

# Review of reviews on the future of the veterinary profession and veterinary education

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We have listed a selection of key review articles and reports which investigate trends impacting on the veterinary profession and veterinary education, and summarized their main outputs. We included a few papers about the medical profession to allow comparison. Most of the reviews acknowledge that the world is changing rapidly, creating threats and opportunities for the veterinary profession. Some make recommendations on how the profession should adapt to its changing landscape. There is general agreement on the following points.

- Trends in governance policies and funding, agriculture, technology, globalization, and society are changing the landscape in which the veterinary profession operates. As a result the veterinary profession is faced with both threats and opportunities.
- The structure and demographics of the profession is changing (gender balance, proportion of farm vs. companion animal veterinarians, variable salaries within the profession).
- To survive, the veterinary profession needs a cohesive strategy and vision.
- It must adapt to societal trends and needs; and it must be flexible and responsive.
- To reflect the society it serves, the profession needs to become pluralistic and multicultural; it needs to diversify.
- The profession and its leadership need to better demonstrate the value of the DVM degree to society and investors.
- Farm animal veterinarians need to play an increasing role as advisers in the area of preventative medicine rather than being focused on 'treating diseases'.
- Veterinarians need to better cooperate with other sectors (including human health, social science, and para-veterinarians).
- Education needs to move towards a competency-based and problem solving model which includes soft skills (leadership, collaboration, management etc.), rather than focus on learning and regurgitation of facts. There is scope for significant improvements in efficiency of knowledge transfer (new educational techniques etc.).
- Societal needs of the veterinary profession are broad and one veterinary college alone cannot provide all the educational resources needed by the profession in a 4-year DVM degree. However a network of colleges can collectively provide these needs.
- There is a need for a cooperative national strategy amongst veterinary colleges to meet all the needs of the profession and society. This should include sharing of educational resources.
- Veterinary education must be flexible and responsive to address emerging trends and needs, e.g. AMR, social sciences
- The current business model for veterinary colleges may not be sustainable (increasing fees, increasing enrollment, increasing student debt, decreasing applicant pool, job market).
- Globally there is no common understanding of what a veterinarian is. The status of veterinarians and the quality of their education varies tremendously internationally.

## Education

### 1. Osburn et al. (2011) Roadmap for Veterinary Medical Education in the 21<sup>st</sup> Century: Responsive, Collaborative, Flexible, NAVMEC report

[http://www.aavmc.org/data/files/navmec/navmec\\_roadmapreport\\_web\\_single.pdf](http://www.aavmc.org/data/files/navmec/navmec_roadmapreport_web_single.pdf)

Veterinary profession and veterinary education are facing increasing challenges and opportunities. Urgent need to respond to changing landscape.

State funding for the profession/education is being slashed. In response colleges have increased fees and enrollment which increases student debt. Quality of veterinary education and research is under threat. Funding losses make it more difficult for the veterinary profession to meet the needs of society.

Recommendations of roadmap:

- Develop a set of core competencies for graduating veterinarians to guide curricula, admissions, accreditation, licensing of veterinarians. This includes technical (clinical, research etc.) and soft skills (leadership, diversity, management, collaboration)
- Veterinary colleges should share educational resources/ take a network approach
- Veterinary colleges need to work with AVMA to refine the business model to develop a more sustainable approach
- Further research is needed to develop evidence based solutions to support the veterinary profession

### 2. Willis et al. (2007) Envisioning the Future of Veterinary Medical Education: The Association of American Veterinary Medical Colleges Foresight Project, Final Report, *JVME 34(1)*

<http://www.aavmc.org/data/files/other%20publications/foresight%20report.pdf>

- The veterinary profession is undergoing a period of rapid change. It must remain relevant.
- Greater numbers of veterinarians are needed to address societal needs and well-being (food supply medicine, public health, companion animal medicine).
- Education must prepare veterinarians for what may come in the future. Veterinarians must prove that they can adapt to new societal trends.
- Strength of veterinarians – comparative medicine, societal interface, human-animal interface, national and international role.
- Veterinary education must be **responsive and flexible** to meet future needs:
  - An individual college would not be able to cover all the educational needs of the veterinary profession in a single DVM course.
  - Thus there is a need to define **areas of professional focus** (which individual colleges may specialize/focus on) according to a national plan
  - For certain professional focus areas students should be able to gain a DVM by studying at multiple colleges (national cooperation)
  - Need national coordination of veterinary colleges with a collective strategy.
  - Selection and admission of veterinary students should be based on anticipated societal need
  - Accreditation of college should focus on strengths/specialization of the veterinary college and licensing of veterinarian should focus on specific professional area of focus
- Veterinary profession should reflect existing and anticipated diversity of society
- Image of veterinary profession can be enhanced through powerful marketing and PR campaign

3. (1989) Future directions for veterinary medicine: The Pew report. Pew National Veterinary Education Program, Can Vet J volume 30, June  
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1681137/pdf/canvetj00559-0018.pdf>

Veterinary profession and education system is under threat and it must adapt to changing needs of society to survive, but it is only responding to 'internal' signals (needs of profession and institutions) and not adapting rapidly enough. Veterinary education is out of step with needs of the profession and stakeholders. The opportunities in companion animal medicine are increasing. Increasing need for farm animal veterinarians as adviser in preventative veterinary medicine, decreasing need for large animal veterinarians to deal only with disease problems. Increased need for a food safety role and education.

Veterinary profession is not diverse enough and must actively diversify to serve a pluralistic multiracial society. Applicant pool of students is dwindling. Recruitment needs to be aggressive.

Veterinary profession is changing from a pool of generalists and clinicians to practitioners with greater depth in competence and cadre of specialists. Skills such as epidemiology, risk assessment, social sciences, economics, policy, will be increasingly important.

Recommendations:

- Change focus from animal disease to animal health
- Abandon concept of universal veterinarian
- Restructure profession to meet needs of society
- Make research a higher priority and establish a more rational system for funding
- Improve quality of vet services in terms of 'care'
- Strengthen 'general' education of veterinarian
- Focus on ability to find and use information (problem solving) rather than accumulate facts
- Strengthen basic biological science
- Improve racial, cultural, ethnic, educational, experiential diversity
- Allow for students to develop a clinical focus (on species)
- Change emphasis away from almost entirely clinical focus to include public sector needs (food safety, public health)
- Move towards a national strategy

4. The AVMA and AAVMC report on the market for veterinary education, (2016)  
<https://www.avma.org/PracticeManagement/BusinessIssues/Pages/AVMA-Economic-Report-Subscription.aspx>

### Veterinary Workforce

5. Ruston et al. (2016) Challenges facing the farm animal veterinary profession in England: A qualitative study of veterinarians' perceptions and responses, Preventive Veterinary Medicine 127, 84-93

The farm animal veterinary profession in the United Kingdom (UK) faces challenges due to contraction of agriculture sector and reduced government funding. Veterinarians responded by partially branching into disease prevention and advisory services, which put them in competition with other service providers. Veterinarians are at risk of de-professionalization. Veterinarians were surveyed for their perspective and most acknowledged that their role had changed. However veterinarians have not fully exploited this new potential role and are not finding effective strategies to effectively fulfil this role. Farm veterinarians need to: re-align

veterinary expertise to market forces/societal needs; cooperate (rather than compete); diversify into preventative medicine; work with non-vet advisors; develop entrepreneurial skills and new business models.

## 6. National Research Council (2013) Workforce Needs in Veterinary Medicine.

<http://www.nap.edu/catalog/13413/workforce-needs-in-veterinary-medicine>

- Important challenges facing the profession include maintaining the economic sustainability of the current veterinary education system and veterinary practice, building its scholarly foundations, and evolving veterinary services to meet changing societal needs.
- There is little evidence of veterinary shortages in most fields of veterinary medicine, except in industry where additional training (e.g., PhD, advanced training in pathology or lab-animal medicine) is needed.
- Still, many veterinary colleges are increasing enrollment size and new veterinary schools are being opened/accredited, increasing students entering into the profession with most going into companion animal practice
  - o This is increasing the supply of companion animal practitioners when the market is not necessitating this demand and the future demand of these services is uncertain.
  - o The consequence may be larger for the veterinary colleges themselves, which have inadequate resources for clinical faculty/specialists to train students.
  - o The dominant curricula and resources in veterinary colleges is for companion animal
- The economic value of the DVM degree needs to be increased; the financial reward for the investment of time and money is lower than in other medical professions that have the same or fewer years of training (e.g., dentists, pharmacists).
- Veterinary colleges are experiencing significant decreases in state support for faculty positions and funding.
- Increasing student debt is prohibiting new graduates from furthering their education to obtain Master's and PhD degrees.

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### Recommendations:

- Future actions should be informed by:
  - o reliable national data on consumer demand for companion animals, the economics of private practice (including work patterns and the role of veterinary technicians)
  - o the need to maintain the quality and affordability of veterinary education
  - o the need to educate veterinarians on the opportunities in other sectors of the profession besides private practice.
- New business models are needed for providing specialty training, which should be coordinated and planned by AVMA, AAHA, and AAVMC
- New partnerships should be formed between industry, government, and academia to expose veterinary students to research, job opportunities, and joint DVM-PhD programs should be established.
- Leaders in academia should make a greater commitment to strengthening its scholarly base
- It is essential to attract more public and private support for veterinary colleges, but that requires academia to demonstrate the value of investment in veterinary medical research
- Hiring DVM-PhDs and PhDs to attract grants, serve as mentors, and provide graduate training of veterinarians at the doctoral level for both biomedical and clinical animal research would keep veterinary schools in the mainstream of research
- The veterinary profession should expand its capacity to address complex global problems, such as those associated with food security, by encouraging interactions between U.S. veterinary graduates and other disciplines and cultures, particularly in the developing world, where the profession has an opportunity to

leverage its expertise in One Health and lead advances in food-animal husbandry and welfare, water safety and security, and the health of wildlife and ecosystems

**7. 2013 U.S. Veterinary Workforce Study: Modeling Capacity Utilization. Final report for the AVMA.**

<https://www.avma.org/KB/Resources/Reports/Documents/Veterinarian-Workforce-Final-Report.pdf>

- Regarding the current state of the veterinary workforce, there is excess capacity at the national level to supply veterinary services; recent trends include falling incomes, falling rates of productivity, and increased difficulty for new graduates to find employment
- Key supply- and demand-related findings:
  - o The current supply of active veterinarians at the beginning of 2012 is approximately 90,200; this number is projected to grow to approximately 95,400 by 2020, 100,400 by 2025, and 108,900 by 2030
  - o The estimated demand of veterinarians in 2012 is 78,950, representing 12.5% excess capacity. The estimated future demand is expected to grow to 88,100 by 2025 with the excess capacity at 14% or greater under the current status quo
  - o Women constitute approximately 50% of the current workforce, but will likely grow to 71% of the workforce by 2030; women constitute 78% of new graduates, whereas the older workforce nearing traditional retirement age is predominantly male
- Other findings:
  - o At the national level there is current excess capacity to provide direct animal care services; this is largest for equine, followed by small animal practice, food production practice, and mixed animal practice
  - o This excess capacity could potentially be reduced or eliminated if veterinarians were able to increase demand for veterinary services through outreach programs to educate pet owners or by removing access barriers or reducing the cost to purchase services to spur greater volume of services

**8. Enticott et al. (2011) The changing role of veterinary expertise in the food chain, Philosophical Transactions of the Royal Society B, 366, 1955-1965.**

<http://rstb.royalsocietypublishing.org/content/366/1573/1955>

In the UK the role of veterinary profession (and relationship between state and veterinary profession) in regulating the food chain has been eroded due to the application of neoliberal management techniques in animal health governance. Social sciences have an important role to play in helping the veterinary profession to adapt to changing environment and societal needs.

**9. GAO report, 2009. Veterinarian Workforce: Actions Are Needed to Ensure Sufficient Capacity for Protecting Public and Animal Health. GAO-09-178: Published: Feb 4, 2009. Publicly Released: Feb 18, 2009.**

<http://www.gao.gov/products/GAO-09-178>

The U.S. Government Accountability Office (GAO) determined the extent to which (1) the federal government has assessed the sufficiency of its veterinarian workforce for routine activities, (2) the federal government has identified the veterinarian workforce needed during a catastrophic event, and (3) federal and state agencies encountered veterinarian workforce challenges during four recent zoonotic outbreaks.

Key findings:

- Most federal veterinarians work in the Departments of Agriculture (USDA), Defense (DOD), and Health and Human Services (HHS); however, there is a growing national shortage of veterinarians

- The federal government lacks a comprehensive understanding of the sufficiency of its veterinarian workforce
  - o More specifically, four of five component agencies GAO reviewed have assessed the sufficiency of their veterinarian workforce to perform routine activities and have identified current or future concerns; this includes USDA's Animal and Plant Health Inspection Services (APHIS), Food Safety and Inspection Service (FSIS), and Agricultural Research Service (ARS); and DOD's Army
  - o Current and future shortages, as well as noncompetitive salaries, were among the concerns identified by these agencies
- There is no government-wide effort to search for shared solutions
- 27% of the veterinarians at APHIS, FSIS, ARS, Army, and FDA will be eligible to retire within 3 years; efforts to identify the veterinarian workforce needed for a catastrophic event are insufficient
- Agencies' plans lack important elements necessary for continuing essential veterinarian functions during a pandemic
- Officials from federal and state agencies involved in four recent zoonotic disease outbreaks commonly cited insufficient veterinarian capacity as a workforce challenge

**10. Silverman et al. (1999) The current and future market for veterinarians and veterinary medical services in the United States (KPMG LLP Veterinary Market Study). Executive summary Journal of the American Veterinary Medical Association 215(2):161-83**

- Focus of the report was on economics and viability of private practice veterinary practitioners
- Veterinary practitioner income seriously lags behind other similar professions
- Pricing of veterinary services and products sold to clients are not appropriate relative to the costs of these services and value
- Income for women veterinary practitioners is below that of men, which may also be reducing incomes for all veterinarians
- There are opportunities to increase the consumer demand for veterinary services
  - o Potential significant markets: non-traditional and non-private practice arenas
- The delivery system for animal care is highly fragmented and inefficient
- There are excess veterinarians, mismatch between supply/demand characteristics
- Modifications in veterinary education are needed to enable the profession to capitalize on emerging markets and create new services
  - o Veterinarians lack skills and aptitudes that lead to economic success (e.g., business acumen, taking risks, willingness to implement change)
- Self-perception of veterinarians on their abilities and contributions to society limit the professional and economic growth of the profession

**AVMA**

**11. Report of the AVMA 20/20 Vision Commission, King et al. AVMA (2011)**

[https://www.avma.org/KB/Resources/Reports/Documents/2020visionreport\\_exec-summary.pdf](https://www.avma.org/KB/Resources/Reports/Documents/2020visionreport_exec-summary.pdf)  
<https://www.avma.org/KB/Resources/Reports/Documents/2020visionreport.pdf>

- The AVMA must develop an agenda focused on animal health and welfare and meeting the needs of society, whilst maintaining support of the public.
- Veterinarians must operate in a global context (global health, trade security, food safety and education).
- Internal and external partnerships are essential

- AVMA should expand its portfolio to animal welfare, research, emergency response, public health
- Develop a common vision and purpose

**12. King L (chair): One Health: A new professional imperative. One Health Initiative Task Force final report, American Veterinary Medical Association 2008.**

[https://www.avma.org/KB/Resources/Reports/Documents/onehealth\\_final.pdf](https://www.avma.org/KB/Resources/Reports/Documents/onehealth_final.pdf)

- While the demand for animal-based protein is expected to increase by 50% by 2020, animal populations are under heightened pressure to survive, and further loss of biodiversity is highly probable
  - o Of the 1,461 diseases now recognized in humans, approximately 60% are due to multi-host pathogens characterized by their movement across species lines
  - o Approximately 75% of new emerging human infectious diseases have been zoonotic
- There is a need for a holistic, collaborative approach to address health issues created by the convergence of human, animal, and environmental domains (“One Health”)
- The benefits of One Health include improving human/animal health globally; meeting global challenges head-on; developing centers of excellence in education and training in specific areas; increasing professional opportunities for veterinarians; creating innovative programs to improve health
- The veterinary profession must implement solutions to the critical workforce challenges in collaboration with multiple professions, including public health, human medicine, bio-engineering, animal science, environmental science, and wildlife

**International**

**13. Report of the meeting of the OIE Ad Hoc Group on Veterinary Education, Paris, 30-31 July 2015.**

[http://www.oie.int/fileadmin/Home/eng/Support\\_to\\_OIE\\_Members/pdf/A\\_AHG\\_VE\\_July\\_2015.pdf](http://www.oie.int/fileadmin/Home/eng/Support_to_OIE_Members/pdf/A_AHG_VE_July_2015.pdf)

Globally there is no common understanding of what a veterinarian is and what competencies they need. Quality of veterinary education in many countries is insufficient to provide veterinary graduates with minimum competencies to support national veterinary services. The OIE supports Member Countries to improve veterinary education to meet minimum core competencies for day one graduates and to meet guidelines for core curricula. Veterinary education establishments are becoming more sensitive to market demand but it is important not to forget the global public good aspect of veterinary services.

Veterinary education must address AMR.

**14. P. Economides (2007) The role of veterinary statutory bodies and association in the promotion of the veterinary profession and upgrading of veterinary services, Conf. OIE 2007, 165-173**

<http://www.oie.int/doc/ged/D4544.PDF>

The role of the veterinary profession is to promote animal health, animal welfare, public health and the protection of the environment. Veterinarians must adhere to high ethical standards and be prepared to apply their specialized knowledge and skills in the interest of others. The organization, structure and functioning of the Veterinary Statutory Bodies and Veterinary Associations are prerequisites not only for the quality of Veterinary Services but also for private veterinary practice in a country. Both organizations provide the necessary infrastructure to ensure that veterinarians in the public and the private sectors have the necessary qualifications, scientific expertise and experience and are free from any financial, commercial, hierarchical, political and other pressures which might affect their competence to make sound professional judgments based on existing scientific data. It is essential that all veterinarians and veterinary para-professionals are

licensed to practice by an autonomous Veterinary Statutory Body and subject to legal disciplinary provisions for any professional misconduct. The existing structures and functional arrangements in most Member Countries of the OIE Regional Commission for the Middle East are not up to standards. Change is therefore necessary for compliance with the provisions of the Terrestrial Animal Health Code dealing with the quality of Veterinary Services, the issue of international veterinary certificates and the regulation of the practice of veterinarians and veterinary para-professionals in the public and the private sector.

**15. Mortola (2006) Future approaches needed to ensure that veterinary education meets societal demands, Conf. OIE 2006, 13-23**

[http://www.oie.int/fileadmin/Home/eng/Publications %26 Documentation/docs/pdf/TT/2006\\_013-023\\_Ugarte\\_A.pdf](http://www.oie.int/fileadmin/Home/eng/Publications_%26_Documentation/docs/pdf/TT/2006_013-023_Ugarte_A.pdf)

- The future approaches needed to ensure that veterinary education meets societal demands encompass multiple areas over and above the most common fields of activity for the veterinary profession such as, for example, veterinary service delivery in urban areas and the animal production sector
- In recent years the OIE has been expanding its role with regard to influencing the objectives and missions of the veterinary profession
- The veterinary profession is, by definition, an art dealing with all issues of animals and their relationship with the environment
- Certain species such as companion and production animals are in some instances favored on account of demand; companion animals are the group of animals which human beings choose to make their lives more bearable and often to mitigate the impact of negative emotions
- In the case of production animals, veterinary professionals are called upon to conduct both therapeutic and production related activities
  - o Therapeutic interventions by veterinarians are the most common involvement, but it is the veterinary profession's responsibility to educate producers to use veterinary professionals also to improve animal productivity
- Feeding and handling of different animal species, including marine animals, play an increasingly important role in production efficiency while animal welfare and traceability have also been added as the responsibilities of veterinarians; the veterinary profession must therefore be ready to meet this new demand
- Consumers are increasingly demanding that animal welfare be treated as a priority as they consider that good animal management practices add value to the products they consume
- Closely linked to animal welfare is traceability for identifying the origin of a product from the producer, the manufacturer and the retailer for the benefit and assurances of the consumer
  - o This also requires a shared responsibility between official and private veterinarians who must work in tandem to ensure guarantees for food safety
- The OIE plays an important role together with training institutions, international and regional cooperation agencies (e.g., Inter-American Institute for Cooperation on Agriculture [IICA], the Food and Agriculture Organization of the United Nations [FAO], and Pan American Health Organization [PAHO]) to equip the upcoming veterinary generation to meet the new demands

**Relevant reports from Human Medicine**

**16. Prober CG, Khan S. Medical education reimagined: A call to action. *Acad Med* 88:1407-1410, 2013.**

The authors propose a new model for medical education based on the "flipped classroom" design. In this model, students would access brief (~10 minute) online videos to learn new concepts on their own time. The

content could be viewed by the students as many times as necessary to master the knowledge in preparation for classroom time facilitated by expert faculty leading dynamic, interactive sessions where students can apply their newly mastered knowledge. The authors argue that the modern digitally empowered learner, the unremitting expansion of biomedical knowledge, and the increasing specialization within the practice of medicine drive the need to reimagine medical education. The changes that they propose emphasize the need to define a core curriculum that can meet learners where they are in a digitally oriented world, enhance the relevance and retention of knowledge through rich interactive exercises, and facilitate in-depth learning fueled by individual students' aptitude and passion. The creation and adoption of this model would be meaningfully enhanced by cooperative efforts across medical schools.

**17. Mehta NB, Hull AL, Young JB, Stoller JK. Just imagine: New paradigms for medical education. *Acad Med* 88:1418-1423, 2013.**

For all its traditional successes, the current model of medical education in the United States and Canada is being challenged on issues of quality, throughput, and cost, a process that has exposed numerous shortcomings in its efforts to meet the needs of the nations' health care systems. A radical change in direction is required because the current path will not lead to a solution. The 2010 publication *Educating Physicians: A Call for Reform of Medical School and Residency* identifies several goals for improving the medical education system, and proposals have been made to reform medical education to meet these goals. Enacting these recommendations practically and efficiently, while training more health care providers at a lower cost, is challenging. To advance solutions, the authors review innovations that are disrupting higher education and describe a vision for using these to create a new model for competency-based, learner-centered medical education that can better meet the needs of the health care system while adhering to the spirit of the above proposals. These innovations include collaboration amongst medical schools to develop massive open online courses for didactic content; faculty working in small groups to leverage this online content in a "flipped-classroom" model; and digital badges for credentialing entrustable professional activities over the continuum of learning.

**18. Flexner A: Medical Education in the United States and Canada: A report to the Carnegie Foundation for the Advancement of Teaching. Bulletin No. 4, New York, NY, The Carnegie Foundation for the Advancement of Teaching, 1910.**

- The Flexner report that still gets cited in many of the discussions of medical education even though it dates to 1910; interestingly, many of its findings are still relevant today
- The report aimed to define the relation between professional education in medicine to the medical schools themselves
- Significant findings during the time of this report:
  - o The medical education system had commercialized the process of education while also obscuring the minds of the public of any discrimination between well trained physicians and those who have less adequate training
  - o Americans only made slight inquiries as to the training of their physician
  - o The medical profession needed to educate the public opinion of the value on well-educated and trained physicians
  - o There had been an enormous overproduction of ill-trained medical practitioners without equivalent consumer demand for service
    - One reason of this was due to the existence of a large number of medical schools with advertising campaigns to increase student enrollment in order to sustain themselves, resulting in increased recruitment of lower or unqualified students
  - o Medical schools could not offer competitive incomes to faculty, resulting in lower quality of education

- The medical teaching hospital is a necessary value in order for students to receive high-grade teaching and increasing the value of the services of graduating students
- Recommendations:
  - A smaller number of medical schools is needed, which are better equipped and conducted, and allow a fewer number of highly qualified and educated physicians entering the profession
  - A call for a medical patriotism by physicians towards the standards of their own practice and respect of the profession, which will ultimately help elevate the value of the profession to society
  - A need to ensure safeguards are in place so as to limit the number of those entering the profession to a reasonable estimate of the number of physicians actually needed

### **Tools and other resources**

1. VIN interactive map  
<http://www.vinfoundation.org/AppUtil/document/default.aspx?pid=0&catid=&objectid=21833&objectypeid=10&redirectFromMiscDefault=1>
2. AVMA tuition map  
<http://aavmc.org/tuitionmap.aspx>
3. AVMA data map on food animal medicine in the U.S.  
<https://www.avma.org/KB/Resources/Reference/Pages/Food-Supply-Veterinary-Medicine-Data-Maps.aspx>