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Establishing Good Collaborative Research Practices in the Responsible Conduct of Research in Nursing Science

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Keywords

Collaborative Practices; Nursing Science; Research Integrity

Introduction

Training in the responsible conduct of research (RCR) has become a mainstay within U.S. academic institutions. This training generally focuses on two main areas—scientific misconduct, particularly as it pertains to falsification, fabrication, and plagiarism, and professional rules of conduct at institutional, federal, and professional levels (Kalichman, 2014; Panel on Scientific Responsibility and the Conduct of Research, 1992). Although training in RCR is necessary to promote transparency and the integrity of the research process, consensus on its goals and how best to achieve them is lacking (Kalichman, 2007). It has been almost a decade since Kalichman and Plemmons (2007) interviewed RCR instructors to better understand the educational goals of RCR training. Their respondents reported over 50 distinct goals concerning knowledge, skills, attitudes, and behavior important to the integrity of science, including knowledge about data management, human subjects, animal subjects, authorship, misconduct, collaboration, ethics, law, psychology, intellectual property, grant writing, knowledge systems, resources, and more. Kalichman and Plemmons (2007) rightfully argued, “If the goals of RCR instructors are so highly variable, then it is unlikely that their diverse efforts at RCR education will result in a common set of outcomes” (p. 848).

Similar to professionals in other disciplines, nurse scientists are required to receive RCR training; they are fundamental contributors to all areas of scientific discourse. Nurse scientists are not however, immune to ethical challenges in the conduct of research. We know, however, very little about their standards of conduct, their views on the integrity of science, and the goals of RCR training for the discipline. As independently funded scientists,

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nurse researchers work collaboratively both within and outside their discipline to extend critical lines of scientific inquiry. In fact, collaboration or working together with others on a research project (as defined by our research team) can yield powerful results, but it can potentially lead to ethical conflicts. These conflicts can vary, ranging from ineffective team leadership in advancing the goals of the collaborative project, to scholarly differences on handling intellectual property, authorship, and dissemination.

The “wicked problems” that researchers encounter today include those that are unique in character, defy complete definition, raise uncertainty about their resolution, and are value laden (Sharts-Hopko, 2013). These research problems not only require different epistemological and empirical approaches but also standards of collaborative research practices that guide the ethical conduct of research. As part of a larger study that was conducted with four different disciplines on the standards and practices of RCR in three domains (i.e., authorship, collaboration, and data management), the purpose of this study was to describe nurse scientists’ views of collaborative standards and practices in nursing science. For participants, we defined standards as accepted practices or approaches to the responsible conduct of research. These standards can be written (e.g., regulations or guidelines) or unwritten (customs or practices) (Kalichman, Sweet, & Plemmons, 2013).

Methods

Survey Development

Data from nurses were collected as part of a larger survey of scientists (i.e., microbiology, neuroscience, psychology, and nursing) who were participating in a study on standards of responsible conduct that included the domains of authorship, collaboration, data management, and teaching and learning. The methods for the full study are described in detail elsewhere (Kalichman, Sweet, & Plemmons, 2013). The survey was developed in several phases, including assembling a panel of research ethics experts, conducting focus groups and interviews, selecting graduate programs and faculty, and pilot testing.

Thirteen focus groups with faculty participants from the various professional disciplines were initially conducted to ascertain common practices of scientists related to our three prominent areas of responsible conduct (authorship, collaboration, and data management). Two of those focus groups were conducted with nursing participants. Focus group information was audiotaped, transcribed, and reviewed to identify recurring themes for survey item development.

Focus groups were followed by a series of telephone interviews with 22 randomly selected U.S. research faculty from the top 10 disciplinary departments, as ranked by *U.S. News and World Report*. Eleven nursing faculty members (ranging in rank) were interviewed to provide input on each survey item and to clarify the content as needed. The final survey consisted of five sections with a total of 132 items and used both closed and open-ended questions. All of the topic domains, as well as the term *standards of conduct*, were defined for the respondents.

Finally, working with the Virginia Commonwealth University Survey and Evaluation Research Laboratory, we conducted a pilot study with a random sample from the larger study to assess any concerns related to the nature of the survey and the mode of electronic dissemination. There were no concerns related to the pilot study; minimal changes were made to the survey and an instruction on estimated completion time was provided. All study aspects were approved by the University of California, San Diego, Institutional Review Board.

Selection of Nursing Graduate Programs

We identified nursing, psychology, neuroscience, and microbiology graduate programs from Peterson's website (www.petersons.com), which provides information on U.S. graduate programs, including the name, city, and state of the academic institution. After identifying a list of nursing graduate programs and excluding those that had little or no information that we could find on the Web or that were solely clinical, we randomized program names and then selected the first 50 graduate nursing institutions. We deleted any duplicate nursing programs on the list and subsequently replaced them with the next program in the list of 50. We then searched the selected institutional websites for faculty information. We included any faculty members who were broadly listed as professor, scientist, adjunct, or researcher, and we excluded those who were emeritus, retired, or clinical faculty. Further, if we could not find e-mail addresses for more than five faculty members at a particular institution, we skipped to the next institution on the list. Invitations were sent in November of 2010 and two follow-up requests to non-respondents were automatically generated and the survey was closed on March 15, 2011. We invited 1,550 nursing faculty to participate in this web-based survey, with an overall 27% response rate.

Measures

To measure participants' views on standards of research conduct for collaboration, we specifically developed items from our formative qualitative focus groups and semistructured interviews. We asked participants to share their experiences on standards of research conduct for collaboration (7 items); factors that contribute to successful and challenging research collaborations, including the involvement of different groups of collaborators (e.g., multiple disciplines and junior and senior faculty) (17 items); and finally, how standards for successful collaborative relationships are learned (8 items). A majority of these items were measured on a 5-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (5). Two of the teaching and learning items were measured dichotomously (yes–no response). These included whether participants knew of any published guidelines in their department or institution for standards of collaboration and whether they explicitly taught graduate and postdoctoral researchers about roles and responsibilities related to collaboration. Each section also allowed for an “other” category so participants could openly identify any concerns related to collaborative practices. In addition, an open-ended item asked participants to address factors posing challenges to research collaborations.

Statistical Analysis

Data were analyzed with SPSS for Windows (version 21.0, SPSS, Inc., Chicago). Measures of central tendency described the sample characteristics. In addition, descriptive analyses were conducted for each collaborative practice item related to standards of conduct. Responses were condensed into three categories for purposes of the analyses (disagree, neutral, and agree) because of limited variability across response options. Item responses also included a “don’t know,” “not applicable,” and “question not clear” category. This category was not included in the analysis because less than 3% of the sample identified with any one of these options for most items with this response structure. In addition, even for the several items on which more than 3% of the sample used this category, responses were equally distributed across academic rank, race, and research methods.

Chi-square tests were used to compare responses of faculty by academic rank (assistant, associate, and full professor), race and ethnicity (Caucasian and minority group), and research methods (qualitative only, quantitative only, and mixed methods). If the expected count of at least one cell was less than 5, a Fisher’s exact test was used. If the chi-square or Fisher’s exact test produced a *p* value less than .05, a pairwise post hoc analysis was conducted to identify which cell or cells produced the statistically significant difference. Bonferroni correction was used to control familywise type I error at the .05 level.

Results

Sample Demographics

A majority of the respondents were female (89.8%) and Caucasian (91.5%). The sample was equally distributed among assistant, associate, and full professors (33.6%, 33.1%, and 31.4%, respectively). Respondents had been faculty members for an average of 15 years ($M = 15.35$, $SD = 10.76$) and had been primary investigators for a mean of 9.43 years ($SD = 8.09$). On average, respondents published a total of about 30 peer-reviewed papers ($M = 28.36$, $SD = 29.67$) and were listed as first or senior author on 16 papers ($M = 16.67$, $SD = 18.58$). A majority of scientists (97.8%) were trained in North America; less than 3% were trained in Europe, Central or South America, Africa, or elsewhere. Finally, a majority of nurse scientists identified with a quantitative research paradigm (81.2%), whereas more than a third (39.9%) indicated qualitative research methods as a focus of inquiry. Among them, 21.3% applied both qualitative and quantitative methods (mixed methods) in their research.

Standards of Conduct for Collaboration in Nursing

Nurse scientists’ views about collaboration are presented in Table 1, by academic rank. First, less than 50% of the sample agreed with the statement “The characteristics of good collaborative practices are commonly known to researchers.” There was no significant difference based on rank of faculty ($p = .290$) with this particular item. Second, most participants (64.3%) agreed that conversations among collaborators about roles and responsibilities occur when the collaboration is first proposed. However, nearly 30% disagreed with this statement. Third, international collaborations were not considered common in nursing science; only slightly more than one of three (34.3%) nurse scientists rated this type of collaboration as common to the discipline. Fourth, more than half of

respondents (54.5%) agreed that junior faculty were at risk of being exploited in collaborative relationships. Conversely, 86.4% of full professors perceived that the rewards of collaboration with senior faculty outweighed the risks, which was significantly higher than the proportion of assistant professors (68.9%, $\chi^2 = 11.2$, $N=257$, $df=1$, $p = .001$) and associate professors (66.7%, $\chi^2 = 13.8$, $N = 257$, $df=1$, $p < .001$) who shared this view.

There was a significant difference in participants' views related to exploitation of junior faculty by rank ($\chi^2 = 27.8$, $N=393$, $df=4$, $p < .001$). Indeed, assistant and associate professors were more likely than full professors to agree with this statement (assistant vs. full professor, $\chi^2 = 22.1$, $N=260$, $df=1$; associate vs. full professor, $\chi^2 = 16.9$, $N=258$, $df=1$, $p < .001$, which was significant at the Bonferroni-adjusted alpha level). Researchers with solely a qualitative focus (70.7%) were also more likely than those with solely a quantitative focus to report concerns about exploitation of junior faculty (47.3%, $\chi^2 = 12.5$, $N=314$, $df=1$, $p < .001$).

Factors That Contribute to Successful and Challenging Research Collaborations

As shown in Table 2, over 90% of nurse scientists noted three particular issues that reflect successful research collaboration: clearly defined roles, responsibilities and boundaries; clear and frequent communication; and complementary interests or expertise. About a quarter of respondents (24.1%) also reported that close geographic proximity of collaborators is important to successful collaborations. The opinions did not differ by academic rank, race, or research method (all $ps > .05$).

Nurse scientists consistently agreed that successful collaborations are challenged by a lack of communication (92.1%) and timeliness (90.9%); different expectations concerning authorship (77.8%) and data ownership (70.6%); and poorly defined roles, responsibilities, and boundaries (91.5%) (Table 3). Collaborations were also challenged when they involved relationships between the academic institution and a foreign government, especially in regard to that government's involvement in or oversight of research (53.3%); industry (52.8%); the community (43.4%); and the military (40.1%). Challenges also occurred in collaborations involving multiple disciplines (38.8%), both junior and senior faculty (28.8%), and bench and clinical science (36.5%). Finally, more than three-quarters of our sample (77.6%) identified language barriers as particularly challenging to collaborative science.

Nurse scientists from different academic ranks had consistent opinions on the challenges of successful collaboration. Associate professors however, were less likely than their full professor colleagues to disagree with the statement that community collaborations are challenging (31.9% vs. 50.9%, $\chi^2 = 8.3$, $N = 223$, $df = 1$, $p = .004$). Researchers from racial-ethnic minority groups were less likely than Caucasians to disagree that the involvement of multiple disciplines (21.9% vs. 46.0%, $\chi^2 = 6.9$, $N = 384$, $df=1$, $p < .01$) is challenging in collaborative relationships. In addition, researchers with a minority background also tended to be neutral with regard to challenges from other types of collaborative relationships, including involvement of junior and senior faculty (36.4% vs. 17.0%, $\chi^2 = 7.4$, $N = 391$, $df = 1$, $p = .006$), bench and clinical science (46.4% vs. 21.7%, $\chi^2 = 8.5$, $N = 300$, $df = 1$, $p = .006$).

004), and academic and industry relationships (42.3% vs. 18.4%, $\chi^2 = 8.3$, $N = 282$, $df = 1$, $p = .004$).

Compared with those who only use quantitative methods, nurse scientists who identified solely with qualitative research methods were more likely to indicate that different expectations about data ownership (87.3% vs. 65.0%, $\chi^2 = 13.0$, $N = 308$, $df = 1$, $p < .001$) and lack of timeliness (100.0% vs. 87.7%, $\chi^2 = 9.6$, $N = 307$, $df = 1$, $p = .002$) challenge successful collaborations. In addition, researchers with a quantitative focus were more likely than researchers using mixed methods to disagree that successful collaborations were challenged by involving bench and clinical science (46.2% vs. 23.0%, $\chi^2 = 10.3$, $N = 247$, $df = 1$, $p = .001$) and by involvement of both junior and senior faculty (57.9% vs. 41.2%, $\chi^2 = 7.1$, $N = 325$, $df = 1$, $p = .008$, marginally significant at the Bonferroni-adjusted alpha level, that is, .0056).

Open-Ended Responses

In addition to the successful collaboration challenges aforementioned, participants openly identified other issues. Participants indicated that collaborations frequently pose challenges because of competing goals (and unacknowledged agendas) among the collaborators; competing egos and expectations; power differentials between collaborators; cultural differences; different work styles, levels of commitment, and levels of trust and communication (including being afraid to ask direct questions about authorship and responsibilities); and time constraints and competing interests. Participants also indicated that the factors that drive collaboration are unknown and some researchers lack the skills needed to carry out collaborative endeavors.

Learning Successful Collaborative Relationships

Most respondents reported learning about collaborative relationships from personal experience or from a research mentor (98.3% and 97.8%, respectively) (Table 4). However, 79.4% of participants did not know of any published guidelines for standards of collaboration in their department or institution, and significant differences were noted between Caucasian and racial-ethnic minority nurse scientists (80.8% vs. 60.0%, $\chi^2 = 6.1$, $N = 342$, $df = 1$, $p < .05$). More than half of participants (57.9%) cited a course or other formal training in learning about collaborative relationships. Others learned about successful collaborative relationships from published professional or journal guidelines (32.4%) or from institutional guidelines or requirements (37.8%).

A majority of participants (93.1%) agreed that standards of conduct can be taught explicitly for entering into and maintaining collaborative relationships. There was consensus across academic rank, race-ethnicity, and research methods (all ps or Fisher's p values $> .05$). Finally, of those who responded, four-fifths of participants (80.1%) reported that they explicitly teach graduate students and postdoctoral researchers about roles and responsibilities for collaboration. Full professors (89.3%) were more likely than assistant professors (71.9%, $\chi^2 = 10.7$, $N = 217$, $df = 1$, $p = .001$) and associate professors (77.1%, $\chi^2 = 6.3$, $N = 239$, $df = 1$, $p = .012$) to teach about these responsibilities (Table 4).

Discussion

This is one of the first studies to investigate nurse scientists' views on the responsible conduct of research, particularly as it pertains to collaborative research practices within the discipline. Five major findings were gleaned from this study: first, the general lack of consensus on standards of conduct for collaborative research practices for nurse scientists; second, concerns about the exploitation of junior faculty in collaborative relationships; third, the unique challenges of qualitative researchers on collaborative teams; fourth, challenges posed by collaborations between academic and other institutions, including international collaborations; and fifth, the lack of published guidelines to support collaborative research practices.

To the first point, our data suggest that nearly 40% of nurse scientists—regardless of rank—had no clear perspective on what constitute good practices for collaboration within the nursing discipline. Although respondents could identify the barriers to good collaborations, describing facilitators for collaboration was much more challenging. Clearly defined roles, responsibilities, and boundaries, clear and frequent communication, and complementary interests and expertise remained the top identified goals for good collaborations.

The fact that junior faculty felt they were at risk of exploitation in collaborative relationships with senior faculty warrants further discussion. Although the nature of this exploitation remains unclear, the pressures of academic science are not trivial. Promotion and tenure are granted to independent scientists who have made significant intellectual contributions to a selected field of inquiry. Collaborative relationships are not usually recognized by academic universities as a criterion for advancement, potentially placing junior faculty at risk. Our finding supports the work of DeVries, Anderson, and Martinson (2008), who reported on 51 qualitative interviews with assistant and associate professors as well as with postdoctoral fellows. Concerns of exploitation mostly centered on postdoctoral fellows and included worries about competition with senior scientists, ideas being stolen, and use of fellows' work by professors without attribution or permission. We also noted similar concerns in our open-ended responses, where collaboration was perceived to pose risks on varying levels.

Junior faculty often struggle to obtain federal funding to establish independent lines of inquiry and rely on senior scientists' mentorship and guidance. Mentorship can vary within collaborative relationships and can either facilitate standards of conduct or—however subtly—promote questionable practices (Anderson et al., 2007). As federal funding resources continue to be stretched, competition will remain. The risk of exploitation was even more pronounced among those who identified themselves as qualitative methodologists, with particular concerns in the area of data ownership. Qualitative methodologists face unique ethical challenges by nature of the participant–researcher interaction, including concerns related to informed consent, confidentiality, and adequate representation of the data. The expansion of qualitative methodology and mixed methods over the past decade requires qualitative expertise on many research teams. However, there are times when qualitative expertise is added to established research teams with a priori hypotheses. Negotiating one's role on a well-known quantitative research team may bring epistemological challenges concerning data ownership. As noted by Lin (2009), "It may be more difficult in qualitative

research to have a clear data ownership agreement, especially where data ownership is split between 2 or more parties” (p. 136). More research is needed to better understand the exploitation concerns of junior faculty members, including those whose primary methodological focus of inquiry is qualitative. In addition, we also need to examine the association between mentorship for junior faculty, federal funding, and RCR practices and behaviors.

Collaborative relationships between the academic institution and other institutions seemed particularly challenging for nurse scientists. First, slightly more than one of three participants indicated that international collaborations were common, yet foreign oversight of research was perceived as a major concern. With the growth in technology and global health, these collaborations are likely to increase markedly in the next decade. The finding that many respondents felt that geographic proximity could facilitate successful collaborations indicates that particular attention is needed to enhance distant collaborations as international nursing science collaborations continue to grow. In addition, more than three-quarters of our sample perceived language barriers as particularly problematic, but whether this perception pertained to national or international research, or both, is unclear.

Working with international colleagues requires ethics approval in both the sponsoring country and host nation, which is often time consuming. The host nation, for example, may have historical, cultural, political, and legal factors that may conflict with Western researchers’ ideals of conducting research (Vasgird, 2010). However, the benefits of international research outweigh the perceived challenges. Importantly, these relationships open new lines of scientific inquiry and different ways of understanding complex global issues.

Nurse scientists are also increasingly entrepreneurial in their research endeavors and are starting to work in close partnership with industry to develop their innovations. For some time however, medicine has been a leading voice on conflicts of interest and other industry-related concerns (Institute of Medicine, 2009; Lo, 2010). Nurse scientists have much to offer industry in addressing the public’s health care needs, but the for-profit mission of industry might diverge from academic goals (Lo, 2010). Future research is needed on industry-related concerns and the collaborative role of nurse scientists within this domain. We also need more research on the views of minority researchers as they were more neutral in their responses regarding collaborative relationships.

Last, a large number of our participants knew of no standards or guidelines within their own academic institutions or relied on their own personal or mentorship experience to provide collaborative research guidance. But, in the words of Kalichman et al. (2013, Conclusion section, para. 9), “If there are no accepted standards, then how can standards be taught?” Although all researchers are presumably trained in RCR, individual RCR education does not imply knowledge of collaborative team conduct. Should collaborative relationships have their own set of guidelines or parameters? If so, what should it include? Collaborative research is often labor intensive, time intensive, and conflict prone, and it requires trust—often long-distance trust (Stokols, Misra, Moser, Hall, & Taylor, 2008). Trust is a key component of nursing research that transcends individualistic goals, yet the overall ethical

conduct of research historically has relied on primary investigators. Maintaining scientific integrity in collaborative relationships requires a diverse community of scholars dedicated to excellence in scholarship and committed to meeting the ethical goals of research through transparent discourse, commitment to the goals of the collaboration, and preservation of the public's trust.

Identifying the types of RCR training that assist nurse researchers in developing, implementing, and sustaining these types of relationships—nationally and internationally—can lead to successful, effective, and cohesive programs of integrative research. This will be important for addressing the so called “wicked problems” our society faces. Indeed, nurses also identified challenges in community and industry relationships; this is an important finding, given that we continue to see more nurses involved in community-based participatory research and industry-sponsored studies. To some degree, RCR training continues to focus on three main elements of misconduct— fabrication of data, falsification of data, and plagiarism. However, much of the evidence suggests that we need to shift our focus to the research environment and the factors that influence the ethical conduct of research within different academic and practice settings (DeVries, et al., 2008; Habermann, et al., 2010; Martinson, Anderson, & DeVries, 2005; Pryor, Habermann, & Broome 2007; Steneck & Bulger, 2007). Indeed, Habermann, Broome, Pryor, and Ziner (2010) noted that “the complex factors that influence integrity occur in the context of a research team and an organizational environment” (p. 57). The growth of team science and collaborative relationships will require future research that examines the factors that promote, inhibit, or challenge the traditional notion of scientific integrity within these broader partnerships, “the success of which depends on collaboration both among and between scientists and, just as importantly, among scientists, clinical providers, community providers, policy makers, and the public to ensure that new discoveries can be implemented to improve health in the fastest way possible” (Leischow et al., 2008, p. S202).

The study had several limitations. First, our response rate was lower than expected for a nursing population. There are several factors that could contribute to this result. Although online surveys meet the needs of busy scientists, there is some evidence to suggest that mixed modes of survey administration (i.e., via telephone, with paper and pencil, or online) and financial incentives may yield higher response rates (Ulrich et al., 2005). In fact, nurse scientists who participated in our standards-of-conduct survey might be systematically different from those who did not participate in regard to their views on the standards of conduct in nursing research or other important factors that we did not explore. However, leading survey methodologists question whether higher response rates actually yield higher survey accuracy, and in fact, they can sometimes lead to less accurate results (Groves, 2006; Groves & Peytcheva, 2008; Kalichman et al., 2013; Keeter, Kennedy, Dimock, Best, & Craighill, 2006; Keeter, Miller, Kohut, Groves, & Presser, 2000; Visser et al., 1996). Second, our results are consistent with other studies that have examined the ethical conduct of research (Pryor et al., 2007). For the primary study however, we did not see any differences in the percentage of nonrespondents across the different disciplines (i.e., microbiology, neuroscience, nursing, and psychology) by program size or institution type (Kalichman et al., 2013). Third, although we chose to examine standards of conduct pertaining to the collaboration of research scientists, categories of researchers and how they

are defined might vary between public and private universities whose primary mission focuses on teaching versus research. Finally, although our survey has content validity through an extensive methodological and iterative process that included verifying the value of the questions first with our expert panel, then with interviews of selected senior faculty, and finally in our pilot testing of the survey (Kalichman et al., 2013), further psychometric evaluation is warranted. Indeed, the individual collaborative RCR items that we developed were not meant to be summative measures representing a single construct; therefore reliability testing was not our goal at the present time. However, future work should begin to examine the psychometric properties of developing such measures, adding additional items and variables as needed to advance methodological rigor in conducting RCR studies in nursing science.

Conclusion

Scientific integrity is essential to meet the scientific and ethical goals of nursing research and to build the scientific basis that expands disciplinary knowledge for the future care of patients, families, and communities. Nurse scientists will continue to contribute their expertise within collaborative research teams. In doing so, they must be knowledgeable of the practices and policies that lead to successful collaborations and the standards of research conduct for the discipline. Collaborative research can provide networking and mentoring opportunities and open new lines of inquiry for new, mid-level, and established investigators alike. Whether we think of scientific collaborations as the development of diverse research teams or as a form of team science, there is little empirical evidence to guide how these collaborative teams can best move nursing science forward. Understanding what faculty at varying ranks perceive as the barriers and facilitators of optimal collaborative research practices begins to address the issues at individual and organizational levels.

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Table 1

Nurse Scientists' Views on the Standards of Collaboration in Nursing

View	n ^a	Agreement	Overall (%)	Academic rank			χ^2b	p
				Assistant Professor (%)	Associate Professor (%)	Full Professor (%)		
The characteristics of good collaborative practices are commonly known to researchers.	398	D	39.7	34.8	44.6	42.4	4,970	.290
		N	12.3	12.9	7.7	13.6		
		A	48.0	52.3	47.7	44.0		
Conversations among collaborators about roles and responsibilities typically occur when a collaboration is first proposed.	403	D	27.5	26.7	29.5	26.4	.689	.953
		N	8.2	7.4	6.8	8.8		
		A	64.3	65.9	63.6	64.8		
International collaborations are common.	359	D	44.6	35.1	42.1	55.3	9,969	.041
		N	21.2	25.4	23.1	15.8		
		A	34.3	39.5	34.7	28.9		
Junior faculty members are often at risk of being exploited in their collaborative relationships with senior faculty members.	404	D	32.4	22.2	29.3	46.4	27,853	<.001
		N	13.1	12.6	9.0	17.6		
		A	54.5	65.2	61.7	36.0		
The rewards of collaborations for junior faculty with senior faculty outweigh the risks of collaboration.	400	D	10.5	14.4	12.1	4.0	16,923	.002
		N	16.0	16.7	21.2	9.6		
		A	73.5	68.9	66.7	86.4		
The term <i>collaboration</i> is reserved for relationships between peers, not between senior faculty and post-docs or graduate students.	398	D	77.4	77.6	76.6	79.4	1,899	.754
		N	6.0	3.7	7.0	5.6		
		A	16.6	18.7	16.4	15.1		
It is common to include graduate students and postdoctoral researchers in initial discussions with potential collaborators.	371	D	22.4	23.9	24.0	19.5	7,412	.116
		N	14.6	11.1	20.8	11.9		
		A	63.1	65.0	55.2	68.6		

Note. D, disagree; N, neutral; A, agree.

^a N = 408. The sum of n of each category is not equal to 408 because some of the participants responded "do not know" or thought the statements were "not applicable" or because of missing data. Post hoc analyses are not displayed.

$df = 4$
 p

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Table 2

Facilitators to Successful Collaboration, as Perceived by 408 Nurse Scientists

Facilitator ^a	<i>n</i> ^b	Disagree (%)	Neutral (%)	Agree (%)
Complementary interests/expertise	405	0.0	0.7	99.3
Clearly defined roles, responsibilities, and boundaries	403	2.0	4.5	93.5
Clear and frequent communication	402	0.7	1.2	98.0
Close geographic proximity	394	57.6	18.3	24.1

^aParticipants responded to the following stem: "In my experience, successful research collaborations are based on:"

^bThe sum of *n* of each category is not equal to 408 because some of the participants responded "do not know" or thought the statements were "not applicable" or because of missing data.

Table 3
Challenges to Successful Collaboration, by Race–Ethnicity and Research Methods Among Nurse Scientists (N = 408)

Challenge ^d	<i>n</i> ^b	Agreement	Overall rate	Race–Ethnicity			<i>p</i>	Research Methods			<i>p</i>
				Caucasian (%)	Minority (%)			Qualitative only (%)	Quantitative only (%)	Mixed (%)	
Lack of timeliness	395	D	4.6	4.5	2.9		.391 ^c	0.0	6.4	3.6	.019 ^c
		N	4.6	4.2	8.8			0.0	5.9	3.6	
		A	90.9	91.2	88.2			100.0	87.7	92.8	
Different expectations about authorship	397	D	10.6	10.7	6.1		.400 ^c	1.4	12.7	12.8	.058
		N	11.6	11.0	18.2			8.6	12.3	11.6	
		A	77.8	78.3	75.8			90.0	75.0	75.6	
Different expectations about data ownership	395	D	16.7	17.2	9.4		.222 ^c	7.0	19.8	15.9	.009
		N	12.7	12.1	21.9			5.6	15.2	11.0	
		A	70.6	70.6	68.8			87.3	65.0	73.2	
Lack of communication	403	D	5.5	4.4	11.8		.052 ^c	1.4	7.5	3.5	.066 ^c
		N	2.5	2.2	5.9			0.0	3.8	1.2	
		A	92.1	93.3	82.4			98.6	88.7	95.3	
Poorly defined roles, responsibilities, and boundaries	399	D	4.5	4.2	5.9		.163 ^c	1.4	5.50	4.7	.690 ^c
		N	4.0	3.7	8.8			2.8	4.2	3.5	
		A	91.5	92.1	85.3			95.8	90.3	91.8	
Involvement of multiple disciplines	392	D	44.1	46.0	21.9		.016	44.1	48.1	32.5	.047
		N	17.1	16.2	31.3			14.7	13.9	26.5	
		A	38.8	37.8	46.9			41.2	38.0	41.0	
Junior and senior faculty	400	D	52.3	54.2	33.3		.014	47.1	57.9	41.2	.029
		N	19.0	17.0	36.4			15.7	16.3	27.1	
		A	28.8	28.8	30.3			37.1	25.8	31.8	
Bench vs. clinical science	304	D	39.8	41.2	25.0		.013	39.6	46.2	23.0	.027
		N	23.7	21.7	46.4			20.8	22.0	27.9	
		A	36.5	37.1	28.6			39.6	31.7	49.2	

Challenge ^d	<i>n</i> ^b	Agreement	Overall rate	Race-Ethnicity		Research Methods			<i>p</i>
				Caucasian (%)	Minority (%)	<i>p</i>	Qualitative only (%)	Quantitative only (%)	Mixed (%)
Academic institution vs. industry	286	D	26.9	27.7	15.4	.014	34.0	26.3	24.2
		N	20.3	18.4	42.3		20.8	18.60	21.0
		A	52.8	53.9	42.3		45.3	55.1	54.8
Academic institution vs. the community	348	D	40.8	42.0	25.0	.128	38.1	45.0	32.1
		N	15.8	15.3	25.0		17.5	15.8	12.8
		A	43.4	42.7	50.0		44.4	39.1	55.1
Academic institution vs. the military	192	D	30.2	30.4	22.2	.619	32.4	31.9	24.4
		N	29.7	28.7	38.9		24.3	29.2	34.1
		A	40.1	40.9	38.9		43.2	38.9	41.5
Foreign government involvement in or oversight of research	169	D	18.9	19.6	11.8	.486 ^c	14.7	23.7	10.8
		N	27.8	26.4	41.2		23.5	25.8	35.1
		A	53.3	54.1	47.1		61.8	50.5	54.1
Language barriers	299	D	12.7	13.3	7.1	.224 ^c	10.9	15.3	7.7
		N	9.7	8.4	17.9		12.7	9.7	6.2
		A	77.6	78.3	75.0		76.4	75.0	86.2

Note. D, disagree; N, neutral; A, agree.

^aThe stem for the item was "In my experience, successful research collaborations are challenged by."

^b*N* = 408. The sum of *n* of each category is not equal to 408 because some of the participants responded "do not know" or thought the statements were "not applicable" or because of missing data. Post hoc analyses were not displayed.

^cFisher's exact test. Post hoc analyses are not displayed.

Table 4

How Standards for Successful Collaboration Are Learned Among Nurse Scientists

Item	<i>n^a</i>	Yes (%)	No (%)	Disagree (%)	Neutral (%)	Agree (%)
Do you know of published guidelines in your department or institution for standards of collaboration?	350	20.6	79.4			
In my experience, standards of conduct can be taught explicitly for entering into and maintaining collaborative relationships.	390			3.1	3.8	93.1
I explicitly teach graduate students and postdoctoral researchers about roles and responsibilities for collaboration.	341	80.1	19.9			
In my experience, standards for successful collaborative relationships are learned from:						
Published professional or journal guidelines	392			49.0	18.6	32.4
Institutional guidelines or requirements	386			44.6	17.6	37.8
Personal experience	400			0.8	1.0	98.3
A research mentor	403			0.7	1.5	97.8
A course or other formal training	392			27.6	14.5	57.9

^a *N* = 408. The sum of *n* of each category is not equal to 408 because some of the participants responded "do not know" or thought the statements were "not applicable" or because of missing data.