Roadmap for Veterinary Medical Education in the 21st Century:

Responsive, Collaborative, Flexible

NAVMEC REPORT AND RECOMMENDATIONS

North American Veterinary
Medical Education Consortium

Foreword

The North American Veterinary Medical Education Consortium (NAVMEC) Board of Directors acknowledges and congratulates the North American schools and colleges of veterinary medicine (CVMs) for their long history of producing high-quality veterinarians to serve North America and the entire world. Recognizing the global context within which we now work, we applaud the CVMs for their continuous innovative approaches to ensuring quality veterinary medical education, and encourage them to devote additional effort and attention to creating and achieving a vision to guide veterinary medical education for the next 20 years and beyond, and to prepare a veterinary workforce able to meet changing societal needs. This new vision, which addresses a heightened level of social responsibility, considers and meets societal needs, and embraces shared technological advances and partnerships, positions the CVMs to be recognized as influential leaders in matters related to animal, human, and ecosystem health. This vision promotes an externally focused profession with boundary-expanding initiatives, encourages interdependency with partners and stakeholders, and sets the profession, and its academic leaders, on a path toward sustained economic stability. This kind of progressive vision will spark a new public awareness of the critical contributions that the CVMs make to 21st-century society.

We believe that the NAVMEC report and its recommendations can provide the momentum to help make this vision become a reality.

Acknowledgments

Roadmap for Veterinary Medical Education in the 21st Century: Responsive, Collaborative, Flexible was prepared under the direction of the NAVMEC Board of Directors, based on discussions and feedback by NAVMEC members and a broad spectrum of stakeholders of academic veterinary medicine. The NAVMEC Board of Directors expresses appreciation for and gratefully acknowledges the support and contributions of those listed in Appendix A, and sincerely thanks the Western Veterinary Conference, which generously contributed the use of facilities at the Oquendo Center for the first and second meetings.

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APPENDICES

ACRONYMS

AAVSB — American Association of Veterinary State Boards

AAVMC — Association of American Veterinary Medical Colleges

AVMA — American Veterinary Medical Association

COE — Council on Education

CVM — College of Veterinary Medicine

DOE — U.S. Department of Education

NAVMEC – North American Veterinary Medical Education Consortium

NAVLE — North American Veterinary Licensing Examination

NBVME — National Board of Veterinary Medical Examiners

PBL — Problem – based Learning

SKAs — Skill, Knowledge, Attitudes and Aptitudes

VEC — Veterinary Educator Collaborative

VEM or VMEM — Veterinary (medical) education model(s)

VetICE — Veterinary Internet Content Exchange

VMA — Veterinary Medical Association

DEFINITIONS

Four important concepts recur throughout this report. Definitions are provided here for clarity and consistency.

Core competencies

The spectrum of knowledge that enables a veterinarian to have the confidence to be productive in his/her chosen career on the day after graduation. A school may choose to add further competencies or provide more depth in its core competencies, to meet its local societal needs.

Core prerequisites

Many schools have similar entry requirements for most of their prerequisite courses. Identifying these "core entry requirements" would simplify admissions processes for students and may increase the applicant pool for most CVMs, while continuing to provide the schools with the flexibility to design curricula to build on their strengths.

One Health

Veterinarians responsibly use their knowledge and influence in collaboration with other professionals to advance the health and welfare of animals, people, their communities, and the environment locally and globally.

Professional competence

The continuous and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served (adapted from *Educating Physicians, A Call for Reform of Medical School and Residency;* Molly Cooke, David M. Irby, Bridget C. O'Brien; The Carnegie Foundation for the Advancement of Teaching; 2010).

1.0
Executive Summary

Veterinary medicine is known as one of the most fulfilling, interesting, and challenging professions and offers an exciting and broad spectrum of career choices to those aspiring to enter the profession. However, veterinary medical education and the profession at large face important challenges and opportunities that are increasing at an accelerated pace. Many agree that veterinary medical education and the profession urgently need to respond to this changing landscape to ensure that graduates can continue to meet societal needs.

The serious challenges facing academic veterinary medicine have not been seen since before World War II. State legislatures have slashed tens of millions of dollars in college funding over the past few years. Consequently, schools and colleges of veterinary medicine have laid off hundreds of staff members, reduced the number of faculty members, and eliminated programs. To help make up for these financial losses, governing boards of colleges and universities have increased tuition and encouraged increased enrollments; this approach stems the tide but also contributes to student debt load. The end result is an unprecedented erosion of funds that seriously threatens the "gold standard of veterinary education."

As the colleges have attempted to cope with these funding losses, the profession is also facing new challenges. Funding losses have played a role in decreasing the scope of veterinary medical education and research at colleges of veterinary medicine (CVMs) and also threaten academic veterinary medicine's capacity to provide greatly needed state, federal, and private research in global food production, safe and secure food supplies, emerging zoonotic diseases, wildlife health conservation and management, and veterinary public health.

With 40 percent of aging faculty eligible for retirement over the next 10 years and an absence of identifiable replacements, a failure to keep faculty in key disciplines could have a major negative impact on the profession and narrow the role of veterinary medicine in this country. Without an adequate number of highly skilled faculty members to replace those who retire, how will we maintain the breadth of the profession in the United States and avoid a loss of leadership in animal, human, and environmental health?

Given this changing landscape in veterinary medicine and education, and building on the progress stimulated by the 2007 *Foresight Report,* the AAVMC convened the North American Veterinary Medical Education Consortium (NAVMEC) in 2008. The NAVMEC brought together the broadest spectrum of stakeholders of veterinary medical education ever assembled to:

1. Identify changing societal demographics and what this society will need from the veterinary medical profession.
2. Create a shared vision for what core competencies every graduating veterinarian should possess, regardless of the field he/she pursues.
3. Identify how veterinary medical education should evolve in concert with evolving societal needs, to graduate veterinarians with these core competencies.

To pursue these goals, AAVMC reached out not only to CVMs but also to two critical groups that wield considerable influence over veterinary medical education: those responsible for the accreditation of veterinary medical colleges and those responsible for testing and licensing new veterinary medical graduates. It was understood from the beginning that leadership from all three groups would be necessary to ensure the profession continues to respond to societal needs.

Over the course of three national meetings in 2010, approximately 400 stakeholders of veterinary medical education convened to discuss, identify, and agree upon evolving societal needs for veterinary medicine, core competencies needed by every graduating veterinarian, cost-effective approaches to educating veterinarians, and ways that accreditation and testing/licensure could best support achieving the core competencies. Participants agreed that a plan to move from recommendations to action would be essential and that employers of veterinarians from the private and public sectors should be actively engaged.

Three members from each group—academia, accreditation, and testing/licensure—made up the nine-member NAVMEC Board of Directors. Following the three national meetings, the board convened to:

1. Identify a set of NAVMEC strategic goals.
2. Confirm the core competencies.
3. Identify information necessary to draw valid conclusions and make informed decisions and develop a preliminary list of priority educational research topics.
4. Develop a series of recommendations to advance veterinary medical education and support the overarching goals of the veterinary medical profession.

The AAVMC Board of Directors received a draft report from the NAVMEC Board of Directors on October 31, 2010, which was published on the NAVMEC website to seek feedback from all stakeholders. Over a six-month period, 353 organizations and individuals from a broad cross section of the veterinary medical profession provided comments. The NAVMEC board carefully considered this feedback in creating its final report to the AAVMC board.

NAVMEC Strategic Goals, Core Competencies, and Recommendations

NAVMEC FIVE STRATEGIC GOALS

1. Graduate career-ready veterinarians who are proficient in and have the confidence to use an agreed-upon set of core competencies.
2. Ensure that admissions, curricula, accreditation, and testing/licensure are competency driven.
3. Share resources to ensure veterinary medical education is of the highest quality and maximally cost-effective.
4. Promote an economically viable education system for both CVMs and veterinary students.
5. Stimulate a profession-wide focus on innovation, flexibility, and action.

Recommendations

Many of these recommendations are already under way or being developed by CVMs, the AAVMC, testing/licensing entities, and accreditation agents. This report encourages the implementation of these recommendations over the next three to five years.

TABLE A. CORE COMPETENCIES OF ALL GRADUATING VETERINARIANS *(Appendix I)*

Multispecies Knowledge plus Clinical Competency in One or More Species or Disciplines		This competency plays a central role in the framework of core competencies because comparative medicine provides the foundation for application of veterinary knowledge in a single species and across species and disciplines. At graduation, veterinarians are able to apply and integrate comparative medical knowledge and clinical and professional skills to their work, enabling them to work productively and effectively. They are advocates for animal health and welfare. While graduates typically focus primarily on one or a few species or a discipline (e.g., public health), they are educated to take a comparative biomedical approach.
One Health Knowledge: Animal, Human, and Environmental Health		In collaboration with other health professionals, veterinarians responsibly use their expertise and influence to advance the health and welfare of animals, people, their local and global communities, and the environment. Veterinarians appreciate the impact of animal diseases on the food supply system and society in general.
Professional Competencies	*Communication*	Veterinarians sustain effective professional relationships and skillful, sensitive, appropriate communications with clients, colleagues, other healthcare professionals, and the public. They communicate effectively, using various methods in a variety of settings with the purpose of achieving the best outcomes/results.
	Collaboration	Veterinarians serve integral roles in interdisciplinary teams to achieve success in business and optimal societal outcomes. They work as effective team members in interdisciplinary, multiprofessional, and multicultural environments.
	Management (self, team, system)	Veterinarians make effective choices to manage their professional and personal lives. They are aware of the challenges and the importance of making good work/life balance decisions. They are able to prioritize, coordinate, and effectively execute tasks and manage resources.
	Lifelong learning, scholarship, value of research	Veterinarians recognize that research, which is based on the scientific method, leads to the generation of new knowledge that underpins the veterinary medical profession. They demonstrate a lifelong commitment to learning. They regularly ask questions and are able to review and analyze the validity of research findings. They apply new knowledge to problem solving and take an evidence-based approach to practice. They are committed to improving their knowledge, skills, and judgment. They participate in the creation, dissemination, translation, and adaptation of new knowledge to their work in order to maintain delivery of the highest quality service.
	*Leadership**	Veterinarians are proactive leaders in the profession and are recognized voices of authority in important areas, such as animal welfare and One Health medicine. They are committed to the health and welfare of animals and the protection of human health through ethical practice, professional self-regulation, legal compliance, and high personal standards of behavior and practice. They are guided by a code of ethics and law and a commitment to professional competence, appropriate attitudes and behavior, integrity, personal well-being, and the public good.
	*Diversity** and multicultural awareness*	Veterinarians demonstrate an understanding of the manner in which culture and belief systems impact delivery of veterinary medical care while recognizing and appropriately addressing biases in themselves, in others, and in the process of veterinary medical care delivery.
	Adapt to changing environments	Veterinarians recognize that they function within a continually changing physical, technological, economic, and societal environment. They demonstrate curiosity and flexibility when challenged with changing priorities and situations. A key attribute for veterinarians is their ability to quickly acquire technological expertise.

* *Leadership is the ability to take direct action and influence others to take action.*

** *Diversity refers to differences among people with respect to race, gender, age, ethnicity, sexual orientation, mental/physical ability, religion, job level, personality traits, education, health, stature, culture, language, and other human differences.*

TABLE A-1. NAVMEC RECOMMENDATIONS: CORE COMPETENCIES FOR PREPARING CAREER-READY VETERINARIANS

6.1.1	NAVMEC core competencies are further detailed and defined.
6.1.2	CVMs use the NAVMEC core competencies to guide curricular development.
6.1.3	All competencies are integrated and taught throughout the curriculum, as appropriate; colleges develop plans to address competencies and benchmark progress with other institutions.
6.1.4	The NAVMEC set of core competencies and their descriptions are integrated into the standards of accreditation and outcomes measurement.
6.1.5	NAVLE optimizes evaluation of these core competencies.

TABLE A-2. NAVMEC RECOMMENDATIONS: ADMISSIONS AND CURRICULA

6.2.1	A core of pre-veterinary academic requirements is developed for admission to CVMs in North America.
6.2.2	CVMs continue to move toward competency-driven curricula, delivered in a flexible and time-efficient format that ensures proficiency in the core competencies.
6.2.3	Curricula incorporate core competencies, as appropriate, using a spectrum of contemporary teaching and learning techniques.
6.2.4	CVMs develop plans to address One Health as it fits local/regional and/or global needs as defined by each college and its partner institutions from medicine, public health, biomedical sciences, environmental sciences, and agriculture and move concurrently to incorporate concepts of One Health into curricula.
6.2.5	CVMs promote diversity in the veterinary profession through proactive admissions practices, educational prerequisites, and curricular enhancements; plans need to be implemented to better meet societal needs.

TABLE A-3. NAVMEC RECOMMENDATIONS: COST-EFFECTIVE QUALITY EDUCATION THROUGH SHARING OF EDUCATIONAL RESOURCES

6.3.1	AAVMC convenes an expert panel to review ways to share education resources, while addressing logistical and economic issues.
6.3.2	AAVMC facilitates the development and maintenance of an inventory of shareable educational resources.
6.3.3	AAVMC facilitates the establishment of an inter-CVM education-technology network to enable the flow of technology-related ideas among experts at individual CVMs.

TABLE A-4. NAVMEC RECOMMENDATIONS: ECONOMICALLY VIABLE SYSTEM FOR CVMS AND VETERINARY STUDENTS	
6.4.1	The leadership of AAVMC works with the American Veterinary Medical Association (AVMA) and other stakeholders to identify effective ways to promote the value of veterinary medicine to human, animal, and environmental health to policymakers, community leaders, and society in general. The plan would include strategies for funding a working interdisciplinary committee to devise a plan to work with animal, public health, and environmental organizations for support of academic veterinary medicine.
6.4.2	CVMs continue to identify opportunities for cost efficiencies and explore innovative additional revenue streams.
6.4.3	AAVMC, AVMA, and other stakeholders collaborate to establish veterinary medicine as a named eligible recipient in student loan restructuring and loan-forgiveness programs at the state, federal, and local government levels. A veterinary medical education foundation is established for endowments, scholarships, etc.
6.4.4	CVMs make financial counseling available to veterinary medical students in each year of study.
6.4.5	AAVMC and AVMA convene a workshop for educators and employers to look for new ways to address the issue of the ratio of student debt to graduate starting salary.
6.4.6	AAVMC, in collaboration with AVMA and other parties, establishes a working group to optimize relationships between veterinary teaching hospitals and veterinary specialty stakeholders.

TABLE A-5. NAVMEC RECOMMENDATIONS: INNOVATION, FLEXIBILITY, AND ACTION	
6.5.1	Collaborative teams are formed at CVMs to maintain focus on NAVMEC recommendations at each CVM and help implement initiatives at the local, national, and international level.
6.5.2	Web-based discussion forums and other open forums are adopted to facilitate sharing of best practices in veterinary education.
6.5.3	The implementation plan (see Section 8.0) is initiated to maintain heightened momentum and measure progress annually.
6.5.4	AAVMC seeks financial support to help CVMs and the profession in general implement the recommendations proposed by NAVMEC.

Research Agenda for Veterinary Medical Education

A dearth of peer-reviewed research on factors impacting veterinary medical education was acknowledged in preparation for and during discussions at the NAVMEC national meetings and the 2011 AAVMC Deans' Conference, thus limiting the ability to adopt an entirely evidence-based approach to address the challenges described in this report. Some of the highest priority items for research identified during the NAVMEC process were:

Teaching and Learning	What teaching and learning strategies in higher education (including 'blended' programs) are emerging as most effective?
Pre-Admission Assessment	What are the most reliable pre-admission assessment criteria and how can they best be evaluated?
Professional Competencies	How do other professions test effectively for competence in leadership, communications, etc.?
Distance Learning Costs	What are the real capital and operating costs associated with distance learning to achieve given educational outcomes?
Self-Directed Learning	Are self-directed learning models applicable in the education of veterinarians?
Professional Mobility	What is the experience of other regulated professions with, for example, interstate licensure? What are the models of professional mobility for veterinarians and other professions in other countries?
Incentives for Courseware Sharing	What is the best way to incentivize, reward, and give credit to faculty members for developing and sharing educational materials among CVMs?
Economic Knowledge	What is the economic knowledge we need to guide faculty hiring, investment in education resources, and CVM viability?

TABLE A-6. NAVMEC RECOMMENDATIONS: IMPLEMENTATION

8.1	Current NAVMEC Board of Directors provides direction until July 2011. AAVMC guides implementation and monitors the progress of NAVMEC recommendations, including collaborations with stakeholders.
8.2	Initial activities include: • Refine recommendations in June 2011 through feedback from partners and stakeholders. • Define metrics for success, including employers' outcomes measures; conduct initial survey to collect baseline data on metrics against which progress in veterinary education, accreditation, and testing/licensure will be measured. • Develop implementation schedule, actions, milestones, and budget. • Create a web-based discussion board and forums, to enable open sharing of innovation. • Ensure progress is communicated regularly to all stakeholders.
8.3	Maintain a North American implementation focus, while finding opportunities to participate in international educational forums, and ensure a global perspective.
8.4	Review and assess NAVMEC progress annually. At each AAVMC annual conference, devote time for CVMs to share NAVMEC successes and to assess the progress of the initiative as a whole. At least every three years, convene a forward-looking NAVMEC summit involving educators, employers, students, and representatives from accreditation, testing, and licensure organizations for sharing best practices, monitoring progress, and ensuring this progress is broadly distributed.

2.0
The Changing Landscape of Societal Needs, Veterinary Medicine, and Veterinary Medical Education

Veterinary medicine is known as one of the most fulfilling, interesting, and challenging professions and it offers an exciting and broad spectrum of career choices to those entering the profession. Veterinarians can pursue careers in companion animal medicine, food animal medicine, rural veterinary practice, equine medicine, wildlife veterinary medicine, public health, food safety, biomedical research, corporate/industrial practice, and much more. However, veterinary medical education and the profession at large face important challenges and opportunities that are increasing at an accelerated pace. Many agree that veterinary medical education and the profession urgently need to respond to this changing landscape in order to ensure that graduates can continue to meet society's needs.

Changing Relationships Between Humans and Animals and Evolving Societal Needs

For centuries, animals have played critically important roles for humankind, including companionship, protection, transportation, work, and food. They have provided important sources of animal protein in the human diet, power for plowing fields and packing goods and supplies, energy for cooking and heating homes, assistance to search and recovery efforts in times in emergency, assistance to the disabled, and companionship to humans. Veterinarians have been privileged to oversee the health of animals and to diagnose, prevent, treat, and control the diseases that afflict them. The intersection of animal, human, and environmental health has served as the underpinning of veterinary medicine since its inception.

Over time, the relationship between humans and animal populations evolved along with the focus of veterinary medicine. In the mid-20th century, the typical veterinary medical student was a young Caucasian male from a rural farming and hunting community who planned to become a rural food animal or mixed animal practitioner.

Today, a more diverse U.S. population lives in urban and peri-urban environments. To feed people at an affordable cost, food animal production units have consolidated and grown in size, with many small farm holdings now out of business or consolidated into large agribusinesses. Pets have moved from the backyard into the house as family members, and pet-owning populations have sought increasing levels of care from

veterinarians who practice in urban settings. Diseases that transmit between animals and people have been on the rise, with the majority of human foodborne and other emerging infectious disease outbreaks of the past 20 years originating from animal sources of infection.[1]

The typical veterinary medical student of today is a young Caucasian female from an urban background.[2]

Changes in Financial Support of Veterinary Medical Education

In North America, some of the earliest veterinary medical schools were established in the late 1800s as part of the land-grant university system, with a foundation of education, research, and service. Given the early emphasis on agriculture, important financial and popular support for colleges of veterinary medicine in the United States and Canada came mostly from state and provincial departments of agriculture, thereby assuring the health of beef, dairy, swine, and poultry populations that were raised for food and trade. With time, and the shift of the North American population to urban settings, financial support to land-grant universities has declined sharply, in stark contrast to what has been provided to schools of human medicine, dentistry, and nursing.

Land-grant universities have had to raise student tuition, with the result that students and their families are shouldering more and more of the cost of their education. Students are taking out larger loans, so that in 2010, the average student loan debt of a graduating veterinarian approached $134,000.[3] In most cases, starting salaries immediately after graduation have not increased at a rate commensurate with climbing student debt, challenging the ability of new graduates to be able to service significant student loans and maintain the quality of life expected for a healthcare professional. The majority of newly graduated veterinarians are pursuing careers in urban companion animal medicine. Some new graduates expressing primary interest in food animal medicine, rural mixed animal practice, public health, food safety, and biomedical research appear to be pursuing careers in urban companion animal medicine for a variety of reasons, including financial ones.

1 Institute of Medicine and National Research Council. 2009. Sustaining global surveillance and response to emerging zoonotic diseases. Washington, DC: The National Academies Press.

2 AAVMC unpublished data.

3 Shepherd, Alison J., Majchrzak, Sue. Employment, starting salaries, and educational indebtedness of year—2010 graduates of U.S. veterinary medical colleges. 2010; *JAVMA* 237 (6): 795–798.

Moreover, the applicant pool to veterinary medicine for the past several years has remained constant rather than increased, as it has for other health professions, though the reason for this trend is not known due to lack of research. Nonetheless, it is clear that the growing cost of education to students and families, balanced against future potential earnings by graduates, seems to be playing a role in the decisions made by potential veterinary medical school applicants.

Changes in Information Technology Enable Options for Sharing and Exchanging Information

Advances in information technology have enabled the rapid, real-time dissemination and exchange of information. These newer technological advances have impacted not only how information is shared but how learning can occur more efficiently. Open source systems of information, and online courses and instruction, are revolutionizing approaches to higher education. Once the younger generations are exposed to technology at very early ages, they not only become comfortable with its applications but expect its incorporation into the educational process.

Evolving Competency-Based Veterinary Medical Education—Curricula, Accreditation, Testing, and Licensure

In North America, all veterinarians take the following oath at graduation: "Being admitted to the profession of veterinary medicine, I solemnly swear to use my scientific knowledge and skills for the benefit of society through the protection of animal health and welfare, the prevention and relief of animal suffering, the conservation of animal resources, the promotion of public health, and the advancement of medical knowledge. I will practice my profession conscientiously, with dignity, and in keeping with the principles of veterinary medical ethics. I accept as a lifelong obligation the continual improvement of my professional knowledge and competence."

This oath identifies several core competencies that every graduating veterinarian should know in order to meet societal needs. Communication and leadership skills are now understood to be essential for success by all newly graduated veterinarians, regardless of the disciplines new graduates intend to pursue.[4]

4 Lloyd J.W., King L., Mase C.A., Harris D. Future needs and recommendations for leadership in veterinary medicine. 2005; *JAVMA* 226 (7): 1060–1067.

Studies of Veterinary Medical Education

The understanding that veterinary medical education must adapt and change over time for the profession to remain relevant to society has existed since the profession's earliest days. As we recognize 2011 as World Veterinary Year, we recognize that the first veterinary school in Lyon, France, was created to respond to societal needs of the day. In 2005, following on several seminal studies of veterinary medical education in the '70s and '80s (Pew,[5] KPMG,[6] Agenda for Action,[7] and others), the AAVMC launched a special study to explore society's changing landscape and what changes veterinary medical education needs to undergo in order to ensure that the profession is well positioned to meet future societal needs. *The Foresight Report: Envisioning the Future of Veterinary Medical Education* was published in 2007,[8] and the findings and recommendations quickly connected with several key stakeholders of the profession.

THE UNDERSTANDING THAT VETERINARY MEDICAL EDUCATION MUST ADAPT AND CHANGE OVER TIME FOR THE PROFESSION TO REMAIN RELEVANT TO SOCIETY HAS EXISTED SINCE THE PROFESSION'S EARLIEST DAYS.

5 Pritchard W.R. *Future Directions for Veterinary Medicine: The Pew Report.* Durham, NC: Pew National Veterinary Medical Education Program, Institute for Policy Sciences and Public Affairs, Duke University, 1988.

6 KPMG LLP. *The Current and Future Market for Veterinarians and Veterinary Medical Services in the United States.* Washington, DC: American Veterinary Medical Association/American Animal Hospital Association/Association of American Veterinary Medical Colleges, 1999.

7 AAVMC. An agenda for action: Veterinary medicine's crucial role in public health and biodefense and the obligation of academic veterinary medicine to respond. 2003; *JVME* 30(2).

8 AAVMC. Envisioning the future of veterinary medical education: The Association of American Veterinary Medical Colleges' Foresight Project, final report. 2007; *JVME* 34 (1).

3.0
Establishing NAVMEC: Engaging Education, Accreditation, and Testing/Licensure

Education, Accreditation, and Testing/Licensure: The Three Legs of Veterinary Medical Education

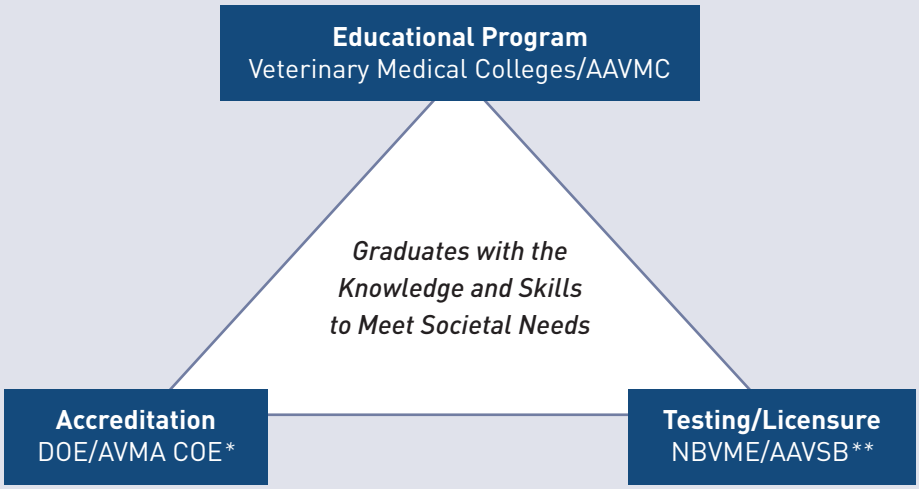
Given the changing landscape described above, and to build on the ideas of the Foresight Report, the AAVMC established NAVMEC in 2008 to bring together the broadest spectrum of stakeholders of veterinary medical education ever assembled to:

1. Identify changing societal demographics and what this society will need from the veterinary medical profession.
2. Create a shared vision for what core competencies every graduating veterinarian should have, regardless of the field he/she pursues.
3. Identify how veterinary medical education should evolve in concert with evolving societal needs to graduate veterinarians with these core competencies.

Importantly, AAVMC reached out to engage the four critical groups that are involved with veterinary medical education: (1) the veterinary colleges; (2) AVMA, which accredits veterinary medical colleges through the Council on Education; (3) the National Board of Veterinary Medical Examiners, and (4) the American Association of Veterinary State Boards, which are involved with the testing and licensure of new veterinary medical graduates. To ensure that the profession continues to respond to societal needs, it was recognized from the outset that leadership from all these groups would be necessary (Figure 1).

FIGURE 1

Three Legs of Veterinary Medical Education



* *DOE/AVMA COE: U.S. Department of Education/American Veterinary Medical Association Council on Education*

** *NBVME/AAVSB: National Board of Veterinary Medical Examiners/American Association of Veterinary State Boards*

All members of NAVMEC understood that its deliverables would be in the form of recommendations. However, given the broad spectrum of stakeholders involved (educators, public and private sector employers, veterinary professional groups, industry, students, etc.), it was anticipated that NAVMEC could influence the evolution of curricula, the revision and application of accreditation standards, and the composition of testing/licensure examinations.

4.0 NAVMEC: Stakeholder Engagement, Goals, Objectives, Process, and Anticipated Outcomes

4.1 Stakeholder Engagement, NAVMEC Members, NAVMEC Leadership, the NAVMEC Board of Directors

From the onset, reaching out to a broad spectrum of stakeholders of veterinary medical education was recognized as essential for a successful outcome (Figure 2a). Each stakeholder has different opinions, expectations, and requirements, but all can influence how future veterinarians are educated. When asked to define what a veterinarian is, stakeholders respond with diverse answers: animal doctor, food safety expert, biomedical researcher, animal welfare advocate, environmental protector, business partner, educator, community leader, public health expert, etc.

Herein lies the opportunity and the challenge: Given these diverse and important roles, the significance of veterinarians to animal, human, and environmental health, and society more broadly, is undeniable. Potential exists for veterinarians to become more highly recognized for their contributions and value to society. However, it is challenging to continue to provide a high-quality education to the best pool of students in all these disciplines in "reasonable" time and at an "affordable" cost.

NAVMEC invited stakeholders from inside and outside academia to contribute their ideas: educators, students, employers, practitioners, regulators, specialists, the veterinary industry, animal welfare personnel, and livestock commodity organizations. Many were represented at and participated in each of three national meetings (Figure 2b). Interest in NAVMEC and participation in the process grew with each meeting, so that by the third meeting, approximately 400 members representing over 150 groups in the veterinary medical community had participated in one or more of the three meetings.

A nine-member board of directors led NAVMEC, with three representatives from education (AAVMC), three from the accrediting body of colleges of veterinary medicine (AVMA Council on Education), and three from testing/licensure (AAVSB and NBVME). The organizational structure of the board is provided in Appendix B. Generous contributions from NAVMEC members completely funded NAVMEC's work, as shown in Appendix C.

FIGURE 2A

Stakeholders of Veterinary Medical Education

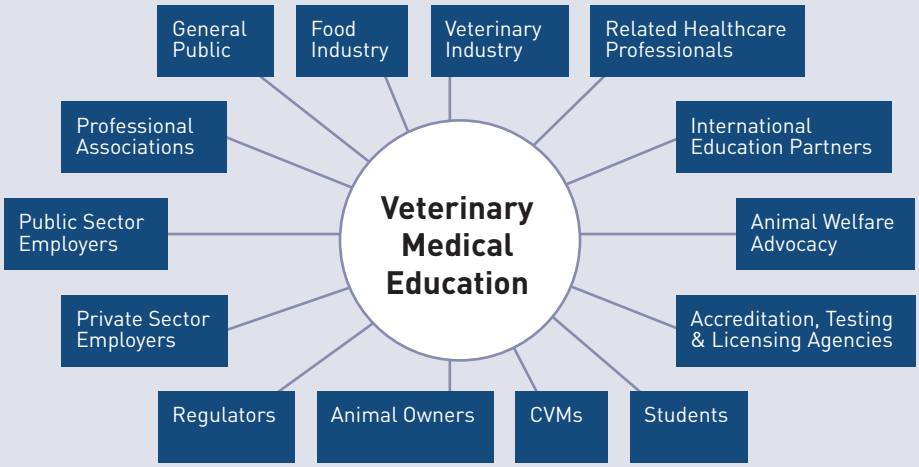
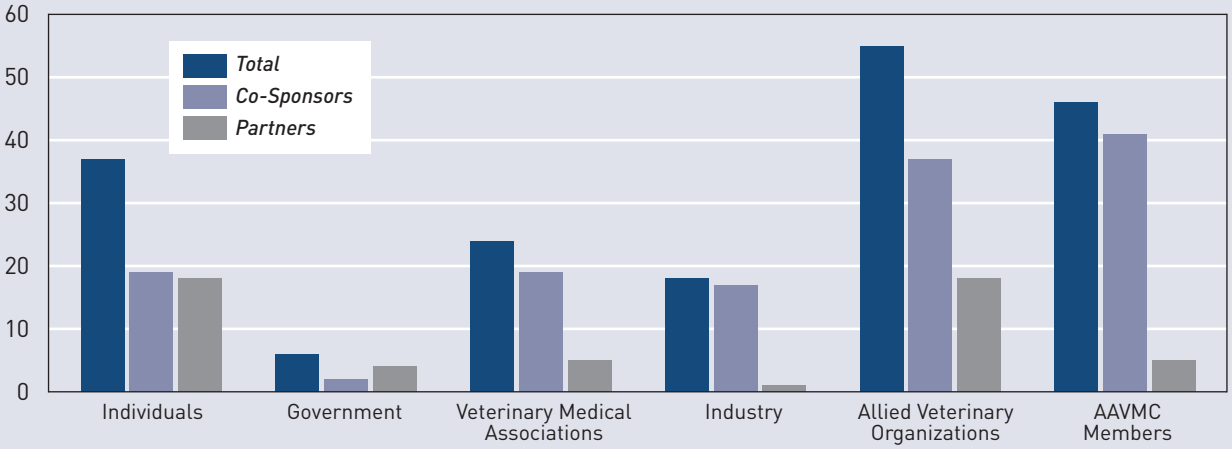


FIGURE 2B

Those Who Participated in NAVMEC



TOTAL NUMBER OF PARTICIPATING GROUPS: 186

4.2
NAVMEC Goals, Objectives, and Anticipated Outcomes

The overall goal of NAVMEC was to identify a cost-effective veterinary medical educational system that would produce graduates with the core competencies that are required and valued by society, including the public and employers.

NAVMEC's objectives were to:

1. Identify current and evolving societal needs.
2. Identify a set of core competencies that graduates will demonstrate the day after graduation.
3. Develop a "road map for education, accreditation, testing, and licensure" that would:
    - Assure the achievement of core competencies by all graduates;
    - Provide for innovation and flexibility by CVMs;
    - Build on the strengths of veterinary medical colleges/schools, and leverage best practices among CVMs and accelerate system-wide reforms[1];
    - Encourage and facilitate partnering, collaboration, and sharing of educational resources among colleges;
    - Identify ways in which accreditation and testing/licensure would support educational reform.

4.3
NAVMEC Consultative Process

NAVMEC adopted a consultative process, convening stakeholders in three national meetings, each having a different focus and consisting of stimulus presentations by invited experts and breakout activities for teams to consider a variety of issues in depth. This meeting format offered stakeholders, beneficiaries of veterinary medical education, and other interested parties the opportunity to discuss the skills and competencies needed by tomorrow's veterinarians, bringing a variety of perspectives to the discussion.[2]

1 NAVMEC participants recognized that many CVMs have already made and are continuing to make important changes that are in line with the direction of NAVMEC discussions at the national meetings.

2 Detailed NAVMEC meeting reports are available online and can be accessed via hyperlinks provided in Appendix H.

The focus/objectives of the three national meetings were as follows:

Meeting 1 (February 2010, Las Vegas): Participants identified societal needs and the skills required by veterinarians to meet these current, emerging, and future needs (see Appendix D for details). An initial set of core competencies was also developed (see Appendix E).

Meeting 2 (April 2010, Kansas City): Participants reviewed and analyzed eight current veterinary medical education models (VMEMs) (i.e., a traditional veterinary medical teaching hospital, "Two plus Two," nontracking, tracking, U.S. distributive, Canadian distributive, Caribbean, and European models) and one conceptual model. Details of the VMEMs and an overview of generic improvements to the models that were identified during group discussions are provided in Appendix F.

Meeting 3 (July 2010, Las Vegas): Participants explored how the veterinary education community and accreditation, testing, and licensing bodies can work together to meet the profession's goals for the future. Specifically, "innovation discussion teams" were tasked with creating curricula that would better and more efficiently develop core competencies of graduates (see Appendix G), amid a host of challenges (e.g., student debt, information overload, and cost of education).

4.4 Anticipated Outcomes of NAVMEC

From the earliest discussions at NAVMEC's first national meeting, members were emphatic that NAVMEC must result in moving from recommendations to action. Participants stressed that recommendations be made that allow, encourage, and facilitate creativity and innovation by faculty members of schools/colleges of veterinary medicine.

4.5 Feedback to NAVMEC Draft Report

NAVMEC published the draft report on its website on October 31, 2010, and invited stakeholders from across the profession to provide quantitative feedback in the form of a survey (support, do not support, etc.), in addition to qualitative feedback in written comments, suggestions, etc. Over the next six months, this feedback was collected, read, analyzed, and synthesized. In addition, NAVMEC board members and AAVMC staff held six webinars and made presentations on the NAVMEC draft recommendations at numerous conferences and meetings. In total, 353 individuals or organizations from across the profession provided feedback during this six-month period (see Figure 3 for distribution).

Feedback on the draft report was broadly positive (see Figure 3), with 80 percent of respondents either supporting or strongly supporting the recommendations overall. Some recommendations that received the strongest support were those advocating competency-driven curricula (90 percent) and schools' provision of financial counseling to students (87 percent). The high rate of support came from both academics and nonacademics. Overall, 75 percent of academics were supportive or strongly supportive of the recommendations compared to 82 percent of nonacademics (mostly employers).

In creating this final report, the NAVMEC Board of Directors read and carefully considered the many pages of feedback it had received from a broad range of contributors.

FIGURE 3A

All Respondents: Employment Status

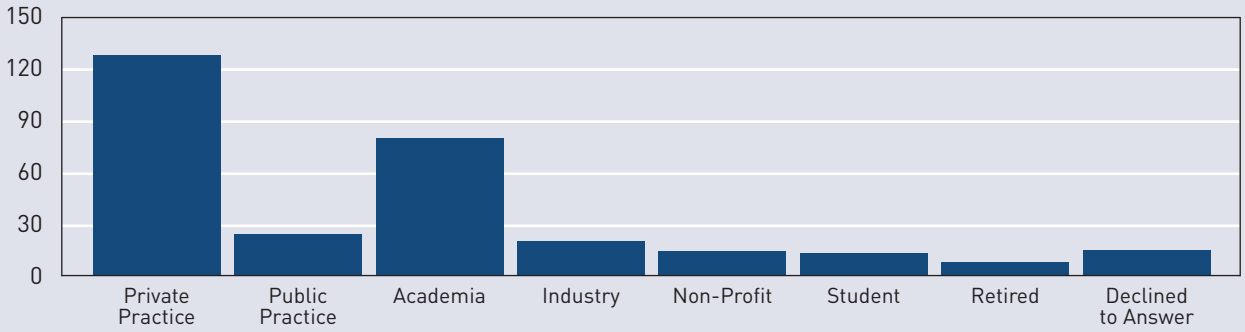
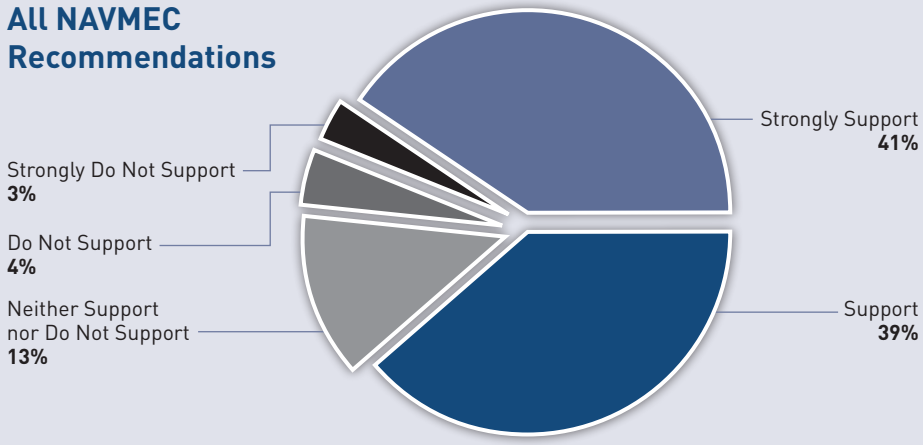


FIGURE 3B

All NAVMEC Recommendations



5.0 Summary Overview of NAVMEC Findings from the Three National Meetings

Early in discussions, NAVMEC recognized the value of leveraging the innovation already demonstrated at many schools, for example, in curricula and teaching methods. The focus for NAVMEC is to identify ways to enhance flexibility and agility, and find opportunities to optimize the capacity of veterinary medical education to respond to an increasingly demanding society. The veterinary education system should also expose all veterinary students to how and why veterinary medicine is an integral partner in the biomedical and comparative biomedical professions, including the importance of assessing and applying research protocols.

5.1 Change Drivers of Veterinary Medical Education

Taking into account the current environmental climate of evolving societal needs and the challenges confronting veterinary medical education, four critical change drivers for veterinary medical education emerged from discussions among participants at the three NAVMEC national meetings (see table on following page). These drivers were believed to significantly influence how veterinarians will be educated in the coming decade.

Presentations at the NAVMEC national meetings confirmed that innovative changes are already under way at most of our North American colleges of veterinary medicine, and that these were consistent with the ideas being explored at NAVMEC. In its deliberations, the NAVMEC Board of Directors brought forward examples of innovation already under way at several CVMs:

EXAMPLES OF CURRENT CVM INNOVATION

- Addition of required rotations in community practice to provide more primary case experience
- Intensive daylong workshops on communications, with actors and fast feedback
- New goal of all veterinary students acquiring international experience before graduating
- Creation of an Office of International Programs, headed by a new director

TABLE B. CHANGE DRIVERS OF VETERINARY MEDICAL EDUCATION THAT EMERGED FROM DISCUSSIONS AT NAVMEC NATIONAL MEETINGS

Change Driver	Commentary
Evolving Societal Needs	• There are expectations that veterinarians will take more of a leadership* role in issues relating to food safety, animal welfare, environmental health, and One Health. • Global food and energy shortages will put the spotlight on choices relating to food production. • Health and wellness will assume a growing importance in society—all healthcare providers will be expected to provide more integrated services. • Veterinarians will play a broader healthcare role in cases of zoonotic disease outbreaks, wellness programs relating to the human-animal bond, and response to natural or induced disasters. • Diversity of North American society will continue to expand; likewise, the population of veterinarians should reflect this diversity.
Financial Challenges	• Financial challenges include reduced financial support to CVMs from state resources, and reduced income from many veterinary teaching hospital caseloads. • Evolving societal expectations will increase the cost of education to students. • Using current starting salaries, some veterinary graduates find it difficult to service their accumulated debt and further their education while paying their living expenses. • The national ratio of applicants to positions in professional veterinary programs has trended downward since about 1990 and is currently 2.1:1.**
Technology	• The technologies of veterinary medicine are expanding rapidly: diagnostics, therapeutics, genetic engineering, etc. Curricula must adapt to educate in these areas. • Knowledge is no longer synonymous with power since information has become ubiquitous. The ability to find and analyze information and draw conclusions is becoming increasingly important; clients are accessing information prior to or in lieu of contacting a veterinarian. • In all fields of education, the basic premises of teaching and learning are going through a renaissance, enabled by online, on-desk, and in-hand technology. These technologies are greatly impacting the education of veterinarians, but it is as yet unclear how these changes will affect the cost and quality of this education, and what their impact will be on staffing and resources at CVMs.
21st-Century Students' Attitudes and Aptitudes for Learning	• Tomorrow's students will expect to receive a high-quality education at a time and location that facilitates achievement of learning objectives in the most efficient process possible. • Students are also becoming more attracted by online, virtual educational facilities, where the quality of the training is growing by leaps and bounds. • Some students find CVMs admissions criteria and processes complex and inconsistent, making their educational choices confusing, a situation that could influence the size of the applicant pool.

** leadership = the ability to take direct action and influence others to take action.* *** AAVMC unpublished data, 2010.*

EXAMPLES OF CURRENT CVM INNOVATION (CONTINUED)

- Modified fourth-year curriculum to include the option for species focus/tracking
- Creation of an Office of Diversity, headed by a new director
- Redesign of a primary care rotation to mirror private practice
- Creation of administrative offices for outcomes assessment and faculty development

NAVMEC members expressed a strong desire to continue to leverage all CVM initiatives and to start implementing new concepts. They agreed that many of the recommended initiatives will require innovative collaboration involving the leadership, faculty, and administration staff of all CVMs, as well as the accreditation, testing, and licensure bodies.

5.2
Identification of Core Competencies Needed to Meet Societal Needs—Outcomes of NAVMEC's First National Meeting

The following evolving societal needs were identified at the first NAVMEC meeting. These needs are broad and demanding of veterinarians. They include:

- Strong comparative medicine primary clinical skills for different species
- Career-ready, business-aware professionals at graduation, skilled in business foundations of clinical practice, communication
- Increased leadership in food safety, zoonoses, animal welfare
- New knowledge required by globalization, food shortages, advancing agribusiness
- A focus on the concepts of One Health
- Leadership in understanding the many dimensions and influencers of diversity in society
- Interdisciplinary problem solvers, critical thinkers
- Leaders in disaster management and public communication
- Technological adeptness
- Compassion

Following the identification of significant, evolving societal needs, NAVMEC members agreed on a set of core competencies for all veterinarians. These competencies are presented in Section 6.1 of this report—NAVMEC Vision and Recommendations. Details of the discussions and outcomes of NAVMEC National Meetings are presented in Appendices D (Meeting 1) and E.

5.3
Opportunity and Challenges to Veterinary Medical Education

NAVMEC members agreed that there is a strategic need to:

- Educate community leaders about the broad value of the veterinary profession. Although veterinarians are consistently highly regarded in terms of societal value, respect, and trust, their starting salaries are lower than those of many health professionals.
- Continually update the scope of topics being taught within the four-year curriculum, focusing on primary/preventive and wellness care, and on both clinical and professional competencies. This may lead to a broader curriculum to deliver career-ready core competencies for all veterinary medical graduates, enabling them to meet societal needs and to lead fulfilling, successful careers. This broader curriculum may necessitate a concurrent decrease in curricular depth with greater emphasis on basic principles, critical thinking, and problem solving.
- Facilitate increased sharing of educational resources among CVMs, which will be essential for systemwide success. Sharing of resources was believed to be a critical factor in ensuring that the education delivered by CVMs continues to be of the highest quality, while achieving affordability and attracting a strong applicant pool of the best students.

5.4
Additional Key Findings from NAVMEC National Meetings[1]

- The needs of society and employers are driving the development of a broader set of core competencies, with increasing emphasis on food safety, wellness and prevention programs, emerging zoonotic diseases, animal welfare, environmental health, public health, and overall stronger links to human health.
- Professional competencies (see 6.1) are increasingly recognized as essential for successful private and public veterinary practitioners, and should be integrated throughout the curriculum.
- Employers are expecting veterinary medicine graduates to be ready to apply core competencies on the first day after graduation (career-ready).
- Current tracking and nontracking veterinary medical education models continue to be successfully deployed and have strengths and weaknesses; several common themes may be considered:

1 Additional details on the discussions and outcomes of the NAVMEC national meetings can be accessed via hyperlinks that are provided in Appendix H.

  - The identification of a core of pre-veterinary requirements would simplify the application process.
  - Continued emphasis on tailoring education delivery to the learning styles of individual students is needed.
  - Flexibility in course design and delivery is essential for innovation and efficiency.
  - Educational curricula should provide graduates with the necessary clinical and professional competencies for their career paths.

- The second national meeting included a presentation and discussion of several models currently in practice for educating veterinarians in the United States, Canada, and Europe, along with suggestions for improvements for all models. In addition to these models now in use, two new "out of the box" conceptual models were presented, based around three foundational concepts: 1) what education costs, 2) what should be taught, and 3) how adults learn.
  - The first new model included a total of four to five years of college education, including one to two years of pre-veterinary education with multimedia distance learning and a pre-veterinary examination at the end of the second year. During the second phase of this first new model, 1.5 years of clinical coursework in clinical disciplines and professional competencies are required. The last phase would last six months with focused clinical training and the opportunity to obtain limited or segmented licensure.
  - The second new model included 5.5 years of college. The first phase included two years of pre-veterinary education with streamlined course requirements, two years of pre-clinical and clinical didactic and laboratory education with accelerated scheduling, and an advancement examination at the end. The third phase included 1.5 years of clinical training modules with focused modular tracks, interinstitutional portability, and post-education retraining opportunities.

THE UNDERLYING PRINCIPLES OF THE TWO NEW "OUT OF THE BOX" MODELS WERE:

1. Education must be more affordable and less reliant on state appropriations.
2. Pre-clinical and clinical instruction should be informed by research; adults learn best in experiential, student-centered teaching environments relevant to their interests.
3. All students must develop an understanding of comparative biology and cognitive skills for solving clinical problems.
4. To achieve entry-level competency, students should be provided sufficient time and opportunity to learn and practice necessary knowledge and skills.
5. Opportunity must be provided for retraining veterinarians who decide to change career directions after graduation.

- Many CVMs are coming under increasing financial pressure due to funding cuts and reduced veterinary teaching hospital case load and accompanying revenue loss. These financial shortfalls are challenging many CVMs to evaluate how to continue to deliver a high-quality clinical education.
- Student debt load may become a deterrent to future entrants to veterinary medical education programs when considered along with their expected early career income.
- A strong understanding, need, and desire exist to share educational resources among CVMs, and to maintain and continually work to elevate the quality of education while pursuing more cost-effective approaches.
- Information overload is a concern. Curricula should continue to focus on essential information and identify ways for students and graduates to acquire and use new technology tools. Educators should continually review how much information needs to be memorized and retained versus learning how to effectively access information.
- New information technology will impact how veterinary medical students are educated. This technology should be carefully adopted to ensure quality and potentially to lower costs.
- Steps should be taken to enhance diversity in the veterinary profession through admissions, prerequisites, and curricula.
- Accreditation standards that are linked to outcomes based on the core competencies can be a powerful change driver in development of veterinary medical educational curricula that will graduate veterinarians with career-ready core competencies.
- The current system of licensure provides career flexibility and a consistent process across state/provincial jurisdictions. In the United States, licensure is a state-regulated issue.

6.0 NAVMEC Vision and Recommendations

NAVMEC's vision is to educate valued and valuable veterinarians for the 21st century.

Its mission is to create a responsive, collaborative, and flexible roadmap for veterinary medical education to:

a. Attract and retain the very best students.

b. Motivate and inspire outstanding educators.

c. Create value for financial investors in the education system.

d. Excite and engage all stakeholders, including employers of veterinarians.

e. Empower veterinarians to contribute to societal needs from a global perspective.

Veterinarians' roles will continue to be diverse: health and welfare of companion animals and food production populations; food safety and food system security; biomedical research; equine medicine; wildlife medicine; and working at the intersection of animal, human, and environmental health.

NAVMEC proposes five strategic goals.

As a result of the discussions and outcomes of the three national NAVMEC meetings, the NAVMEC Board of Directors proposes five strategic goals, accompanied by 23 recommendations, to advance veterinary medical education in order to ensure that each graduating student is proficient in a set of core competencies.

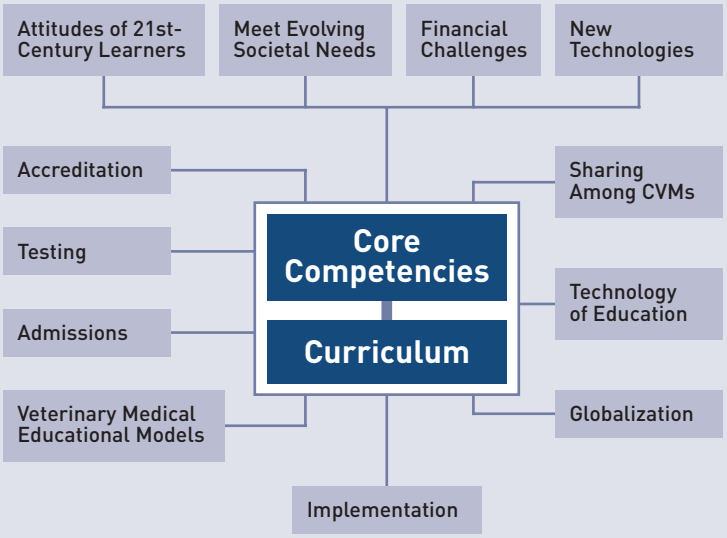
NAVMEC'S PROPOSED FIVE STRATEGIC GOALS

1. Graduate career-ready veterinarians who are proficient in and have the confidence to use an agreed-upon set of core competencies.
2. Ensure that admissions, curricula, accreditation, and testing/licensure are competency driven.
3. Share resources to ensure veterinary medical education is of the highest quality and maximally cost-effective.

4. Promote an economically viable education system for both CVMs and veterinary students.
5. Stimulate a profession-wide focus on innovation, flexibility, and action.

FIGURE 4

Connecting Change Drivers and NAVMEC Recommendations



NAVMEC recommendations focus on core competencies and other drivers of veterinary medical educational curricula. NAVMEC's goals, objectives, and recommendations are based on and driven by core competencies required for new graduates to meet societal needs. These competencies drive admissions, curricula, accreditation, and testing/licensure. There are several influences on curricula, including different ways of delivering the curricula (veterinary medical educational models), the type and level of sharing among the CVMs, new information technology, learning aptitudes of 21st-century students, and the financial challenges facing CVMs and students.

Core Competencies, CVMs, and Curricular Development

MULTISPECIES KNOWLEDGE PLUS CLINICAL COMPETENCY IN ONE OR MORE SPECIES OR DISCIPLINES

The core of veterinary medicine revolves around the knowledge embodied in the biology of domestic and wildlife species and the diseases that affect these animals. The diversity of the different species studied for both terrestrial and aquatic/marine systems is extensive and includes the application of comparative biomedical sciences. Thus, veterinarians have the background to evaluate the impact of diseases, welfare, and environmental factors on an individual animal and on affected animal populations. This represents the core of knowledge and application of clinical skills for diagnosis, treatment, and control of diseases and for improving the health and well-being of multiple species.

Because of the diversity of species, the approaches to clinical procedures are systematically conducted, with treatment depending on the biology of the type of animal treated. The wide diversity of species that veterinary medicine addresses presents a challenge for each college of veterinary medicine. Thus, the education and teaching of clinical skills should be confined to a limited number of species for any one institution. Common domestic species are more readily available to develop clinical skills and serve as the usual means of training. Those students wishing to specialize within a single species should be able to do so if the college offers a track curriculum. Tracking or focused in-depth clinical training can be enhanced utilizing the collective expertise that a "center of emphasis" provides for a particular animal species. The strategy for tracking opportunities for students is substantially improved by sharing resources among colleges and/or other partners, such as large private practices, federal agencies, or other disciplines.

ONE HEALTH KNOWLEDGE: ANIMAL, HUMAN, AND ENVIRONMENTAL HEALTH

Veterinary medicine must become a leader in One Health. This may be the single most important new opportunity for the profession for the foreseeable future and in particular for academic veterinary medicine. In order for each veterinary college to develop a One Health initiative, NAVMEC recommends that each college develop a plan to address One Health as it fits local/regional and/or global needs as defined by that college and its partner institutions from medicine, public health, biomedical sciences, or agriculture. This initiative would then lead to a consensus of a new identity for One Health by the college(s) and eventually to the broad implications of this new definition for the profession.

One Health has been described as global health, veterinary public health, ecosystem health, food safety and security, emerging diseases, environmental degradation (because of chemical and microbial contamination), translational medicine, animal models of human diseases, and wildlife medicine and management among other things. Essentially, through veterinary medicine, One Health bridges animal, human, and environmental/ecosystem health in ways that no other profession does. This does not mean that all colleges must develop every specialty but rather that each college should choose one or more areas that are relevant to local/regional needs. Defining One Health to clearly demonstrate veterinary medicine's role in improving the health and well-being of people puts the profession in a better position to be a member of healthcare teams and funding. To assist in obtaining funding, NAVMEC recommends that progress reports be given at AAVMC/AVMA meetings every other year.

PROFESSIONAL COMPETENCIES

Most professional health science programs (medical, dental, etc.) highlight competencies to enhance the overall stature of the profession. The following competencies are of great importance for the veterinary profession, elevating it to a level of greater prominence among the members of the general public in relation to their health; highlighting its economic role as small businesses in local communities; addressing important issues

relating to animals and their role in society; highlighting the need for balanced lifestyles; developing management teams; and developing plans for diversity and changing environments. With this in mind, NAVMEC recommends that colleges develop plans to address the following competencies and benchmark progress with other institutions. In addition the Council on Education could consider this information as it reaccredits veterinary colleges and revises and updates the North American Veterinary Licensing Examination (NAVLE).

Communication: Communication skills are a critical part of all aspects of veterinary medicine. Colleges need to develop plans for teaching and evaluating verbal and written communication skills. These plans should include means of sustaining effective, professional relationships and skillful, sensitive, and appropriate communication with clients, healthcare professionals, and the public. These skills need to be incorporated throughout the curriculum so that the new graduate is comfortable and competent in providing this information.

Collaboration: Colleges need to develop strategies for implementing roles whereby students, faculty, and staff serve in various capacities as interdisciplinary teams to improve efficiency and profitability. These teams can also assist in achieving optimal outcomes, particularly in multiprofessional and multicultural environments, as the profession becomes more community oriented and involved in One Health responsibilities.

Management (self, team, system): The challenges facing the future veterinary workforce require mentoring and the development of role model programs that address managing the veterinarians' professional responsibilities and personal lives. Veterinary careers can be greatly enhanced by providing guidelines on how decisions are made for good work/life balances based on the circumstances that each professional faces. Students need to understand how to prioritize, coordinate, and effectively execute tasks and manage resources.

Lifelong learning, scholarship, value of research: Newer technologies make lifelong learning a means by which graduates will have ready access to new information and renewal of contacts with experienced and expert faculty. Plans need to be formulated whereby faculty and students alike begin to understand and utilize the power of the new technologies as a ready source of information for the future. Included in this concept is the need to create, disseminate, and become more involved in the translation of knowledge based on the disease and case management issues. Each CVM needs to ensure that students will have optimal opportunities both to be exposed to research projects at some point in the curriculum and to learn to interpret the data in research reports. Students and future practitioners need to be more attuned to asking the right questions and strive to adapt and increase their knowledge, skills, and judgment. Select cases may become future material for clinical trials.

Leadership: Leadership is a critical skill for the veterinary profession. Plans for incorporating leadership training and reinforcement, throughout the curriculum, are needed to prepare the future veterinary workforce. The emphasis on commitment to the health and welfare of patients, the protection of human health, professional self-regulation, legal compliance, and high personal standards of behavior and practice are all leadership competencies that can be assessed during matriculation in veterinary college. Leaders are guided by a code of ethics and law and a commitment to professional competence. High standards in appropriate attitudes and behavior, integrity, personal well-being, and public good are essential for veterinarians to follow to continue public trust and confidence.

Diversity and multicultural awareness: Plans from each veterinary college need to be made to address local and regional issues related to the diversity of the area in order for the profession to be successful. Veterinarians need to demonstrate an understanding of the manner in which culture and belief systems impact the delivery of veterinary medical care, while recognizing and appropriately addressing biases in themselves, in others, and in the process of veterinary medical care delivery. These plans need to be implemented to better meet societal needs.

Adapt to changing environments: The rapidly changing dynamics of society and environment require that veterinarians need to have an open mind and be flexible enough to make the changes required for the profession to remain relevant for both personal satisfaction and for society's appreciation of future contributions. Planning for flexibility in meeting societal needs must address globalization (animals, people, diseases), economic shocks, and natural and intentional disasters. Challenging situations need to be met with curiosity and flexibility when changing priorities and situations arise.

6.1
Graduate Veterinarians Proficient in Core Competencies

The primary objective of veterinary medical education is to graduate veterinarians with the skills that are highly valued by employers and by society in general. NAVMEC participants confirmed that veterinary medical education revolves around a strong, well-defined set of core competencies for all graduates. All stakeholders would benefit from this approach:

- Students acquire a broad set of skills, which increases their value in the veterinary medical market.
- The public will be better served by veterinarians with the most relevant skills.
- Employers can hire veterinarians ready to contribute as soon as they graduate, thereby increasing their value.
- Educators know where to invest time and resources to optimize the breadth and depth of the curriculum.

Each of the NAVMEC meetings considered the definition of the core competencies, and how these would be delivered to students and assessed. More specialization will require additional education beyond these core competencies. After three national meetings by a multistakeholder panel, NAVMEC participants agreed upon and further developed a set of core competencies. A strong representation of employers (public and private sector) on this panel ensured that the expectations of animal-owning clients and society were considered; additionally, faculty members and associate deans for academic affairs, and experts in accreditation, testing, and licensure focused on how the core competencies could be taught and assessed. More details are provided in Appendix I. This initial set of core competencies will form the foundation for further detailed definition work by educators, assessors, and employers.

TABLE A. CORE COMPETENCIES FOR ALL VETERINARY MEDICAL GRADUATES

Multispecies Knowledge plus Clinical Competency in One or More Species or Disciplines		This competency plays a central role in the framework of core competencies because comparative medicine provides the foundation for application of veterinary knowledge in a single species and across species and disciplines. At graduation, veterinarians are able to apply and integrate comparative medical knowledge and clinical and professional skills to their work, enabling them to work productively and effectively. They are advocates for animal health and welfare. While graduates typically focus primarily on one or a few species, or a discipline (e.g., public health), veterinarians are educated to take a comparative biomedical approach.
One Health Knowledge: Animal, Human, and Environmental Health		In collaboration with other health professionals, veterinarians responsibly use their expertise and influence to advance the health and welfare of animals, people, their local and global communities, and the environment. Veterinarians appreciate the impact of animal diseases on the food supply system and society in general.
Professional Competencies	*Communication*	Veterinarians sustain effective, professional relationships and skillful, sensitive, appropriate communications with clients, colleagues, other healthcare professionals, and the public. They communicate effectively using various methods in a variety of settings with the purpose of achieving the best outcomes/results.
	Collaboration	Veterinarians serve integral roles in interdisciplinary teams to achieve success in business and optimal societal outcomes. They work as effective team members in interdisciplinary, multiprofessional, and multicultural environments.
	Management (self, team, system)	Veterinarians make effective choices to manage their professional and personal lives. They are aware of the challenges and the importance of making good work/life balance decisions. They are able to prioritize, coordinate, and effectively execute tasks and manage resources.

TABLE CONTINUES ON THE NEXT PAGE

TABLE A. CORE COMPETENCIES FOR ALL VETERINARY MEDICAL GRADUATES (CONTINUED)

Professional Competencies	*Lifelong learning, scholarship, value of research*	Veterinarians recognize that research, which is based on the scientific method, leads to the generation of new knowledge that underpins the veterinary medical profession. They demonstrate a lifelong commitment to learning. They regularly ask questions and are able to review and analyze the validity of research findings. They apply new knowledge to problem solving and to taking an evidence-based approach to practice. They are committed to improving their knowledge, skills, and judgment. They participate in the creation, dissemination, translation, and adaptation of new knowledge to their work, in order to maintain delivery of the highest quality service.
	Leadership	Veterinarians are proactive leaders in the profession, and are recognized voices of authority in important areas, such as animal welfare and One Health medicine. They are committed to the health and welfare of animals and the protection of human health through ethical practice, professional self-regulation, legal compliance, and high personal standards of behavior and practice. They are guided by a code of ethics and law and a commitment to professional competence, appropriate attitudes and behavior, integrity, personal well-being, and the public good.
	Diversity and multicultural awareness	Veterinarians demonstrate an understanding of the manner in which culture and belief systems impact delivery of veterinary medical care while recognizing and appropriately addressing biases in themselves, in others, and in the process of veterinary medical care delivery.
	Adapt to changing environments	Veterinarians recognize that they function within a continually changing physical, technological, economic, and societal environment. They demonstrate curiosity and flexibility when challenged with changing priorities and situations. A key attribute for veterinarians is their ability to quickly acquire technology expertise.

NAVMEC RECOMMENDATIONS: CORE COMPETENCIES FOR CAREER-READY VETERINARIANS

6.1.1 NAVMEC core competencies are further detailed and defined.

6.1.2 CVMs use the NAVMEC core competencies to guide curricular development.

6.1.3 All competencies are integrated and taught throughout the curriculum, as appropriate; colleges develop plans to address competencies and benchmark progress with other institutions.

6.1.4 The NAVMEC set of core competencies and their descriptions are integrated into the standards of accreditation and outcomes measurement.

6.1.5 NAVLE optimizes evaluation of these core competencies.

6.2
Make Admissions Requirements and Curricula Competency-Driven and Time-Efficient

The objective of CVMs is to educate veterinary medical students with the core competencies to meet societal needs. Achieving these competencies will increase the value of veterinarians to their employers and society, while affording them more choice in career directions. The NAVMEC innovation teams identified some concepts to help accomplish these goals:

- "Teach commonly seen clinical conditions uncommonly well"—focus on primary care, wellness, and prevention in clinical courses.
- Every CVM has unique strengths, determined by its local community, which direct its curriculum. Many schools have similar entry requirements for most (about 80 percent) prerequisite courses. A task force could be established and charged with developing common core requirements and recommend these to AAVMC as the core prerequisite requirements for veterinary colleges. Identifying these "core entry requirements" would simplify admissions processes for students to most CVMs. This may also enable some students to consider an accelerated pre-veterinary program that they could complete in less than four years.
- Colleges need to develop core offerings either locally or shared with other colleges to provide content on food safety, public health, and disaster response and preparedness to stimulate interest in careers outside of clinical practice.
- Create and update course materials on ethics and leadership for use in, and sharing among, CVMs.
- Develop a plan to embed the understanding of cultural diversity in and throughout the curriculum including, but not limited to, information on how different cultures regard animals and animal welfare. Ideally, the plan will include a goal to achieve diversity that reflects local and regional demographics.
- Encourage CVMs to share diversity orientation teaching materials for faculty, staff, and students with other CVMs.
- Establish teaching academies to emphasize the importance of scholarship for and in all CVMs, with the appropriate recognition/sharing of outstanding teachers. Shared course offerings should be peer-reviewed and used in faculty for academic advancement.
- CVMs should explore the concept of student-selected flexible veterinary medical education program entry, exit, and re-entry and determine its feasibility.

NAVMEC RECOMMENDATIONS: ADMISSIONS AND CURRICULA

6.2.1 A core of pre-veterinary academic requirements is developed for admissions to CVMs in North America.

6.2.2 CVMs continue to move toward competency-driven curricula, delivered in a flexible and time-efficient format that ensures proficiency in the core competencies.

6.2.3 Curricula incorporate core competencies, as appropriate, using a spectrum of contemporary teaching and learning techniques.

6.2.4 CVMs develop plans to address One Health as it fits local/regional and/or global needs as defined by each college and its partner institutions from medicine, public health, biomedical sciences, environmental sciences, and agriculture and move concurrently to incorporate concepts of One Health into curricula.

6.2.5 CVMs promote diversity in the veterinary profession through proactive admissions practices, educational prerequisites, and curricular enhancements; plans need to be implemented to better meet societal needs.

6.3
Increase the Sharing of Educational Resources Among CVMs to Enable Quality, Flexibility, and a Cost-Effective Education for Veterinarians

NAVMEC participants reported growing enthusiasm and need for sharing of educational expertise and resources among the CVMs and with other university colleges. This recommendation is driven by the desire to continually improve the quality of education for veterinarians in accordance with the core competencies, while making the educational process as cost-effective and affordable as possible[1] for a highly diverse pool of applicants. Various education delivery technologies are being explored and adapted by several schools. While this information is shared informally, significant opportunities exist to do more—once important logistical and political challenges are addressed (e.g., faculty recognition, tuition revenue and cost sharing, assignment of credits and degrees, support by state legislatures, etc.).

Veterinary programs are under way and opportunities for potential funding have been proposed. The Veterinary Educator Collaborative (VEC), a working group of the AAVMC Associate Deans of Academic Affairs Committee, was formed several years ago to provide online and face-to-face collaboration and sharing among veterinary educators. VEC has been meeting and discussing strategies to address such things as outcomes assessment, distance education and virtual courses. The Healthcare Reform Act, which includes language authorizing "Centers of Excellence" and support for faculty and equipment, is a

1 Tuition is often determined by universities at large, outside the influence and authority of CVMs.

potential source of support for veterinary medical education. NAVMEC has identified the importance of addressing these issues and creating an equitable working model for collaboration in expertise (inside and outside CVMs), course materials, and technologies.

NAVMEC RECOMMENDATIONS: COST-EFFECTIVE QUALITY EDUCATION THROUGH SHARING EDUCATIONAL RESOURCES

6.3.1 AAVMC convenes an expert panel to review ways to share education resources, while addressing logistic and economic issues.

6.3.2 AAVMC facilitates the development and maintenance of an inventory of shareable educational resources.

6.3.3 AAVMC facilitates the establishment of an inter-CVM education-technology network to enable the flow of technology-related ideas among experts at individual CVMs.

6.4
Promote a Sustainable, Economically Viable System of Education for Veterinary Medicine and Its Students

As noted in Section 2.0, the veterinary medical education system is facing significant challenges, as are all education systems in North America.

- Financial support for CVMs from state and federal agencies continues to decline; this is putting pressure on the quality of education CVMs deliver through increased class sizes and lack of investment in facilities, faculty, staff, and education technology.
- Many veterinary teaching hospitals are experiencing decreasing caseloads for some species and disciplines.
- Competition from individual and corporate specialty practices has had a significant impact on academic teaching hospitals.
- The ratio of student debt to graduate starting salary is increasing to a level where it may impact the numbers and quality of students applying for a veterinary medical education.

NAVMEC recommends that all stakeholders of veterinary medical education and veterinary medicine work cooperatively and in unison to address these financial challenges. An effective strategy is needed to secure federal funds to support educational programs and infrastructure in the CVMs that contribute to the public good. The strategy should include funding and a working committee to devise a plan to work with animal, public health, and environmental nongovernmental organizations for support of academic veterinary medicine.

NAVMEC RECOMMENDATIONS: ECONOMICALLY VIABLE SYSTEM FOR CVMS AND VETERINARY MEDICAL STUDENTS

6.4.1 The leadership of AAVMC works with AVMA and other stakeholders to identify effective ways to promote the value of veterinary medicine to human, animal, and environmental health to policymakers, community leaders, and society in general. The plan would include strategies to fund a working interdisciplinary committee to devise a plan to work with animal, public health, and environmental organizations for support of academic veterinary medicine.

6.4.2 CVMs continue to identify opportunities for cost-efficiencies and to explore innovative additional revenue streams.

6.4.3 AAVMC, AVMA, and other stakeholders collaborate to establish veterinary medicine as a named eligible recipient in student loan restructuring and loan-forgiveness programs at the state, federal, and local government levels; a veterinary medical education foundation is established for endowments, scholarships, etc.

6.4.4 CVMs make financial counseling available to veterinary medical students in each year of study.

6.4.5 AAVMC and AVMA convene workshops for educators and employers to look for new ways to address the issue of the ratio of student debt to graduate starting salary.

6.4.6 AAVMC, in collaboration with AVMA and other parties, establishes a working group to optimize relationships between veterinary teaching hospitals and veterinary specialty stakeholders.

6.5
Stimulate a Profession-Wide Focus on Innovation, Flexibility, and Action

NAVMEC participants enthusiastically reviewed and became familiar with innovations in curricula that are already being adopted by CVMs in the United States, Canada, Europe, the Caribbean, and elsewhere. Indeed, several of these CVMs are addressing many of the recommendations proposed in this report. There was also a strong desire to quickly implement NAVMEC recommendations and take essential actions to ensure the sustainability of veterinary medical education. Specifically, participants underscored that NAVMEC must not result in a report gathering dust on a shelf. This will require attention, commitment, and investment at the operational level of each CVM, regionally by groups of CVMs, and at the systemwide strategic level. Innovation and flexibility will also be required on the part of the accreditation and testing/licensure regulatory groups. This will require coordination, communications, and networking on a new and much broader scale.

NAVMEC RECOMMENDATIONS: INNOVATION, FLEXIBILITY, AND ACTION

6.5.1 Collaborative teams are formed at CVMs to maintain focus on NAVMEC recommendations at each CVM and help implement initiatives at the local, national, and international level.

6.5.2 Web-based discussion forums and other open forums are adopted to facilitate sharing of best practices in veterinary medical education.

6.5.3 The implementation plan (see Section 8.0) is initiated to maintain heightened momentum and measure progress annually.

6.5.4 AAVMC seeks financial support to help CVMs, and the profession in general, implement the recommendations proposed by NAVMEC.

6.6 NAVMEC Recommendations and Change Drivers

The impact of each of the 23 NAVMEC recommendations is assessed against the drivers of educational change in this table.

TABLE C. NAVMEC RECOMMENDATIONS AND CHANGE DRIVERS

#	*Recommendation*	*Suggested Primary Coordinating Group**	● = strong impact ○ = moderate impact			
			Meet Societal Needs	*Financial Challenges*	*Technology Changes*	*Attitudes of C21 Learners*
6.1.1	Competencies further defined	AAVMC	●	○	○	●
6.1.2	Use NAVMEC core competencies to guide curricula	CVMs	●	○	○	●
6.1.3	All competencies integrated across curriculum (when appropriate)	CVMs	●	○	●	●
6.1.4	NAVMEC competencies are integrated in the standards	AVMA COE	●	●		○
6.1.5	NAVLE optimizes evaluation of these core competencies	NBVME	●		○	○

* *AAVMC's and AVMA's primary roles will be as catalysts, conveners, facilitators, advocates, and information collectors, and as builders of coalitions, according to the needs of their memberships.*

TABLE CONTINUES ON THE NEXT PAGE

TABLE C. NAVMEC RECOMMENDATIONS AND CHANGE DRIVERS (CONTINUED)

#	Recommendation	Suggested Primary Coordinating Group*	● = strong impact ○ = moderate impact			
			Meet Societal Needs	Financial Challenges	Technology Changes	Attitudes of C21 Learners
6.2.1	Develop core pre-veterinary requirements	AAVMC/CVMs		○		●
6.2.2	Move toward competency-driven curricula	CVMs	●	○	○	●
6.2.3	Incorporate contemporary teaching techniques	CVMs	○		●	●
6.2.4	Incorporate concepts of One Health into the veterinary medical curriculum	AAVMC/CVMs	●		○	○
6.2.5	Proactively enhance diversity	CVMs	●			○
6.3.1	Convene panel to review education sharing models	AAVMC	○	●	●	
6.3.2	AAVMC facilitates development of inventory of shareable courses	AAVMC		●	●	
6.3.3	Facilitate the establishment of an inter-CVM education-technology network	AAVMC/CVMs		●	●	○
6.4.1	Promote value of veterinary medicine	AVMA/AAVMC	○	●		●
6.4.2	Identify additional revenue streams	CVMs		●		
6.4.3	Advocate for student loan-restructuring, debt forgiveness	AVMA/AAVMC		●		●
6.4.4	Schools provide financial counseling	CVMs		●		●
6.4.5	Convene employers-educators workshop on student debt	AVMA/AAVMC		●		●
6.4.6	Working group: relations between VTHs and private specialists	AVMA/AAVMC	○	●		
6.5.1	Form collaborative teams at CVMs	CVMs		○		
6.5.2	Adopt web-based networking to discuss best practices	AAVMC		○	●	○
6.5.3	Initiate the implementation plan	AAVMC	●	●	●	●
6.5.4	Seek financial support to implement NAVMEC recommendations	AAVMC	●	○	○	○

* *AAVMC's and AVMA's primary roles will be as catalysts, conveners, facilitators, advocates, and information collectors, and as builders of coalitions, according to the needs of their memberships.*

7.0 Research Agenda for Veterinary Medical Education

In preparation for and during discussions at the NAVMEC national meetings and at the 2011 AAVMC Deans' Conference, one topic was the dearth of peer-reviewed research on factors impacting veterinary medical education and the resultant lack of an evidence-based approach that could be adopted to address the challenges to education described in this report. It is suggested that the Associate Deans of Academic Affairs Committee convene subcommittees to address the highest priority items for research identified during the NAVMEC process:

Teaching and Learning: Evaluate the teaching and learning strategies in higher education (including "blended" programs) that are emerging as the most effective for the health profession.

Pre-Admission Assessment: Identify the most reliable pre-admission assessment criteria and the best method to evaluate the applicants.

Professional Competencies: Collect and evaluate the tests to determine competency used by other professions.

Distance Learning Costs: Evaluate the cost benefit analysis of distance learning—the real capital and operating costs associated with distance learning to achieve the desired educational outcomes.

Self-Directed Learning: Evaluate the pros and cons of self-directed learning and the models that are most effective for veterinary medicine.

Professional Mobility: Explore the experience of other regulated professions with, for example, interstate licensure, and the models of professional mobility for veterinarians and other professions in other countries.

Incentives for Courseware Sharing: Describe the various models of incentivizing, rewarding, and crediting faculty members as they develop and share educational materials among CVMs.

Economic Knowledge: Develop recommendations for the economic knowledge needed to guide faculty hiring, investment in educational resources, CVM viability, and the most economical ways to assure that the veterinary workforce is meeting societal needs.

8.0 Recommendations for NAVMEC Implementation

During the consultative period, respondents urged the quick implementation of the recommendations. The following steps are proposed to transition NAVMEC into an implementation phase.

TABLE A-6. NAVMEC RECOMMENDATIONS: IMPLEMENTATION	
8.1	NAVMEC Board of Directors provides direction until July 2011. AAVMC guides the implementation and monitors the progress of NAVMEC recommendations, including collaborations with stakeholders.
8.2	Initial activities include: • Refine recommendations through feedback from partners and stakeholders. • Define metrics for success, including employers' outcomes measures; conduct initial survey to collect baseline data on metrics against which progress in veterinary education, accreditation, and testing/licensure will be measured. • Develop implementation schedule, actions, milestones, and budget. • Create a web-based discussion board and forums, to enable open sharing of innovation. • Ensure progress is communicated regularly to all stakeholders.
8.3	Maintain a North American implementation focus, while finding opportunities to participate in international educational forums and ensure a global perspective.
8.4	Review and assess NAVMEC progress annually. At each AAVMC annual conference, devote time for CVMs to share NAVMEC successes and to assess the progress of the initiative as a whole. At least every three years, convene a forward-looking NAVMEC summit involving educators, employers, students, and representatives from accreditation, testing, and licensure organizations for sharing best practices, monitoring progress, and ensuring this progress is broadly distributed.

9.0
Next Steps

Since its formation, the core principles of NAVMEC have been inclusion, engagement, collaboration, and consultation. Many hours of thought have gone into the recommendations in this report and there is a great determination not only to "do it" but to "do it right." The AAVMC Board of Directors accepted and approved this final report and its recommendations on July 17, 2011.

Over the months to follow, the AAVMC will convene a meeting of representatives from education, accreditation, and testing/licensing groups, so that they can begin planning how best to put the recommendations into action.

REPORT PREPARED BY

Dr. Ken Andrews, NAVMEC Facilitator

Submitted to AAVMC by NAVMEC Board of Directors, July 8, 2011
Approved by the AAVMC Board of Directors, July 17, 2011

APPENDIX A
NAVMEC Participants

SPONSORS
(provided financial support)

Academy of Veterinary Consultants

American Animal Hospital Association

American Association for Laboratory Animal Science

American Association of Avian Pathologists

American Association of Bovine Practitioners

American Association of Equine Practitioners

American Association of Public Health Veterinarians

American Association of Swine Veterinarians

American Association of Veterinary Clinicians

American Association of Veterinary Laboratory Diagnosticians

American Association of Veterinary Parasitologists

American Association of Veterinary State Boards

American Board of Veterinary Practitioners

American College of Laboratory Animal Medicine

American College of Theriogenologists/Society for Theriogenology

American College of Veterinary Anesthesiologists

American College of Veterinary Behaviorists

American College of Veterinary Internal Medicine

American College of Veterinary Internal Medicine Foundation

American College of Veterinary Nutrition

American College of Veterinary Pathologists

American College of Veterinary Radiology

American College of Zoological Medicine

American Farm Bureau Federation

American Pet Products Association

American Society for Laboratory Animal Practitioners

American Society of Veterinary Medical Association Executives

American Veterinary Dental College

American Veterinary Medical Association

Animal Agriculture Alliance

Animal and Plant Health Inspection Service/USDA

ASPCA

Association of Shelter Veterinarians

Banfield, The Pet Hospital

Bayer Animal Health

California Veterinary Medical Association

Canadian Veterinary Medical Association

Charles River Laboratories

Colorado Veterinary Medical Association

CONEVET

D.C. Veterinary Medical Association

Eli Lilly

Elsevier Health Sciences

Florida Veterinary Medical Association

Hill's Pet Nutrition

Humane Society of the United States

Indiana Veterinary Medical Association

John Wiley and Sons, Inc.

Lesbian and Gay Veterinary Medical Association

Lincoln Memorial University

Merial

Michigan Veterinary Medical Association

Minnesota Veterinary Medical Association

Montana Veterinary Medical Association

Morris Animal Health Foundation

National Association of Federal Veterinarians

National Association of Veterinary Technicians in America

National Board of Veterinary Medical Examiners

North Dakota Veterinary Medical Association

Office of Laboratory Animal Welfare/NIH

Ohio Veterinary Medical Association

Pennsylvania Veterinary Medical Association

Pet Industry Joint Advisory Council

Pfizer Animal Health

Saskatchewan Veterinary Medical Association

Student American Veterinary Medical Association

SRG Partnership

Texas Veterinary Medical Association

Touro University

VCA Animal Hospitals

Vermont Veterinary Medical Association

Veterinary Emergency and Critical Care Society

VetPartners

VIN Foundation

Washington State Veterinary Medical Association

Western Veterinary Conference

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University of Saskatchewan

University of Sydney

Virginia-Maryland Regional College of Veterinary Medicine

Washington State University

Western University of Health Sciences

PARTNERS

(provided non-financial support)

INSTITUTIONAL PARTNERS

Academy of Veterinary Technician Anesthetists

American Association of Corporate and Public Practice Veterinarians

American Association of Retired Veterinarians

American Association of Small Ruminant Practitioners

American Association of Wildlife Veterinarians

American College of Veterinary Preventive Medicine

American College of Veterinary Surgeons

American Holistic Veterinary Medical Association

American Society for Veterinary Clinical Pathology

American Veterinary Medical Law Association

Angell Animal Medical Center

Animal Medical Center

Association for Veterinary Informatics

Brazilian Veterinary Medical Association

Department of Homeland Security
FAO
Kansas Board of Veterinary Medical Examiners
Maryland Veterinary Medical Association
Massey University
Murdoch University
National Assembly of State Animal Health Officials
National Association of State Public Health Veterinarians
National Cattlemen's Beef Association
NCVEI
NCZEID/Centers for Disease Control and Prevention
North Dakota State University
OARDC/Ohio State University
Pennsylvania State University, Department of Comparative Medicine
Pennsylvania State University, Department of Animal Science
Stanford University
United States Animal Health Association
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University of California, San Diego
University of Connecticut
University of Edinburgh
University of Florida
University of Glasgow
University of Kentucky
University of Melbourne
University of Michigan
University of Tennessee
University of Texas MD Anderson Cancer Center
University of London
University of Wisconsin-Madison
University of Wyoming
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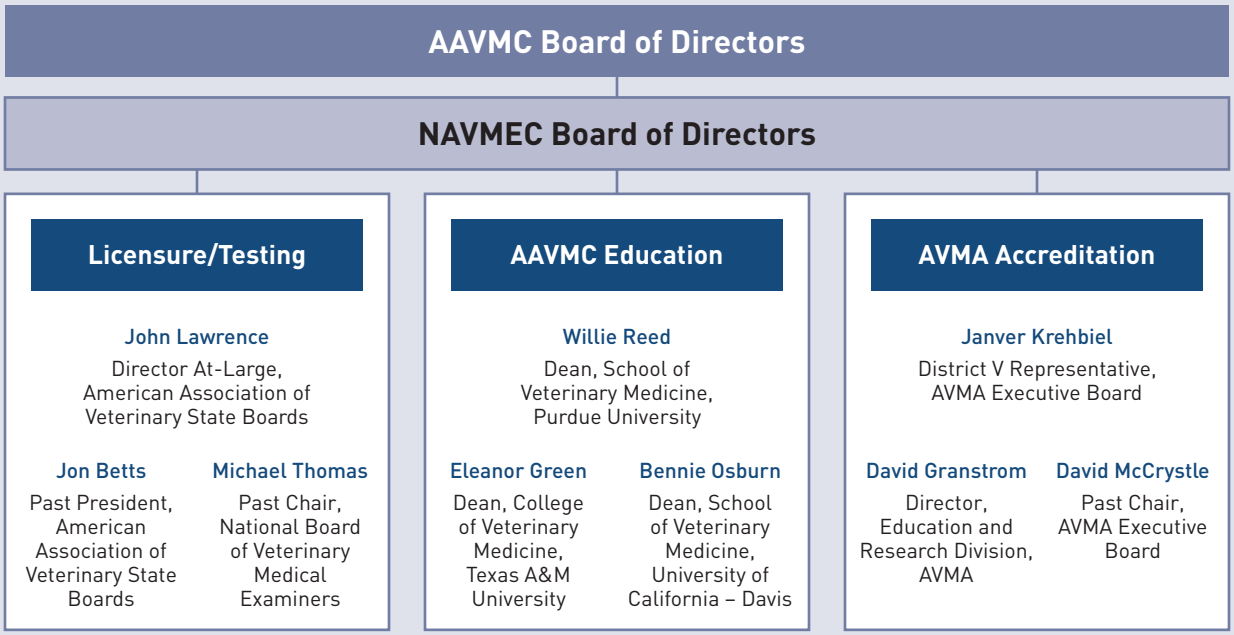
APPENDIX B
NAVMEC Governance Structure and Project Team

FIGURE 5
NAVMEC Governance Structure



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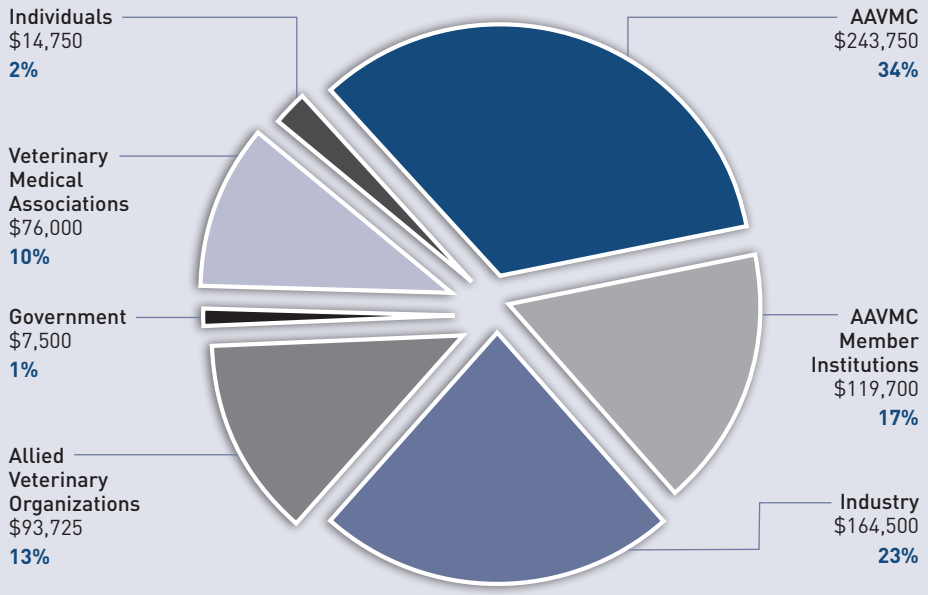
APPENDIX C
Funding and Sponsorship

FIGURE 6
NAVMEC Pledged Funds by Category



TOTAL: $704,304

- 136 co-sponsors provided financial support.
- 65 partners.
- The Western Veterinary Conference generously contributed the use of facilities at the Oquendo Center for the first and third meetings.

APPENDIX D
Societal Needs Overview (Meeting 1)

Societal Needs: Public Community

TECHNOLOGY CHANGES

- Veterinary skills will be expected to be much broader (zoonotic diseases, wellness and preventive programs, emergency preparedness, human-animal interactions).
- Clients will have even greater access to information on the Internet.
- Clients may have access to diagnostic technologies.

FOOD SAFETY

- Veterinarians will need to assume greater leadership roles as "protectors" of food safety, animal welfare, and public health.
- Food shortages will create new roles and pressures.
- New agriculture technologies will change food animal production.

COMMUNITY LEADERSHIP

- Human and animal health and food safety issues will merge (One Health).
- Cultural diversity will create animal welfare challenges.
- Veterinarians must be sensitive to cultural and societal diversity.

Societal Needs: Veterinary Community

EMPLOYERS OF VETERINARIANS EXPECT VETERINARIANS TO BE …

- At the intersection of human, animal, and environmental health.
- Leaders of an interdisciplinary effort on food supply medicine.
- Critical thinkers and problem solvers.
- Respected leaders in disaster management.
- More involved in public communication, risk communication, and education.
- Engaged in "One Health, One Medicine" as it evolves.

FINANCE AND ECONOMIC PRESSURE

- Decreased government funding to CVMs means increased tuition and class sizes.
- Trends in increased student debt may not be sustainable in near-term.
- About 40 percent of graduating veterinarians choose to pursue additional training.

APPENDIX E
Core Competencies Overview (from NAVMEC National Meetings)

Skills and Competencies

MULTISPECIES CLINICAL EXPERTISE

- Diagnosis and therapeutic skills; animal behavior, wellness, and welfare.
- Prevention and treatment of common health problems.

INTERPERSONAL COMMUNICATIONS AND EDUCATION

- Facilitate doctor-patient-client relationship.
- Effective interactions with team members, colleagues, and community.
- Oral and written communications, and use of e-media (social networking).
- Perform compassionate healthcare delivery.

COLLABORATION

- Work with a healthcare team to achieve optimal patient care.
- Partner with interdisciplinary healthcare providers, policymakers, etc.

MANAGEMENT (SELF, TEAMS, SYSTEMS)

- Efficient operation of business; financial literacy.
- Resource allocation, delegation, prioritization, and investment decisions.

PUBLIC HEALTH AND ONE HEALTH PROMOTION

- Prevent, diagnose, and control zoonotic diseases.
- Knowledge of food safety and security.
- Human-animal bond benefits.

LIFELONG LEARNING

- Critical thinking, problem solving, and curiosity.
- Invest in self-directed learning to develop and expand competencies.

ETHICS AND PROFESSIONAL LEADERSHIP

- Committed to health and welfare of patients.
- Protection of human health through ethical practice.

DIVERSITY COMPETENCE

- Understanding and accepting of all societal diversity, including (but not limited to) racial, ethnic, gender, sexual orientation, socio-economic, and cultural.
- Working in multicultural teams.
- Knowing how to provide the most appropriate veterinary medical advice to a diverse clientele.

ADAPTABLE TO CHANGING ENVIRONMENTS

- Able to quickly acquire technology expertise.

Emerging and New Skills and Competencies

- Competency in a much broader spectrum of digital technology: communications, diagnostic, and therapeutic.
- Knowledge of eco-issues, climate change, "green" approaches.
- Increasing awareness on ethical issues, including genetic modification.
- Increased political engagement and advocacy.
- One Health may provide opportunities for new roles, requiring new skills (medical and nonmedical).

APPENDIX F
Generic Improvements to Veterinary Medical Education Models

- Consideration of problem-based learning (PBL) and learner-managed, self-paced delivery.
- More visibility on the importance of nonprivate practice specialty.
- Nontechnical and technical skills to be integrated throughout the curriculum, not considered as separate discrete courses.
- There was some discussion on selection of students with desirable SKAs on admission, though uncertainty remained concerning the efficacy of this strategy.
- Increase the teaching competencies of faculty, particularly in the use of technologies in the "blended" learning environment.
- More emphasis on primary care and wellness.
- Use of distance learning, specifically to accelerate and reduce the cost of completing required admission prerequisites.
- Mini-sabbaticals to refresh and develop faculty.
- Placing greater value on teaching outcomes in evaluating the performance of faculty at CVMs.
- Flexible programming to allow for career changes later in life and second-career students.
- Standardized prerequisites and entrance exams in North American CVMs.
- Broader adoption of shared education processes, such as the VetICE concepts.
- Increased use of stakeholder partnerships (e.g., industry, state VMAs).
- Costs of delivering most remodeled VEMs were perceived to be somewhat higher, due to faculty training and technology investments. The length of the educational process was mainly unchanged.
- Teams recommended that changes be implemented incrementally, suggesting that CVMs would be unlikely to completely switch over to a new model.

APPENDIX G
Consistent Themes for Innovative Curricula

- Technical skills and nontechnical SKAs fully integrated, in all years.
- "Clinical Proficiency" taught using comparative techniques.
- Benchmarking, partnering, and sharing of material among CVMs.
- Combo of didactic learning and practicum/problem-based learning.
- Increased use of online tools and information sourcing (vs. memorization).
- Use faculty from other schools and colleges within the university (management, communications).
- Integrate new technologies and learning methodologies.
- Self-directed learning.
- Exposure to animals and animal health from year one.
- Use of veterinarians who have specialized adult education skills.

APPENDIX H
Internet Links to Meeting Reports and Other Information

INTERNET LINKS	
Meeting	**Report**
1	*Executive Summary Only*
	Full Meeting Report
	Stimulus Presentations
2	*Executive Summary Only*
	Full Meeting Report
	Stimulus Presentations
	Innovation Team VEM Analysis Tracking model, Nontracking model, US distributive model, Canadian distributive model, European model, Veterinary teaching hospital model, Caribbean model, 2 + 2 model, New concept model
3	*Executive Summary Only*
	Full Meeting Report
	Stimulus Presentations
	Innovation Team VEM Analysis of Core Competencies and Optimized Curricula Multispecies clinical expertise, Interpersonal communication, Collaboration, Management (self, team, systems), Public health/One Health, Lifelong learning/scholarship, Ethical professional leadership, Adaptability to changing environments
	Innovation Team VEM Analysis of Environmental Factors Delivery methods and learning styles, Information overload, Admissions prerequisites, Diversity
Other	*NAVMEC Co-Sponsors*

To access these links go to www.navmec.org and click on NAVMEC National Meetings.

APPENDIX I
Core Competencies

TABLE A. CORE COMPETENCIES OF ALL GRADUATING VETERINARIANS

Multispecies Knowledge plus Clinical Competency in One or More Species or Disciplines		This competency plays a central role in the framework of core competencies because comparative medicine provides the foundation for application of veterinary knowledge in a single species and across species and disciplines. At graduation, veterinarians are able to apply and integrate comparative medical knowledge and clinical and professional skills to their work, enabling them to work productively and effectively. They are advocates for animal health and welfare. While graduates typically focus primarily on one or a few species or a discipline (e.g., public health), veterinarians are educated to take a comparative biomedical approach.
One Health Knowledge: Animal, Human, and Environmental Health		In collaboration with other health professionals, veterinarians responsibly use their expertise and influence to advance the health and welfare of animals, people, their local and global communities, and the environment. Veterinarians appreciate the impact of animal diseases on the food supply system and society in general.
Professional Competencies *	*Communication*	Veterinarians sustain effective professional relationships and skillful, sensitive, appropriate communications with clients, colleagues, other healthcare professionals, and the public. They communicate effectively, using various methods in a variety of settings with the purpose of achieving the best outcomes/results.
	Collaboration	Veterinarians serve integral roles in interdisciplinary teams to achieve success in business and optimal societal outcomes. They work as effective team members in interdisciplinary, multiprofessional, and multicultural environments.
	Management (self, team, system)	Veterinarians make effective choices to manage their professional and personal lives. They are aware of the challenges and the importance of making good work/life balance decisions. They are able to prioritize, coordinate, and effectively execute tasks and manage resources.
	Lifelong learning, scholarship, value of research	Veterinarians recognize that research, which is based on the scientific method, leads to the generation of new knowledge that underpins the veterinary medical profession. They demonstrate a lifelong commitment to learning. They regularly ask questions and are able to review and analyze the validity of research findings. They apply new knowledge to problem solving and take an evidence-based approach to practice. They are committed to improving their knowledge, skills, and judgment. They participate in the creation, dissemination, translation, and adaptation of new knowledge to their work in order to maintain delivery of the highest quality service.

* *The habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served.*

TABLE CONTINUES ON THE NEXT PAGE

TABLE A. CORE COMPETENCIES OF ALL GRADUATING VETERINARIANS (CONTINUED)

Professional Competencies *	*Leadership*	Veterinarians are proactive leaders in the profession and are recognized voices of authority in important areas, such as animal welfare and One Health medicine. They are committed to the health and welfare of animals and the protection of human health through ethical practice, professional self-regulation, legal compliance, and high personal standards of behavior and practice. They are guided by a code of ethics and law and a commitment to professional competence, appropriate attitudes and behavior, integrity, personal well-being, and the public good.
	Diversity and multicultural awareness	Veterinarians demonstrate an understanding of the manner in which culture and belief systems impact delivery of veterinary medical care while recognizing and appropriately addressing biases in themselves, in others, and in the process of veterinary medical care delivery.
	Adapt to changing environments	Veterinarians recognize that they function within continually changing physical, technological, economic, and societal environments. They demonstrate curiosity and flexibility when challenged with changing priorities and situations. A key attribute for veterinarians is their ability to quickly acquire technological expertise.

* *The habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served.*

CORE COMPETENCY:

Multispecies Knowledge plus Clinical Competency in One or More Species or Disciplines

This competency plays a central role in the framework of core competencies because comparative medicine provides the foundation for application of veterinary knowledge in a single species and across species and disciplines.

At graduation, veterinarians are able to apply and integrate comparative medical knowledge and clinical and professional skills to their work, enabling them to work productively and effectively. They are advocates for animal health and welfare. While graduates typically focus primarily on one or a few species or a discipline (e.g., public health), they are educated to take a comparative biomedical approach.

Key objectives and competencies that underpin this core competency:

In one or more species, veterinary medical graduates will be able to demonstrate:

- Diagnostic and therapeutic skills needed to appropriately assess and manage common health problems, including those related to animal behavior, health promotion, wellness, and welfare

CORE COMPETENCY:

One Health Knowledge: Animal, Human, and Environmental Health

In collaboration with other health professionals, veterinarians responsibly use their expertise and influence to advance the health and welfare of animals, people, their local and global communities, and the environment. They recognize their duty and ability to improve the overall health of animals and the society they serve. They understand the interrelationship of animals, people, and the environment in the context of health promotion and improvement and disease risk management. Veterinarians understand the impact of animal diseases on the food supply system and society in general.

Key objectives and competencies that underpin this core competency:

Veterinary medical graduates will be able to demonstrate:

- Knowledge of appropriate strategies for the prevention and control of zoonotic diseases
- Knowledge of the importance of health promotion and a population health approach
- The ability to explain the veterinarian's responsibilities for emerging and reportable diseases, and the veterinarian's role in emergency response
- Knowledge of the responsibility as a healthcare professional to practice One Health
- Knowledge of the concepts of the environmental/ecosystems that contribute to animal and human health, as well as sustainable agricultural systems
- Knowledge of food safety and security

PROFESSIONAL COMPETENCY:

Communication

Veterinarians sustain effective, professional relationships and skillful, sensitive, appropriate communications with clients, colleagues, other healthcare professionals, and the public. They communicate in various ways and in a variety of settings with the purpose of achieving the best outcomes/results. They are able to establish and maintain effective communication in the face of cultural differences and challenging situations. They are approachable and professional, providing credible, accurate, science-based information in a timely manner. Veterinarians are aware of messages conveyed using body language, particularly from their patients and clients. Their role is to deliver compassionate health care.

Key objectives and competencies that underpin this core competency:

Veterinary medical graduates will be able to demonstrate the ability to:

- Facilitate the doctor-patient-client relationship
- Communicate effectively with clients, producers, lay public, professional colleagues, and responsible authorities
- Accurately elicit and synthesize information from multiple sources
- Professionally and confidently convey oral and written information, including reports, case records, and therapeutic plans, by all necessary means, including electronic, to clients, colleagues, the public, and media
- Use effective communications techniques to educate clients and present treatment options
- Communicate difficult issues such as bad news or disclosing errors or adverse events

PROFESSIONAL COMPETENCY:
Collaboration

Veterinarians serve integral roles in interdisciplinary teams to achieve optimal societal outcomes. They work as effective team members in multiprofessional and multicultural environments.

Key objectives and competencies that underpin this core competency:

Veterinary medical graduates will be able to demonstrate the ability to:

- Work effectively as a member of a multidisciplinary team in the delivery of veterinary services and make necessary compromises to accomplish a common goal
- Recognize and explain the diverse roles, responsibilities, perspectives, and resources of others
- Manage conflict and employ collaborative negotiation skills
- Perform both peer- and self-assessment and discuss the strengths and weaknesses of collaboration

PROFESSIONAL COMPETENCY:
Management (Self, Team, System)

Veterinarians make effective choices to manage their professional and personal lives. They are aware of the challenges and importance of making healthy work/life balance decisions. They are able to prioritize, coordinate, and effectively execute tasks and manage resources.

Key objectives and competencies that underpin this core competency:

Veterinary medical graduates will be able to demonstrate:

- A working knowledge of business and financial concepts on a personal and professional level
- An understanding of administrative and leadership roles
- The ability to supervise, delegate, and communicate appropriately within a group environment
- The ability to work cooperatively and effectively in a multidisciplinary team environment, including consensus building and conflict resolution
- The ability to identify business and personal priorities and apply time management skills to balance professional and personal life
- A working knowledge of laws and regulations pertaining to their chosen discipline or career

PROFESSIONAL COMPETENCY:

Lifelong Learning, Scholarship, Value of Research

Veterinarians recognize that research, which is based on the scientific method, leads to the generation of new knowledge that underpins the veterinary medical profession. They demonstrate a lifelong commitment to learning. They regularly ask questions and are able to review and analyze the validity of research findings. They apply new knowledge to problem solving and take an evidence-based approach to practice. They are committed to improving their knowledge, skills, and judgment. They participate in the creation, dissemination, translation, and adaptation of new knowledge to their work, in order to maintain delivery of the highest-quality service.

Key objectives and competencies that underpin this core competency:

Veterinary medical graduates will be able to demonstrate:

- An understanding of the importance of self-reflection and assessment
- The ability to effectively accomplish self-directed learning
- The ability to evaluate information critically and make evidence-based decisions
- The ability to explain how research is created, disseminated, interpreted, and applied

PROFESSIONAL COMPETENCY:
Leadership

Veterinarians are committed to the health and welfare of their patients and the protection of human health through ethical practice, professional self-regulation, legal compliance, and high personal standards of behavior and practice. They are guided by a code of ethics and law and a commitment to professional competence, appropriate attitudes and behavior, integrity, personal well-being, and the public good. Veterinarians develop a clear vision for the future and communicate the vision in a meaningful manner by establishing trust and effectively deploying themselves in a disciplined manner. They are respectful of colleagues, clients, and the communities in which they serve.

Key objectives and competencies that underpin this core competency:

Veterinary medical graduates will be able to demonstrate the ability to:

- Explain the importance of maintaining professional behaviors, including honesty, integrity, reliability, compassion, respect, altruism, and commitment to animal health and welfare and public health
- Explain the importance of maintaining appropriate professional boundaries and effectively managing conflicts of interest
- Motivate and coach others

PROFESSIONAL COMPETENCY:
Diversity/Multicultural Awareness

Diversity enhances the quality of education and results in more effective and culturally competent veterinarians who are better prepared to serve an increasingly heterogeneous population. Veterinarians demonstrate an understanding of the manner in which culture and belief systems impact delivery of veterinary medical care while recognizing and appropriately addressing biases in themselves, in others, and in the process of veterinary medical care delivery.

Diversity refers to differences among people with respect to race, gender, age, ethnicity, sexual orientation, mental/physical ability, religion, job level, personality traits, education, health, stature, culture, language, and other human differences.

Key objectives and competencies that underpin this core competency:

Veterinary medical graduates will be able to:

- Demonstrate an understanding of
  a) Societal diversity in its various dimensions
  b) Working in diverse teams
  c) The varying societal roles of animals among diverse population groups
  d) How to provide the most appropriate veterinary medical advice to a diverse clientele
- Explain how the strengths and benefits of diversity within veterinary medical communities and the communities that veterinarians serve influence veterinary medical decisions

PROFESSIONAL COMPETENCY:

Adapt to Changing Environments

Veterinarians function within a continually changing physical, technological, economic, and societal environment. They demonstrate curiosity and flexibility when challenged with changing priorities and situations. A key attribute for veterinarians is their ability to quickly acquire technology expertise.

Key objectives and competencies that underpin this core competency:

Veterinary medical graduates will be able to demonstrate:

- Knowledge of coping skills to handle stress in positive ways
- The ability to critically evaluate emerging technologies relating to veterinary medicine and discuss their potential benefits to the profession and society

APPENDIX J
NAVMEC Board of Director Biosketches

JON BETTS, DVM

Dr. Betts is a 1978 graduate of the University of California, Davis. After graduation, he moved to Woodburn, Oregon, where he joined a mixed animal practice becoming a partner in 1980 until the sale of his interest in 2009. Dr. Betts was appointed to the Oregon Veterinary Medical Examining Board in 1988. He served nine years on the board. He joined the American Association of Veterinary State Boards (AAVSB) in 2005 as a director, and was president of AAVSB in 2008–2009.

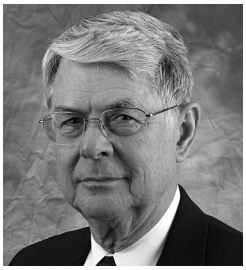
DAVID E. GRANSTROM, DVM, PHD

Dr. Granstrom received his DVM and PhD degrees from the Kansas State University College of Veterinary Medicine in 1978 and 1988, respectively. From 1988 to 1997, he was a faculty member at the University of Kentucky Department of Veterinary Science. From 1997 to 2001, Dr. Granstrom was assistant director of the Education and Research Division at the American Veterinary Medical Association (AVMA). From 2001 to 2008, he was associate director of the Animal and Natural Resources Institute, USDA, Agricultural Research Service (ARS). Dr. Granstrom rejoined AVMA staff in 2008 as director of the Education and Research Division where he provides professional staff support to the Council on Education.

ELEANOR M. GREEN, DVM, DACVIM, DABVP

Dr. Green is the Carl B. King Dean of the Texas A&M University College of Veterinary Medicine and Biomedical Sciences. She received her DVM from Auburn University and is a Diplomate of the American College of Veterinary Internal Medicine, Large Animal, and Diplomate of the American Board of Veterinary Practitioners, certified in Equine Practice. Her professional experience includes starting a private practice and serving on the faculty at Mississippi State, University of Missouri, University of Tennessee, and University of Florida. She has served as president of the American Association of Equine Practitioners, American Board of Veterinary Practitioners, and the American Association of Veterinary Clinicians. Among her honors are The Wilford S. Bailey Distinguished Alumni Award from Auburn University, Award of Distinction College of Agriculture & Life Sciences University of Florida, and AAVC Faculty Achievement Award.

JANVER D. KREHBIEL, DVM, PHD



Dr. Krehbiel received his DVM from Kansas State University in 1962 and his PhD from Michigan State University in 1972. He joined the faculty at the Michigan State University College of Veterinary Medicine as an academic clinician in 1966. He served as associate dean for Academic Programs from 1989 to 2006, senior associate dean from 1998 to 2006, acting dean of the college in 2006, and director of International Programs from 2006 until his retirement in 2008. Dr. Krehbiel was president of the Michigan Veterinary Medical Association, and served on the American Veterinary Medical Association's Informatics Committee, Council on Education, and Veterinary Technology Committee. He is currently a member of the AVMA Executive Board.

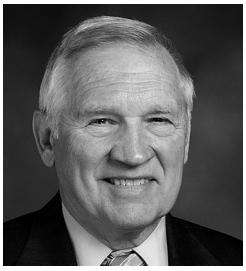
JOHN LAWRENCE, DVM

Dr. Lawrence received his DVM from Iowa State University in 1973. Throughout his 25 years in practice in Louisiana, he was actively involved with continuing education for veterinarians. Since 2003, Dr. Lawrence has been a member of the Minnesota Board of Veterinary Medicine and is currently the president of that board. Since 2007, he has served on the board of directors of the American Association of Veterinary State Boards (AAVSB). He is currently serving on the AVMA Committee for Veterinary Technicians Education and Activities.

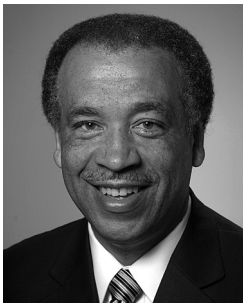
DAVID MCCRYSTLE, DVM

Dr. McCrystle received his BSc degree and DVM from the University of California at Davis. He has been in practice in Healdsburg, California, since 1969. Dr. McCrystle served in the AVMA House of Delegates (HOD) for 18 years, during which time he participated on the association's Long-Range Planning, Leadership Conference Planning, and House Advisory committees. He served a six-year term on the AVMA Executive Board and as chair for one year. In addition, Dr. McCrystle has served as the executive director and chair of the Animal Welfare Committee of the American Association of Small Ruminant Practitioners.

BENNIE I. OSBURN, DVM, PHD, CHAIR OF NAVMEC BOARD

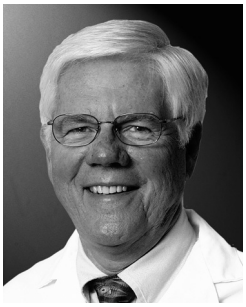


Dr. Osburn received his DVM degree at Kansas State and earned a PhD in comparative pathology from the University of California, Davis. He found his academic home at UC-Davis in 1970 and became dean in 1996. He has produced more than 280 peer-reviewed publications. Dr. Osburn served as president of the Association of American Veterinary Medical Colleges. Among his honors are membership in the Johns Hopkins Society of Scholars and the American Association for the Advancement of Science, as well as recognition by the American College of Veterinary Pathologists, the American Association of Veterinary Immunologists, the American Veterinary Epidemiology Society, and the National Academy of Practice in Veterinary Medicine.



WILLIE M. REED, DVM, PHD

Dr. Reed received his DVM degree from Tuskegee University in 1978 and his PhD in veterinary pathology from Purdue University in 1982. He returned to Purdue in January 2007 as dean of the School of Veterinary Medicine and professor of Veterinary Pathology. He is a Diplomate of the American College of Veterinary Pathologists, and Charter Diplomate of the American College of Poultry Veterinarians, past president of the American Association of Avian Pathologists (AAAP), past president of the American Association of Veterinary Laboratory Diagnosticians (AAVLD), and past chair of the American Veterinary Medical Association Council on Research. Dr. Reed has served as the secretary and president of AAVMC.



R. MICHAEL THOMAS, DVM, VICE CHAIR OF THE NAVMEC BOARD

Dr. Thomas, who is in private practice in Indianapolis, earned his DVM from Auburn University. He is a past president of the American Animal Hospital Association, where he was instrumental in creating its distance education program for technicians. He is a past chair of the National Board of Veterinary Medical Examiners and past president of the Companion Animal Parasite Council, and he serves on the board of directors for Veterinary Information Network and Veterinary Study Groups. Dr. Thomas also owns six veterinary hospitals in central Indiana. His professional interests include recent and current changes in veterinary medicine and helping private veterinary practices survive and thrive. He is also interested in veterinary medical ethics, companion animal general practice, orthopedic and general surgery, dermatology, and support staff training.

APPENDIX K
A Guide to Tables and Figures

TABLES

FIGURES

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