 16) for PDs. There were no significant differences in the numbers of residents who completed the questionnaire in each year of postgraduate training. Table 1 presents resident demographic data stratified by year of training (PGY1 to PGY5). Eighty percent of respondents had a partner or spouse, and the proportion of respondents with dependents increased as year of training increased ($\chi^2$ for trend = 15.9; $P \leq 0.001$; Table 1). Fifty-two percent of resident respondents had research experience and 15% had an MSc ± PhD degree. Table 2 shows that those with a graduate degree were twice as likely to report that they would be somewhat to very likely to pursue an academic career (54% versus 26%, $\chi^2 = 12.3$; $P \leq 0.001$). At the time of the survey 67% of PGY2-5 residents had been or were involved in a research project. The majority of respondents (59%) felt that residents should add to the body of anesthesiology knowledge; however, only 41% felt that research should be mandatory during residency training.

When asked if a commitment to family, friends, or other responsibilities impacted on their ability to take

**Table 2.** Postgraduate Year 1 to 5 (PGY1-5) Resident Attitudes and Opinions About Research During Residency Stratified by Graduate Degree (MSc/PhD)

| | Total ($n$ = 282) | Graduate degree ($n$ = 41) | No graduate degree ($n$ = 241) |
|---|---|---|---|
| Residents should add to knowledge | 166 (59) | 29 (71) | 137 (57) |
| Research should be mandatory | 115 (41) | 17 (41) | 98 (41) |
| Likelihood of undertaking a project during residency | 215 (76) | 32 (78) | 183 (76) |
| Involved in resident research ($n$ = 234, excludes PGY1) | 157 (67) | 19 (63) | 138 (70) |
| Likely to pursue an academic career* | 86 (30) | 22 (54) | 64 (26) |

Values are $n$ (%).
* $P \leq 0.001$.

part in research during the residency, 39% of the residents indicated that these commitments would prevent or significantly deter conducting a research project. Another 49% of residents indicated that these commitments would impact some of the time on their ability to work on a research project.

Residents and PDs were asked to rank three or more items in lists of "Institutional" and "Personal" barriers to undertaking a research project. Table 3 shows the percentage of times residents or PDs gave specific listed barriers a first- or second-place ranking. Residents and PDs assigned a high rank to the time needed to learn clinical anesthesia as a very common barrier. "Schedule conflicts" was the most highly ranked barrier to research by residents, but this was not highly ranked by PDs. Although a lack of protected time was very highly ranked by residents, no PDs ranked this as a first- or second-choice barrier to research. Together, PDs and residents ranked "inadequate mentors and assistants" highly. PDs selected a lack of faculty interest in research as an important barrier to residents' research. PDs and residents were similar in the ranking of other items. Residents without prior research training were more likely to report a lack of interest in doing research compared to those with a graduate degree (40% versus 12%, $\chi^2 = 11.5$, $P = 0.001$). Interestingly, respondents with a MSc ± PhD were more likely than the other residents to rank "Learning Anesthesia takes all their time" as one of the main obstacles to doing research (76% versus 51%, $\chi^2 = 8.681$; $P = 0.003$).

Thirteen of the 15 PDs indicated that research was mandatory in their program. Eighty-three percent of residents in programs where research was mandatory knew that a research project was a requirement in their program. Ninety-four percent of residents in programs without a mandatory research component concurred with their PD that research was not mandatory. In general, residents with a MSc ± PhD were less likely to be aware that research was mandatory in their programs compared with those without a graduate degree (35% versus 14%, $\chi^2 = 7.066$; $P = 0.008$).

Residents in programs with a mandatory research requirement are significantly more likely to be involved in a research project and to have presented some aspect of their research at an academic meeting (Table 4). However, there was no difference in the

**Table 3.** Perceived Importance of Obstacles Preventing Residents in Postgraduate Years 2 to 5 from Doing a Research Project: Residents versus Program Directors (PDs)

| Obstacle preventing resident involvement in research | % Residents selecting as 1st or 2nd ($n$ = 234) | % PDs selecting as 1st or 2nd ($n$ = 15) |
|---|---|---|
| A. Institutional Reasons | | |
| Schedule conflicts | 56 | 6 |
| Inadequate mentors, assistants | 48 | 40 |
| Lack of research curriculum | 29 | 0 |
| Inadequate financial support | 22 | 27 |
| Other reasons: time | 14 | 0 |
| Lack of patients | 8 | 0 |
| Lack of faculty interest* | – | 40 |
| B. Personal reasons | | |
| Learning anesthesia takes all time | 53 | 53 |
| Lack of protected research time | 42 | 0 |
| Lack of interest | 36 | 33 |
| Other personal obstacles | 33 | 25 |
| Feeling inadequate doing research† | 24 | – |
| Other commitments (home, etc.) | 3 | 6 |

* Asked of PDs only.
† Asked of Residents only.

**Table 4.** Differential Involvement and Productivity by Postgraduate Year 2 to 5 Residents From Anesthesiology Programs With and Without a Mandatory Research Requirement

| | Mandatory research requirement (14 programs, 175 residents) | | Non-mandatory research requirement (2 programs, 52 residents) | |
|---|---|---|---|---|
| Currently involved in a research project* | 138 | 79 | 16 | 31 |
| Poster/presentation of research at an Academic meeting† | 69 | 39 | 10 | 19 |
| Abstract produced | 44 | 25 | 10 | 19 |
| First author of article based on research | 21 | 12 | 7 | 13.5 |

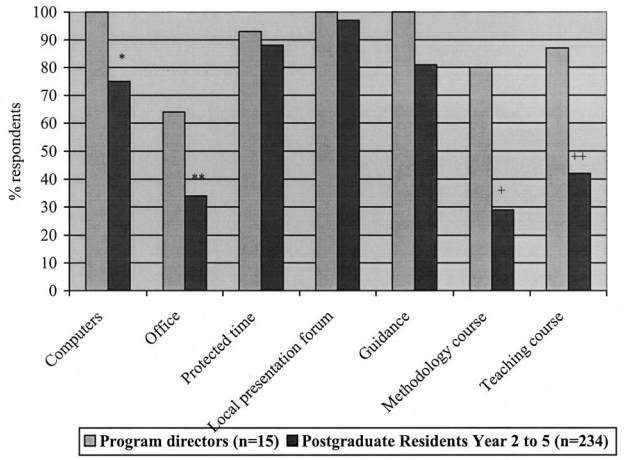
* $\chi^2 = 42.49$, $P < 0.000$; † $\chi^2 = 7.21$; $P < 0.007$

likelihood that residents in mandatory versus non-mandatory research programs would produce an abstract or first-author a publication based on their research.

Using a Likert scale (1 = not important and 5 = very important), residents were asked to rate whether continuing a research project was beneficial for the purpose of reading journals, undertaking future research, and applying research findings to clinical practice. Research was rated as important (median score, 4.0) for learning skills for reading journals and applying findings to their clinical practice, and was rated as moderately important (median = 3.0) for learning skills for conducting future research. When asked the same questions, PDs' responses mirrored those of the residents. Resident respondents with a MSc ± PhD were more likely to report that doing research was relevant to learning epidemiology and biostatistics for the purpose of doing future research than respondents without a graduate degree (median, 4.0 versus 3.0, Mann-Whitney *U*-test = 3638; $P = 0.009$).

Figure 1 compares PDs to the residents' (PGY2 to PGY5) responses regarding the availability of departmental resources to support the conduct of research. PDs were more likely to report the availability of all resources compared to residents. In particular, PDs were significantly more likely than residents to report the availability of computers, office space, and methodology and teaching courses.

Figure 2 compares PGY2 to PGY5 resident and PDs responses to questions regarding the availability of faculty support to conduct research. Significantly fewer PDs reported that there was an adequate number of research advisors, whereas residents were more likely than PDs to report that there was a motivated faculty and a supportive environment for research. However, significantly fewer residents than PDs reported that faculty provided useful advice about research (63% versus 94%, $\chi^2 = 5.46$; $P = 0.019$). When asked if the availability of having protected time influenced the decision to do a research project, 73% of residents said that this was very influential in their decision and a further 17% said it was somewhat influential.

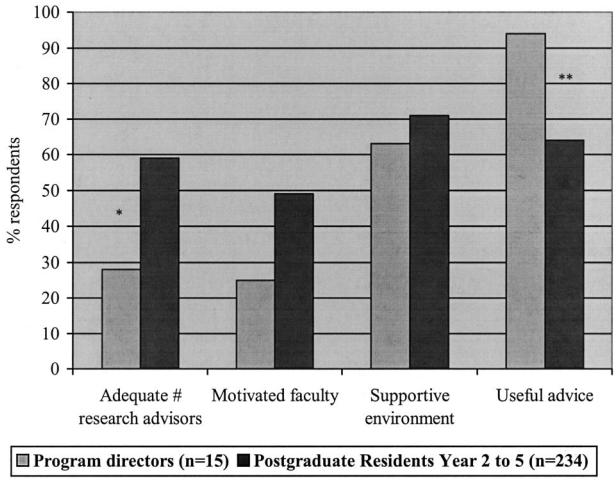



*$\chi^2 = 4.85$, P = 0.028; **$\chi^2 = 4.58$, P = 0.032; +$\chi^2 = 16.8$, p ≤ 0.001; ++$\chi^2 = 11.9$, P ≤ .001

**Figure 1.** Departmental research support available: Residents and program directors (PDs) differed significantly in their perception of the availability of certain institutionally offered resources that would help to facilitate resident research.

Seventy-two percent of residents indicated that they would be "somewhat" or "very likely" to prefer pursuing activities other than research. However, respondents with a graduate degree were less likely to consider alternate academic activity (51% versus 76%, $\chi^2 = 10.812$; $P = 0.001$). Of the 205 respondents who listed their choice of alternate activities, 3 main themes emerged. Forty percent wanted to take transesophageal echocardiography courses, 35% listed some education-related activity (e.g., medical student teaching, graduate education courses), and 35% wished to attend clinical courses or workshops. Other activities that residents indicated would be valuable alternatives included time in an anesthesia simulator, practicing clinically relevant activities, and skills acquisition (bronchoscopy, regional anesthesia, trauma management). Two thirds of the responding PDs recognized that residents would prefer pursuing an alternate academic activity.

Finally, the majority of resident respondents (64% answered "yes" and 28% answered "don't know") believed that research-oriented anesthesiologists were financially disadvantaged.




$^{*}\chi^2 = 6.15$, P = 0.013; $^{**}\chi^2 = 5.46$, P = 0.019

**Figure 2.** Faculty support available: Program directors (PDs) were less likely to suggest that programs had sufficient faculty resources for supporting resident research compared to the PGY2-5 residents. However, the residents were more likely to indicate that the advice they received was inadequate.

## Discussion

Consistent with the RCPSC residency requirements, Canadian anesthesiology PDs report that they offer resources for research projects during the residency and most (13 of 15) have a mandatory research component in their curriculum. The majority of residents believed that they should add to the body of anesthesia knowledge, and many residents acknowledge that there are benefits to be gained by doing a research project. However, 72% of residents would prefer to do some alternate academic activity, and only 41% of residents think research should be a mandatory component of a resident training program. From this survey, it would appear that the most significant factor preventing anesthesiology residents from embracing research is the perceived lack of time. This is consistent with the findings of others who have studied similar aspects of pediatric, radiology, family medicine, and psychiatry residencies (4,5,7–9). Many anesthesia residents, similar to the pediatric residents in the McCrindle and Grime study (5), feel that the majority of their time should be spent learning the clinical aspects of their specialty. Although anesthesiology residents acknowledge that there is time set aside for research, residents indicated that their commitments to family and other activities were significant barriers to doing a research project. This may reflect lifestyle considerations similar to those of radiology residents who are less willing to sacrifice personal time for research that is perceived as an extra time commitment rather than an integral part of the curriculum (4). Importantly, PDs did not even rank residents' commitments outside anesthesia as a barrier to resident research.

Gay and Hillman (12) evaluated 24 radiology residents' attitudes to the imposition of a mandatory 1-month research rotation. Only 10 residents reported that they would have done the rotation had it been optional but, once completed, 18 residents thought the rotation should be continued. In contrast, Morris et al. (10) reported that 61% of graduates of a family medicine residency thought that they had not gained a great deal from their mandatory research rotation.

Not all PGY2-5 residents in anesthesiology programs where the PD stated that research was mandatory were aware of this mandatory requirement. Interestingly, residents with a postgraduate degree were less likely to be aware that research was a mandatory part of their program. PDs were more likely to report that teaching and methodology courses were available, but residents were not aware of these resources. More PDs than residents were also likely to perceive the advice by faculty as being useful. These discrepancies may reflect a lack of a coordinated research curriculum in some residency programs or a varied perception of what is considered a research program. Buschbacher and Braddom (6), in a survey of all residents and residency PDs in physical medicine and rehabilitation, assessed the perspective of residents and PDs regarding research training, resources, mentorship, and encouragement available to residents. They found similar discrepancies in perceptions of residents versus the PDs in the provision of research support and training including statistics, research design, and tips for writing research papers. DeHaven et al. (14) showed that residency programs with successful research curricula had at a minimum PD support for research, time for research, faculty involvement, a research curriculum, professional support, and opportunities for presenting research. This implies that research-successful residency programs communicate to the residents that research is a priority in the curriculum and make the resources, including protected time, available.

Perhaps the most outstanding finding in this study was that 72% (205 of 283) of the residents were clearly interested in alternate forms of academic activity, generally activities that would enhance their clinical abilities such as learning transesophageal echocardiography or other clinically oriented courses. Thirty-five percent of residents would prefer to concentrate on acquiring teaching or education skills rather than devote time to research. Fewer residents with significant research backgrounds (MSc/PhD) were interested in pursuing alternate activities. This is consistent with the results of Ullrich et al. (8), who found that residents with PhD, MSc or other postgraduate degrees were more likely than others to participate in research during residency. However the residents in Ullrich et

al.'s study were pediatric residents who were also more likely to subspecialize. This interest in alternate academic activity may have become evident because we asked the question "Would you prefer to pursue some alternate academic exercise rather than doing a research project during your residency?" Although some researchers have found a large percentage of residents feeling that research should be an option during residency training (4,9,11), others such as Morris et al. (10) found that 79% of the graduates of a family practice program would not have done a research project if it had not been mandatory. No other studies specifically asked residents what they would consider an alternate academic activity.

As with any survey, there are limitations to this study. Residents and PDs were asked to self-report activities. Although a pilot study was conducted to assess the face validity of the questionnaire, the survey did not clearly distinguish those residents who may have had significant research experience without gaining a postgraduate degree. PDs were not asked if they had any clearly defined curriculum for their research program despite the fact that the majority of the PDs indicated that research was a mandatory component of their residency. The presence or absence of a published research curriculum could explain the confusion some residents expressed concerning the mandatory nature of research in their program. Further research in this area could focus on the development of successful research curricula for each program.

We could not sample the nonresponders to determine if they represented significantly different points of view because of the confidential nature of the study. All but one of the 16 PDs returned the questionnaire. Thus, PD data are representative of opinions of Canadian academic anesthesiology programs. The overall response rate of 60% for the resident questionnaire is acceptable for this type of study and similar to others (4,6,9,12). In addition, the findings are consistent with findings reported in the literature by other specialties (4,6–9,11).

This study demonstrated that, in Canadian anesthesiology residency training programs, a major barrier to doing a research project is the residents' perceived lack of time. Although very important to residents, PDs do not rank resident commitments outside of their resident education as an obstruction to resident research. Most residents would prefer to partake in alternate, often clinically relevant, activities rather than a research project. Based on this and other studies, it would seem necessary that PDs define and communicate the goals, objectives, and benefits of research to all residents as part of the requirements of their education. Research activity must be supported with a well-defined curriculum and adequate resources, with particular attention to protected time and mentoring capabilities to facilitate research endeavors (14). These activities may be helpful in achieving a renewed interest in research during the residency. As noted by Miller (1) ". . .research is vital to the future of anaesthesiology as a profession."

The authors would like to thank Ms. Kim Asselstine, our Postgraduate Residency Program Coordinator, for her organizational assistance with this project. We would also like to thank all the residency program coordinators across Canada, and the residents and PDs who supported this study by filling out the survey, and Dr. Ian Gilron MD, FRCP for his critical review of our questionnaire and manuscript.

## References

1. Miller RD. The place of research and the role of academic anaesthetists in anaesthetic departments. Best Pract Res Clin Anaesthesiol 2002;16:353–70.
2. McKinnon G. "But I just want to be a good clinician": research in Canadian surgical training programs. Ann R Coll Physicians Surg Can 2002;35:203–6.
3. Frank JR, Jabbour M, Tugwell P, et al. Skills for the new millennium: report of the societal needs working group, CanMEDS 2000 Project. Ann R Coll Physicians Surg Can 1996;29:206–16.
4. Logan PM. Resident research in Canadian radiology training programs. Ann R Coll Physicians Surg Can 1998;31:233–5.
5. McCrindle BW, Grimes RB. Will pediatric residents do research? A survey of residents' attitudes. Ann R Coll Physicians Surg Can 1993;26:283–7.
6. Buschbacher R, Braddom RL. Resident versus program director perceptions about PM&R research training. Am J Phys Med Rehabil 1995;74:90–100.
7. Gill S, Levin A, Djurdjev O, Yoshida EM. Obstacles to residents' conducting research and predictors of publication. Acad Med 2001;76:477.
8. Ullrich N, Botelho CA, Hibberd P, Bernstein HH. Research during pediatric residency: predictors and resident-determined influences. Acad Med 2003;78:1253–8.
9. Temte JL, Hunter PH, Beasley JW. Factors associated with research interest and activity during family practice residency. Fam Med 1994;26:93–7.
10. Morris BA, Kerbel D, Luu-Trong N. Family practice residents' attitudes toward their academic projects. Fam Med 1994;26:579–82.
11. Fitz-Gerald MJ, Kablinger A, Manno B, et al. Psychiatry residents' participation in research: a survey of attitudes and experience. Acad Psychiatry 2001;25:42–7.
12. Gay SB, Hillman BJ. Evaluation of a mandatory radiology resident research rotation. Acad Radiol 2000;7:172–5.
13. Dillman DA. Mail and internet surveys: the tailored design method. 2nd ed. New York: John Wiley & Sons, Inc., 2000.
14. DeHaven MJ, Wilson GR, O'Conner-Kettlestrings P. Creating a research culture: what we can learn from residencies that are successful in research. Fam Med 1998;30:501–7.