

Perspectives in Professional Education

Personal characteristics, knowledge of the veterinary profession, and influences on career choice among students in the veterinary school applicant pool

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In the late 1990s, the KPMG¹ and Brakke studies² were major research projects conducted to learn more about the profession of veterinary medicine. Both gave the profession high marks with respect to the depth of medical knowledge, the level of care for animals, and the quality of veterinary school education in veterinary science and medicine. In addition, in these times when scandal and greed have tarnished the image of many professions, veterinary medicine stood out for the high degree of respect afforded it by others. However, in stark contrast to the technical and ethical accolades, reports of both studies raised concerns about the economic health of the profession and the fit of its members to evolving practice demands and career opportunities. The income of veterinarians lost ground when compared with professions such as dentistry. Low starting salaries coupled with high educational debt, lack of attention to shifts in the nature of work from individual to multidisciplinary teams, and changing roles for veterinarians were a few of the conditions that were mentioned as possible contributors to the economic conditions.

In response to these studies, 2 additional studies^{3,4} were undertaken to guide the profession in preparing future veterinarians. Although the approaches of these follow-up studies differed considerably, both were directed at meeting future staffing needs of the profession. The first, conducted by **Personnel Decisions International (PDI)**,³ focused on identifying personal competencies needed for future success. Using focus groups, the PDI study compiled a set of nontechnical competencies—**skills, knowledge, aptitudes, and attitudes (SKAs)**—that successful veterinarians believed contributed to their success and were likely to be critical for veterinarians in the near future. Recommendations from the study focused on the

selection of veterinary students and the development of students' nontechnical competencies from the point of entering veterinary school on through early career experiences.

The second study,⁴ described in this executive summary, addressed the issue of critical present and future needs by targeting the potential applicant pool for future veterinarians. The primary focus was to gain information useful for proactively recruiting to veterinary medicine those individuals with desirable skills, knowledge, abilities, and personal interests and values. A second aim was to identify job activities among various career paths in veterinary medicine to compare and contrast career paths in ways that shed light on meeting current and future staffing needs. Complete details of the methods and results of this study⁴ are reported elsewhere; only the executive summary is included here.

Populations Studied

Investigators in the current study surveyed individuals from 3 populations in a random, stratified manner and gathered data using a survey method. Two of the 3 groups represented potential applicants to veterinary schools or colleges. One group comprised students who had taken the **Scholastic Aptitude Test (SAT)**, as administered by the College Board, in their junior or senior year of high school and had scored $\geq 1,150$. This group (1,200 surveys mailed, 372 [31%] returned) was further stratified into 3 subgroups on the basis of their preference for college majors in 3 general categories: working with animals (animal science, dairy science, equestrian science, and veterinary medicine); medicine (human medicine and other health professions) and biological sciences; or business and law.

The second group of potential applicants targeted persons who had indicated their commitment to a career in veterinary medicine by applying to veterinary schools and colleges through the **Veterinary Medical College Application Service (VMCAS)** of the Association of American Veterinary Medical Colleges. In 2002, VMCAS data were used in some capacity by 27 schools and colleges of veterinary medicine for stu-

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dent admissions. The VMCAS applicants (500 surveys mailed, 145 [29%] returned) were subgrouped into those who had been admitted to veterinary school (VMCAS admits) at the time of the survey ($n = 86$) and those who had not (VMCAS non-admits; 60).

To establish standards for comparing the potential applicants' SKAs and knowledge of veterinary medical careers, veterinarians representing 7 career paths were also surveyed (1,750 surveys mailed, 595 [34%] returned) using a list provided by the AVMA. This third group, the veterinarians, provided descriptions of activities involved with their jobs, measures of job satisfaction, assessments of several personal characteristics and values, and expectations about critical future activities for veterinarians. For a number of analyses, the veterinarians were subgrouped into the following 7 career paths: industry, government, academics, and 4 types of practice—companion/small animal, equine, food animal, and mixed. To create the private practice categories, those who indicated that over 50% of their time was spent in a particular type of practice (eg, equine) were classified as such. Private practitioners who indicated that none of the 3 primary species options occupied over 50% of their time were classified as having a mixed practice.

Survey Highlights

Survey topics and statistical analysis—Data were collected from veterinarians and students in 5 broad categories: work activities, working conditions, outcomes associated with being a veterinarian, personal values and orientations, and influences on career choices. Questions were asked in such a manner that comparisons would be possible both within and between veterinarians and students. Statistical analyses included both bivariate correlations and analysis of variance. Unless otherwise noted, differences were considered to be significant if $P \leq 0.05$.

Work activities—The 2 student groups were asked to describe the frequency with which veterinarians engaged in 9 sets of activities: examination/diagnosis, treatment of animals, reproductive health, personnel management, business management, client services, professional services, research, and networking/liason activities. Using veterinarians' reports of the frequency with which they performed the same activities as the standard, the students substantially overestimated the degree of involvement in all 9 activities. This pattern was particularly true for 3 activities involving direct con-

tact with animals and clients (ie, examination/diagnosis, treatment, and client services). Applicants whose familiarity with and commitment to veterinary medicine were highest (those in the VMCAS group and those in the College Board subgroups who indicated a career interest related to working with animals) inflated the level of all activities most, and they differentiated among activities less than did the others.

Within the group of veterinarians, the most noteworthy findings with regard to work activities related to the relative frequency of performing management versus clinical activities. Clinical activities were more likely to be performed by younger veterinarians than by those who were older. In contrast, older veterinarians were more likely to perform management activities than those who were younger, and male veterinarians were more likely to perform management activities than were females. Interestingly, no significant differences were found between the veterinarians' assessment of the current and future importance for any of the 9 activities.

When students were asked about the attractiveness of each of the 9 activities, the VMCAS subgroups tended to see the activities as more attractive than others, with the non-admitted students actually indicating a greater attraction than those who had been admitted (Fig 1). Within the College Board group, those who expressed an interest in college majors dealing with animals gave higher rankings than the others on those activities dealing with animals. Activities dealing with animal reproductive health were the least attractive for all groups.

Given the concern with nontechnical activities, it is worth noting that VMCAS students admitted to veterinary schools and colleges found practice management and research activities significantly less attractive than VMCAS students who had not been admitted. Although differences between VMCAS admits and non-admits for

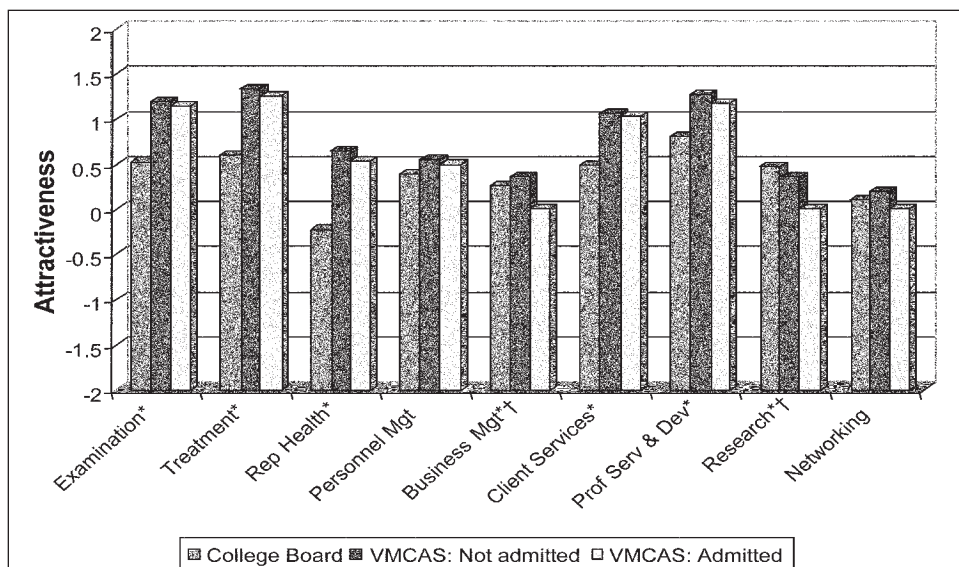


Figure 1—Attractiveness of typical veterinarian activities to College Board and Veterinary Medical College Application Service (VMCAS) subgroups. Items were measured on a 5-point scale from -2 (very unattractive) to 2 (very attractive). *Indicates that the means of the highest and lowest groups for that activity are significantly different at $P \leq 0.05$; †Indicates that the means of the VMCAS subgroups (non-admitted and admitted) for that activity are significantly different at $P \leq 0.05$. Rep = Reproductive.

the other 7 activities were not significant, the direction of the difference was the same in each category. Furthermore, in only 4 of the 27 group-activity combinations charted (Fig 1) was the mean attractiveness score at or below 0 (the neutral point between attractive and unattractive), and 3 of these 4 involved the VMCAS-admitted subgroup. Thus, although there were few actual significant differences among the groups, the fact that the VMCAS-admitted subgroup was consistently lower in all categories than those not admitted suggests that the non-admits may be more attracted to the activities that characterize the veterinary profession than those being admitted, signifying that the current selection practices may need to be reassessed.

Working conditions—Perceptions of 3 general working-condition issues, autonomy, prestige, and teamwork, were addressed. The 5 student subgroups reported beliefs that there were moderate levels of autonomy in the jobs. There were no significant differences among the 5 student subgroups; however, students significantly underestimated the extent to which veterinarians experience autonomy. Given the fact that autonomy is a valued characteristic of work,³ underestimating its presence in veterinarians' jobs may have a negative impact on interest in the career. For prestige and teamwork, the results were mixed depending on the veterinarian career path to which student responses were compared. Prestige, when considered across student subgroups, was scored higher among those whose interests were most similar to veterinary medicine. This finding emphasizes the need to be aware of the fact that perceived high prestige of the veterinary profession cannot be assumed when attempting to attract persons whose initial career focus may not have been veterinary medicine.

There were some significant gender differences among students in perceptions of working conditions. Across the groups, men tended to believe that the career offered more opportunities for autonomy than did women. With respect to perceptions of the level of prestige of the profession, men believed it was higher than women among VMCAS respondents, but women in the College Board group believed it was higher than men.

Outcomes associated with being a veterinarian—Student groups were asked the extent to which a career

in veterinary medicine was likely to lead to attaining a typical set of job satisfaction outcomes (eg, good coworkers, income, working conditions, status, etc) and 5 other outcomes that were created to fit veterinary medicine: the chance to manage one's business, care for animals, have a career in science, meet personal career goals, and receive a high level of income. The general pattern of results fit initial expectations in that those preferring a career working with animals saw a career in veterinary medicine as providing more animal care opportunities than did others; those in business and law saw more opportunities for business and less for science.

The VMCAS non-admits were significantly more attracted to overall career outcomes and opportunities to have a career in science than the other student subgroups. College Board students expressing an interest in majors related to working with animals also saw veterinary medicine as providing opportunities for entrepreneurial outcomes. Those interested in business and law were most attracted to business-related outcomes, but they also saw veterinary medicine as less likely to be able to provide the total set of outcomes than did the other subgroups. College Board students preferring majors in biological sciences and medicine perceived income opportunities higher than those preferring majors involving working with animals or business/law. When both subgroups of VMCAS students were compared with the other student subgroups, their mean expectations for income were lower.

The supposition that more familiarity with veterinary medicine may lead to lowered expectations about income was supported by the fact that mean satisfaction levels for income among the veterinarians was moderately high, implying that lower expectations may play a role in terms of satisfaction level. The other interesting finding was that satisfaction with income was significantly higher among industry veterinarians than with the other career paths.

Personal values and orientations—A number of personal characteristics (self-esteem, conscientiousness, openness to experience, agreeableness, extroversion, and emotional stability), typically called personality variables, were assessed in the student and veterinarian groups (Table 1). Across the 6 variables evaluated, the VMCAS non-admits had higher

Table 1—Mean self-esteem and personality dimension scores* for Veterinary Medical College Application Service (VMCAS) subgroups and College Board subgroups with interest in animals, biology and human medicine, and business and law

Personality dimension	VMCAS admitted	VMCAS not admitted	Animal interests	Biology & human medicine	Business & law
Self-esteem	4.25 (a,b)	4.43 (b)	4.17 (a)	4.11 (a)	4.13 (a)
Conscientiousness	3.97 (b)	4.22 (c)	3.92 (a,b)	3.73 (a)	3.71 (a)
Openness to experience	3.67 (a)	3.86 (b)	3.88 (b)	3.88 (b)	3.91 (b)
Agreeableness	4.16 (b)	4.24 (b)	4.15 (b)	4.13 (b)	3.87 (a)
Extroversion	3.28	3.30	3.67	3.45	3.44
Emotional stability	3.60	3.64	3.46	3.45	3.29

*Items were rated on a 5-point scale where 5 was the most positive response. Letters in parentheses indicate groupings based on Tukey's post hoc comparisons. Within rows, subgroups with different letters in parentheses are significantly different from each other at $P \leq 0.05$.

scores than the VMCAS admits in every category (2 were significantly different—conscientiousness and openness to experience). In addition, the VMCAS non-admits exceeded the veterinarians' scores in every category except extroversion (3.33 vs 3.30), and 3 of the differences (self-esteem, conscientiousness, and emotional stability) were significant. In short, the VMCAS non-admits compared quite favorably with the other groups, including the veterinarians.

Other differences were observed in the College Board subgroups. Specifically, those interested in majors involving working with animals were higher in conscientiousness than the other 2, whereas those preferring business/law and other majors were lower in agreeableness.

Despite the differences, there is no reason to believe that desired personality characteristics are or would be lacking in students selected from the pool currently applying to veterinary schools and colleges (the VMCAS group), given the mean level of scores on all these measures. However, the difference between VMCAS admits and non-admits with regard to desirable attributes does point to further exploration of possible unintended screening effects in the admissions process.

With specific attention to self-esteem, it was interesting that early-career veterinarians (less than 30 years old) scored significantly lower than the VMCAS admits and more experienced veterinarians (30 or more years old). This finding is consistent with those documented in the Brakke study² and raises questions about the potential impact of veterinary school and early-career experiences on self-esteem.

Influences on career choices—Students and veterinarians were asked to rank a number of possible influences on their selection of a career in veterinary medicine. In general, the strongest influences on choosing a career in veterinary medicine were experiences working with a veterinarian and with animals, particularly having a pet. Interpersonal or in-depth experiences, such as working with a veterinarian, living on a farm, or interacting with a friend or family member who was a veterinarian or a teacher in a course, appeared to carry more weight than information-driven media, such as a television show or the Internet. Interestingly, the Internet and television had little influence on career choice. This may reflect the fact that there is little career-related material on veterinary medicine available from these sources (or that students are unaware of the material). All groups indicated that the cost of education was a negative influence on their choice, although apparently not sufficiently so as to keep them from applying to veterinary school in the case of the VMCAS students.

Some significant gender differences were also observed. Women in the VMCAS groups were more likely than men to report being attracted to the career by the experience of owning a pet or a horse, and men were more likely than women to report being influenced by the status of the career or the rigor of the educational environment. The importance of income pos-

sibilities was not found to differ by gender, with the exception of 1 College Board subgroup where men were more likely to report being influenced by it than women.

Two open-ended questions had particular implications for recruiting. Students who indicated that they would not consider a career in veterinary medicine were asked to list the main reasons for that decision. In addition, the same students were asked what it would take for them to consider veterinary medicine as a career. Responses implied that for those with low interest in animals, extended education, science, or medicine, it was unlikely they could be attracted to the career. However, responses to the "what would it take?" question, such as opportunities to positively impact environmental issues, research opportunities, managerial positions, more prestige, more direct benefit for people, shorter hours, higher pay, and less travel, imply that accurate perceptions related to careers in veterinary medicine, along with job conditions consistent with expectations, will be critical for attracting an appropriate applicant pool in the future.

Overview of Findings

The assumption underlying this research is that those with the requisite skills, knowledge, aptitudes, and attitudes to meet the challenges facing the veterinary profession must be attracted, trained, and nurtured over their entire career in veterinary medicine. The research focus was on entry into veterinary school, particularly on attraction and selection, and the development of career skills during veterinary school and beyond. The implications of the results refer most directly to recruitment; selection for veterinary school; and early experiences designed to attract, develop, and commit individuals entering the profession to a productive and rewarding career in veterinary medicine. By restricting student groups to those who were likely to possess the intellectual abilities necessary to gain entry into the career, a focus was maintained on attracting, developing, and retaining those high-ability people with the desired nontechnical competencies.

Recruitment—Two conditions are necessary to attract those with the desired competencies to veterinary school to eventually become successful veterinarians. First, those who make up the potential applicant pool should have sufficient knowledge about careers in veterinary medicine to make informed choices. Second, if they have that knowledge, potential candidates must find the careers to be attractive. Results of this study speak to both of these issues.

With respect to knowledge about what veterinarians do, the range of knowledge was found to be quite restricted. The dominating view of the field was that of a veterinarian in practice, where the primary activities are those of examining animals, diagnosing and treating their illnesses, and providing client services. However, knowledge about activities that occupy the daily activities of veterinarians in practice was limited. Even the general understanding of the practicing veterinarian was stereotypic—not adequately recognizing the variety of activities beyond those of dealing direct-

ly with animals and their owners. The limitations in knowledge were even greater with respect to activities in fields of veterinary medicine other than companion animal practices. Furthermore, knowledge about general aspects of the career are limited and, at times, inaccurate. Of particular interest was the finding that students underestimated the degree of autonomy a career in veterinary medicine provides. Results of this study imply that efforts must be made to present a realistic picture that is broadly based across the diverse subfields of the profession and the varied activities important for success within private practice, including teamwork, personnel management, and business management.

When asked about the likelihood that a career in veterinary medicine would lead to specific outcomes such as respect, good coworkers, reasonable work schedules, and good income, students' ratings were somewhat positive but not high. When those who had made a commitment to the career as evidenced by completing the VMCAS application process were compared with those completing high school regarding expected outcomes for veterinarians, the 2 groups (VMCAS and College Board) were similar with 1 exception: the VMCAS applicants had lower expectations that income would be high. Therefore, although the data indicate that there is a need to provide potential applicants with better knowledge about what is involved in a career in veterinary medicine, the variety of career paths that exist, and what outcomes result, we do not believe there is any reason to expect that the knowledge alone will increase attractiveness of the profession to current applicants. The activities themselves, while by no means unattractive, were not enthusiastically endorsed by the larger applicant pool. Yet, the mean of the larger pool may mask subsets within that pool who do find the activities attractive. Discovering the nature of such subsets, if they exist, would appear to be useful, but sample sizes and the information available in this study were not sufficient to further partition the data.

Although improved knowledge alone may not increase attraction to the profession within the current applicant pool, better knowledge about careers in veterinary medicine might broaden the pool of individuals interested in the profession, or at least change its fundamental composition. Results obtained in the current study imply that targeting those with higher interests in and experience with animals would be a good place to start. More targeted recruiting information, particularly to those with interests in working with animals, would appear to be useful.

Selection—Given interests in considering nontechnical competencies that may be reflected in personality traits, values, and interpersonal experiences, comparisons on self-esteem and standard personality measures were made among the College Board and VMCAS students and veterinarians. Although there were some differences among them, similarities more than differences prevailed. There was no overall evidence to support a conclusion that values and personality characteristics as identified by Lewis and Klausner³ were likely to be missing from those who

currently show interest in a career in veterinary medicine. However, the comparison between those in the VMCAS-admitted and non-admitted subgroups was of particular interest. When differences existed, those not admitted had more favorable scores than those admitted. These differences suggest that current selection procedures may be screening out people with desirable attributes related to the nontechnical competencies.

Early experiences—Data from the veterinarian group implied that even though direct experiences with animals tended to occur more frequently for those respondents who were early in their careers, dealing with personnel and business management were more likely to occur later in the career. Combined with this is the fact that preveterinary curricula must be heavily loaded with biological and physical sciences, as is the case with veterinary curricula. Both leave little room for developing nontechnical interpersonal and business skills. The result is that before entering veterinary school, during the professional curriculum, and soon after entering the profession, veterinarians get limited exposure to experiences that develop nontechnical interpersonal and business skills. Yet, if these skills are important for overall success in the veterinary profession, more effort is needed to build them into the overall experience of those preparing for and entering the field. These experiences should be developed in parallel with, and not as a substitute for, improved selection processes.

Recommendations

On the basis of results of this study, it is recommended that model processes for recruitment, selection, and development of veterinary students be designed with the overriding goal of improving the base of nontechnical SKAs in the veterinary profession. To achieve this goal, it will first be important for veterinary school administrators, faculty members, and admissions committees to understand the results of this study. Beyond that, 3 sets of recommendations are presented and organized from a career development perspective. They begin at the point of making a career choice (recruitment), move to selection of veterinary students, and end with experiences in veterinary school and into the early years as a veterinarian (educational/career experiences). Given the focus of this study, the results speak most directly to the first 2 stages, but some inferences about experiences after admission to veterinary school were possible.

Recruitment—Together, the recruitment recommendations are targeted at those who are making career-choice decisions. The objective is to ensure that those who are making career-choice decisions understand the nature and variety of career opportunities that exist in veterinary medicine. Hopefully, this will increase the likelihood that those individuals who possess the SKAs needed to meet the needs of the profession will be attracted to and choose veterinary medicine as a career.

- Recommendation 1: Develop improved information related to careers in veterinary medicine that adequately reflects the breadth of activities per-

formed, within and between career paths, and the intrinsic and extrinsic rewards that are likely to be obtained from being a veterinarian.

Information on the variety of activities that veterinarians do is needed within and across career paths. Within private practice, the dominating view is that a veterinarian's time is spent primarily dealing directly with animals and clients. More exposure to the full range of activities in the practice of veterinary medicine, including business management, personnel management, professional development, and networking, should help create more realistic expectations among potential applicants. Specifically, realistic job previews should be developed for the various career options in veterinary medicine. This recommendation is consistent with findings of the PDI study.³

It should be noted that the inaccuracies in estimates about veterinary activities between students and veterinarians were almost always in the direction of students overestimating the frequency of individual activities. Although overestimation may, at first glance, appear to be helpful for recruiting (particularly of positive conditions), there are at least 2 reasons to question this common-sense conclusion. First, research in work settings consistently indicates that this is not the case. Unrealistically high expectations do not lead to greater job acceptance than realistic ones. Such high expectations do, however, lead to poorer adjustment to work settings and higher turnover. Second, data in the present study indicated that students did not rate any of the activities particularly high on attractiveness; most ratings were in the neutral zone. Thus, knowledge of the activities, while a necessary condition, is not sufficient for attraction to the profession.

With respect to the amount of autonomy in the job and the rewards that one attains from a career in veterinary medicine, the data also suggest the need for improved communication of what exists and what is possible. The results implied that student estimates of autonomy were lower than the veterinarians' reports of that characteristic. Given the attractiveness of autonomy to most people,⁵ correcting that misperception should be helpful for recruiting. The critical importance of other particular misperceptions was highlighted by the responses obtained to the open-ended questions asking what it would take to attract those who would not currently consider a career in veterinary medicine. Realistic career information should help remedy these shortcomings.

For 1 particular reward, income potential, there was an interesting pattern in the data. Those who knew the most about the field (those in the VMCAS group and those in the College Board subgroup who indicated an interest in working with animals in their career) held lower expectations about income. Although their expectations may capture the mean level of income for the profession, they do not reflect the variance that exists across people and career paths. Thus, as was the case with other characteristics associated with being a veterinarian, better information about the variance in income emphasizing the possibility of achieving much higher than average income levels in several career

paths should be made more readily available to the general public. For example, this might be accomplished by showcasing individuals or career paths where income possibilities are particularly high. Recall that higher satisfaction with income was found among industry veterinarians. Increasing awareness of opportunities for high income in certain career paths, just as emphasizing greater opportunities for intrinsic satisfaction related to caring for and handling animals in other career paths, should be helpful for attracting applicants with a variety of different career goals.

- Recommendation 2: Develop a system for distributing information on careers in veterinary medicine that involves veterinarians as a central focus, and seek to make appropriate information available in a useful fashion for high school courses, college courses, and the Internet. Recruitment activities that do not use veterinarians as the central focus should use animal ownership as an initial filter for identifying potential veterinary school applicants.

Greater attention to the full range of activities in career information materials, Web sites, television shows, and other outlets where veterinarians are featured would be useful. In particular, development of Internet materials should be especially useful and should be expected to yield a high benefit for the modest cost involved.

Experiences working with veterinarians and personal contacts with veterinarians were found to be particularly important influences on career choices. Developing guidance materials for veterinarians who offer work experience to potential future veterinarians and for veterinarians involved in outreach activities with students is suggested. Care should be taken to avoid a private practice bias in these materials, with adequate visibility provided to the breadth of career opportunities within the veterinary profession. In addition, preparing materials to be made available for high school and college instructors would appear to be useful because experiences in formal classes ranked highly in career-choice influence.

Results also implied that living in a house with a pet or having other direct experience with animals might be a useful indicator of potential interest in a career in veterinary medicine. Targeting those with higher interests in and experience with animals would be a good place to start, especially when attempting to attract individuals whose initial career focus may not have been veterinary medicine.

With regard to the gender shift, results of this study do not definitively answer the question of why more females than males are being attracted to careers in veterinary medicine, but it appears that 1 key factor is that the perceived opportunity to care for animals has a very strong influence on career-choice decisions of females. To maintain a gender balance, the realistic job information of Recommendation 1 should be helpful as a first step, especially if distributed according to the guidelines of Recommendation 2. However, further research is warranted for full and complete understanding of this issue.

Selection—Our research was predicated on the assumption that certain nontechnical SKAs are important for the success of veterinarians. The desirability of nontechnical SKAs was clearly established in the KPMG¹ and Brakke² studies and reinforced by the PDI study.³ Consequently, it is important to select veterinary applicants who possess desirable nontechnical SKAs.

Two general trends in the current data have implications for selection as it relates to nontechnical SKAs. The first is the unexpected finding of differences in the levels of nontechnical SKAs and behavior attractiveness between VMCAS admits and non-admits. In all cases, those not accepted were higher in the desirable characteristics than those who were accepted. The second general finding was that overall mean SKA levels were not so low as to imply that typical applicant pools would be totally lacking in the SKAs. The combination of these 2 conditions leads to the following recommendations.

- Recommendation 3: Develop measures of nontechnical SKAs for veterinary school applicants that enable identification of individuals who possess desired characteristics. These would include measures to objectively evaluate knowledge of the veterinary profession.
- Recommendation 4: Design a model admissions and selection process for use by schools and colleges of veterinary medicine whose goals are to foster academic excellence while enhancing the nontechnical SKAs.
- Recommendation 5: Develop a system to monitor the nontechnical SKAs in admitted and non-admitted veterinary school applicants over time.

For nontechnical SKAs to play a role in admissions, good measures are needed. A number of methods exist for tapping these constructs, including structured interviews, empirically keyed biographic data, assessment centers, and personality tests. Each of these methods has strengths and weaknesses. For example, assessment centers can have reasonable validity, but they are labor-intensive measurement systems; personality measures are far easier to administer but can be open to deceit. Professional schools typically conduct their selection processes in a manner that results in much more convergence on types and quality of technical, as opposed to nontechnical, SKAs. Yet, if nontechnical SKAs are important and are to be used in selection, these skills must be assessed with valid measures.

Recommendations 4 and 5 address the fact that although it is important to measure nontechnical SKAs if they are to be used in selection decisions, they must be shown to be valid under the constraints of the selection situation. In this case, the selection decision involves selection for training in a very technical field. Therefore, nontechnical SKAs cannot be substitutes for technical ones. Additional research is needed with technical and nontechnical selection measures to help understand why current selection processes appear, to some extent, to be filtering out many desirable charac-

teristics. Without such research, it will not be possible to develop an algorithm to appropriately guide future selection decisions. And once such an algorithm is developed, it will be critical to monitor its performance over time.

Directly related to monitoring is the issue of what, if anything, happens to students' self-esteem during veterinary school. Further research would also be beneficial as a part of the monitoring activity to investigate the impact of veterinary school and associated experiences on self-esteem.

Educational and career experiences—Although some important SKAs are stable by the time of early adulthood, individuals also have the capacity to change over the course of a lifetime as a result of maturation and experience. The amount of change that occurs depends on an interaction between the particular SKA, the nature of the experience, and the individual person. But 2 generalizations are clear. First, the possession of many critical SKAs depends on experiences that foster their development. Second, exposure to experiences that develop competencies can also increase the motivation to apply these competencies both because the experiences provide a better understanding and appreciation of the importance of the skills and because of the intrinsic satisfaction associated with performing a set of activities competently.

Two patterns in the data from the veterinarian sample speak to experiences regarding nontechnical SKAs: older veterinarians were more frequently engaged in personnel and business management activities than were younger veterinarians, and women tended to be less engaged in these activities than men. If nontechnical SKAs are important and performing these activities helps build related competencies, more attention should be given to providing experiences in these activities to men and women who are early in their careers (including those in veterinary school). Thus, we make the following recommendations for development of programs to develop nontechnical SKAs:

- Recommendation 6: Develop structured programs to provide experiences that develop nontechnical SKAs throughout the career of veterinarians. The need for such experience is particularly important for men and women in the early years, so 3 areas of emphasis are suggested:
 - Development of programs to complement the traditional veterinary training, including both curricular and cocurricular experiences
 - Development of coordinated continuing education and executive training programs, with particular emphasis on the early postgraduate years
 - Development of a structured mentoring program targeting students, potential students, and recent graduates

There are many ways to provide a broader base of experiences. One is obviously the inclusion of

more formal courses directed specifically at nontechnical SKAs in veterinary school and in postgraduate continuing education. A recent article by Lloyd and Walsh⁶ provides a template for veterinary education that addresses the types of issues that are relevant to this recommendation. Examples include embedding business and management experiences wherever possible, such as rotations in the clinics serving the public, where students could learn about billing, teamwork, and working with technicians in concert with clinical examination and treatment. Mentor programs, preceptorships, and guest speaker series designed to showcase nontechnical competencies and successful veterinarians who espouse their benefits are other means of heightening awareness and appreciation of the importance of nontechnical aspects of the career in the early development of veterinarians. Similar recommendations resulted from the PDI study,³ and the AVMA has already established a group to consider options for developing a broad-based mentoring program. Because results showed a distinct tendency for men to be more involved in business and management experiences, conscious effort should be made to actively include women in all of these programs.

In recommending greater exposure to business, management, and other nontechnical SKA development opportunities in veterinary school and early in the career, it is recognized that serious time constraints are faced by veterinary schools and colleges stemming from the large number of technical competencies that must be created in a limited time. Simply expanding content is not reasonable. Therefore, accepting the importance of the nontechnical competencies also

means that one must accept the need to search for creative solutions for developing them throughout the career. An added advantage of more fully integrating nontechnical competencies into the development process with technical skills is that the 2 sets will not likely be seen as totally separate domains. The latter is important for recognizing that good science and practice are possible only when state-of-the-art technology and training exist, and these exist only when economically possible. Furthermore, continued emphasis on both sets of competencies would be expected to increase the likelihood that the business and management activities are appropriately valued. Sustaining a high level of quality in medicine and surgery over time is not feasible in the absence of a solid base in the nontechnical SKAs.

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