

IDEXX Chair in Emerging Technologies and Preventive Healthcare

Annual Report
2020 – 2021





DR. THERESA BERNARDO

Professor, IDEXX Chair in Emerging
Technologies and Preventive Healthcare
Department of Population Medicine
Ontario Veterinary College



THANK YOU

As a global citizen, IDEXX seeks ways “to improve the lives of animals, people and the planet.” OVC shares this One Health perspective. The search for solutions to complex issues like infectious disease, antimicrobial resistance, pandemics or climate change, requires collaboration and the assimilation of data from numerous spheres of scientific discourse.

- Dr. Jeff Wichtel, BVSc, PhD, ACT, Professor and Dean, OVC

WORKING TOGETHER WITH IDEXX TO IMPROVE THE LIVES OF ANIMALS, PEOPLE AND THE PLANET

The IDEXX decision to renew investment in support of the IDEXX Chair in Emerging Technologies and Preventive Healthcare, Dr. Theresa Bernardo, has been met with gratitude, commitment and activity. The Chair and her team of researchers have led discussions and presentations at a variety of national and international conferences regarding the adoption of emerging technologies and health informatics in veterinary education and practice. Research has continued on the use of technology for the health monitoring of pets and the development of Day 1 competencies in health informatics for graduating veterinarians, and there are new findings regarding the communication of medical test results to clients.

In the veterinary sector, the path to progress and sustainability is through streamlining and integrating technology and developing recognized standards for combining and reporting data in real time. In partnership with IDEXX, this is the effort that Dr. Bernardo has joined, and this report documents the significant progress made during the pandemic. Through IDEXX’s expanded collaboration with the Ontario Veterinary College, we will improve life for pets, people and the planet.

Dr. Jeff Wichtel, BVSc, PhD, ACT
Professor and Dean, OVC

ISSUES & TRENDS: COVID-19-ACCELERATED INNOVATION

FROM THE IDEXX CHAIR

On March 8, 2020, my research team and I led a workshop on Preparing Veterinarians for Success as part of the American Association of Veterinary Medical College's (AAVMC's) Annual Conference in Washington DC. We asked over 30 Veterinary Deans, Associate Deans and faculty for their opinions on how emerging technologies will affect veterinary practice, education and research. They were unanimous in their concern about the profession falling behind. (See *Veterinarians' perceptions of telemedicine prior to COVID-19* on page 14). Later that day, en route to the airport, the taxi driver relayed that fights were breaking out in stores over water and toilet paper. This was a portent of things to come — an unbelievable year of lockdowns, masks and social distancing that accelerated the adoption of technology in veterinary medicine, as well as in our daily lives.

In his new book *Post Corona: From Crisis to Opportunity*, entrepreneur and NYU Stern School of Business marketing professor, Scott Galloway, explained that COVID-19 was not so much a change agent as an accelerant of trends that were already well underway in business, culture and society.¹ He estimated that we have accelerated to the 2030 point on the trend line (whether positive or negative); equivalent to advancing a decade within a year.²

In a recent interview, Bill Gates acknowledged shortcomings in the response to COVID-19, but said that “there’s some brilliant things going on” and that countries are now willing to fund innovation that will lead to great progress in global health.³

Our paper “Collaborating in the time of COVID-19: the scope and scale of innovation to confront a global pandemic,” was published in the highly ranked *Journal of Medical Internet Research* and was viewed 1,848 times in the first six weeks.⁴ It highlighted the numerous ways that citizens, industry professionals, researchers and academics have come together worldwide to consolidate information and produce products to combat the COVID-19 pandemic.



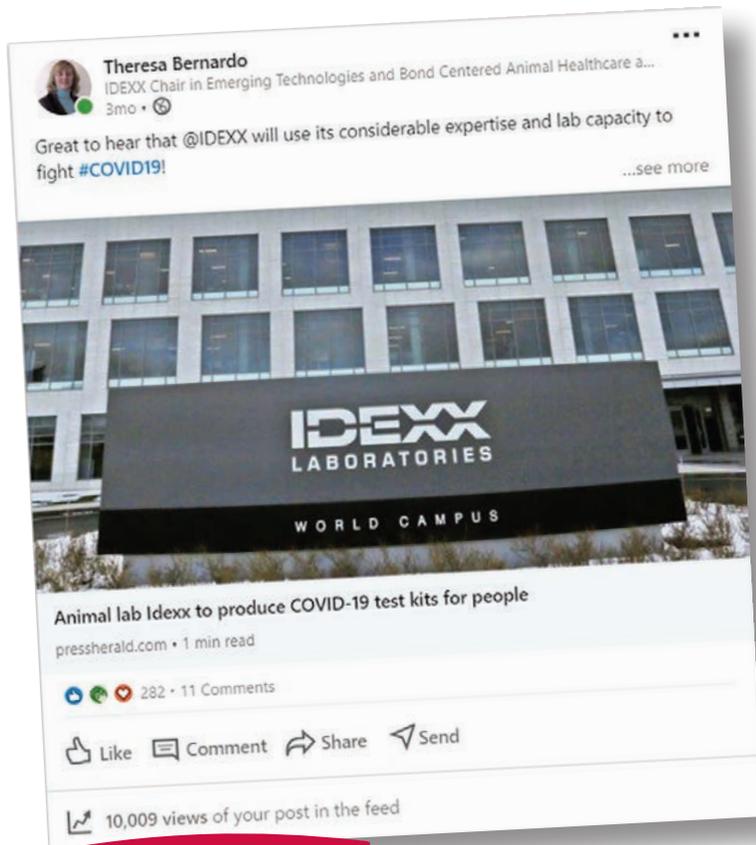
We categorized more than 60 projects into five main themes: knowledge dissemination; data propagation; crowdsourcing; artificial intelligence; and hardware design and development.⁵ The pandemic highlighted the need to combine and analyze data from multiple sources for various groupings, including clinics, hospitals, cities, regions and countries, as well as globally. (See *Developing a Global Information System to Measure Animal Health and Disease* on page 23.) These data arrived in different formats and at both the individual and aggregated population levels. Whether we are dealing with an acute pandemic or a stealthy problem like antimicrobial resistance, these same principles apply. To ensure the health of individuals and populations we need to create One Health data, combining data across human, animal and environmental health.⁶

“We are drowning in information, while starving for wisdom. The world henceforth will be run by synthesizers, people able to put together the right information at the right time, think critically about it, and make important choices wisely.”

- E. O. Wilson, Entomologist, Author, Pulitzer Prize Winner

ACCELERATING DIAGNOSTIC TESTING

IDEXX reacted quickly to the pandemic, leveraging its expertise to develop both animal and human diagnostic tests for COVID-19. IDEXX also created a mobile testing lab, enabling the state of Maine to quadruple its testing capacity.⁷



Chair Bernardo shared a LinkedIn article about IDEXX's contributions, which attracted more than 10,000 views.

The XPRIZE Foundation incentivized the development of fast, easy, cheap and scalable COVID testing with a \$6 million prize.⁸ Responding to the demand for tests that can easily be done **at home** (like pregnancy tests), several of the winning XPRIZE entries used **non-invasive** samples like saliva or breath, in tests that could be self-administered. One of the winners partnered with SalivaDirect, which was developed by researchers at Yale University. SalivaDirect was created to be agnostic to the equipment on which it is run. Validated with reagents and instruments from multiple vendors, its protocol is available as open-source at protocols.io to encourage widespread adoption and production.^{10,13,14} This development may result in growing familiarity with saliva testing methods that could then be used for other diseases and species.

Led by life science investors, the U.S. \$50 million COVID Apollo Project is poised to take the XPRIZE winners to market. These innovations could have wide implications for diagnostic testing, including in the veterinary market, which would welcome monitoring tests that could be done at home, to be followed up with in-clinic exams and bloodwork.

DIGITIZING THE HEALTHCARE SECTOR: FROM ACUTE TO CHRONIC CARE

COVID-19 has accelerated the digital transformation of the healthcare sector. In human medicine, much of the focus has been on telehealth, accompanied by the meteoric rise of companies such as Teledoc Health, the largest telehealth provider in the U.S.

According to MIT's Sloan School of Management, there are four hurdles to the uptake of digital health:¹⁵

- Interoperability;
- Ongoing personal connections;
- Equitable access to virtual care; and
- Reimbursement

The largest hurdle is interoperability, the sharing of data across hospital systems and technology products, which is very cumbersome without common standards.

In human medical practice, it is difficult to establish an ongoing relationship with clients based on acute care, as it tends to consist of one-off visits. It is becoming more common to hear “telemedicine and ongoing monitoring,” which is exemplified by Teledoc's merger with virtual chronic care leader Livongo, which helps patients achieve clinical outcome goals.^{16,17} Livongo began by helping diabetics reduce their hemoglobin A1c levels and is expanding into the management of blood pressure and weight — perhaps **the** most important factor in preventive care. The total addressable market includes almost half of the U.S. population: 147 million people have a chronic condition. COVID-19 forced the approval of reimbursement for virtual visits by insurance companies; whether it persists beyond the pandemic remains an open question. (See page 11 for applied research on the use of technology for weight management.)

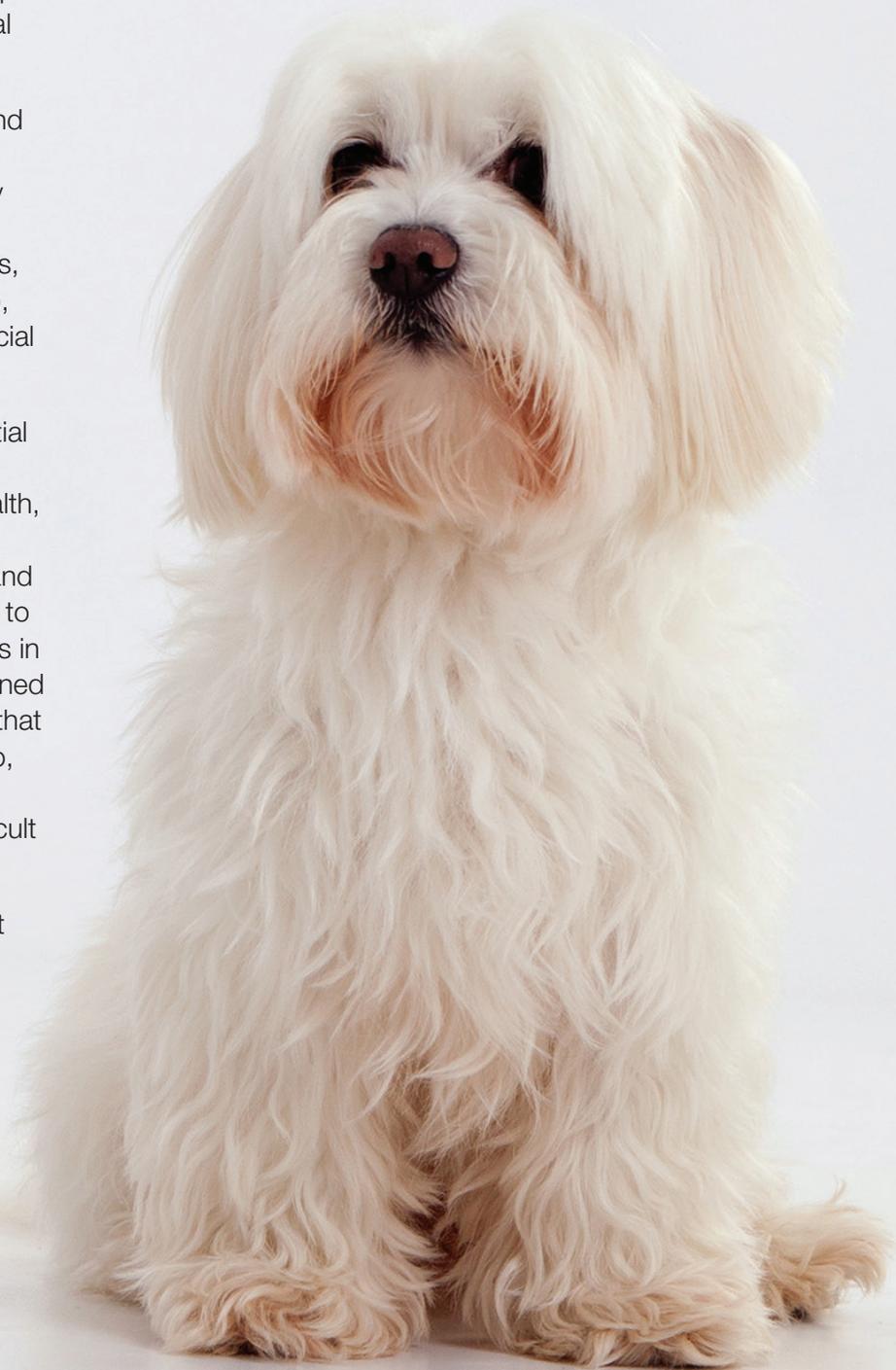
For veterinarians, the major shift was not to telemedicine, but to curbside practice. (See page 14 for research on veterinary impressions of telehealth.) Noting that it took several phone calls to set up a curbside visit, AirVet, a telemedicine provider, pivoted to provide a software platform that integrated curbside check-in, live video and chat, one-touch payment and post-visit appointment scheduling.¹⁸ Airvet also has a unique approach to customer acquisition, partnering with a veterinary clinic to offer a free virtual consultation within 30 days after adoption of dogs and cats from an animal shelter or rescue service.¹⁹

SnoutID (<https://snoutid.com/>) also offers touchless curbside check-in and is compatible with major practice management systems, affording the convenience of a pet picture and summary of the pet's medical record at the point of care.²⁰

With more people working from home and adopting pets, veterinary businesses are thriving. They seek solutions that simplify operations by integrating more of their communications, services and processes, including external (clients, supply chains), internal (employees, workflow) and financial interactions.

There are so many options that fulfill partial needs (legacy software, cloud-based offerings, client communications, telehealth, appointment scheduling, contactless payment, automated ordering of drugs and supplies, etc.) that veterinarians struggle to put together a coherent whole that works in a seamless fashion. One practitioner likened the challenge to solving smaller puzzles that must then fit within a master puzzle. Also, the variability among practices and their attitudes toward technology make it difficult for any one system to prevail.

Ideally, all the pertinent information about an animal would be assembled into a veterinary view and a pet parent view, each customized to present the desired information in a manner tailored to that user's needs.



Digital health startups Airvet and Ro have remarkably similar origin stories. Each was founded by the entrepreneurial son of a doctor (a veterinarian and MD, respectively). They had grown up accustomed to 24/7 access to their medical fathers at home who could help them navigate life-threatening emergencies, and they wanted to replicate that experience for others.

“Part of me wanted to place my dad in everyone’s home,” said Zachariah Reitano, cofounder and CEO of digital health start-up Ro.²¹

“All of a sudden, I was just like every other pet owner — scrambling to find a vet when every hour counts,” said Brandon Werber, founder of AirVet. “It was a terrifying feeling.”¹⁹

Whereas the scale of investment, regulatory requirements and approaches differ (Ro recently raised U.S. \$500 million, versus Airvet’s U.S. \$15 million), the common element is care at home.

Last year’s annual report focussed on “the continuum of care” between the home and the clinic. This year the home (and curbside) has become an even more important location for both acute veterinary care and ongoing health monitoring. COVID-19 has pushed the limits of what we can do from home: Now we need to see what sticks. One thing is clear — we are headed toward a more owner- and pet-centric model for the delivery of veterinary medicine. Adoption of the right digital technologies could help alleviate the acute workforce demand for veterinarians and veterinary technicians, leading to a new normal that is more efficient and less stressful for clients, pets and vets.

HEALTH INFORMATICS RESEARCH AND GRADUATE TRAINING

Spurred by the current COVID crisis, technology's role in serving patients in an effective and efficient manner has become more apparent, both for managing infectious disease and for ongoing monitoring of chronic disease. Practices like telemedicine and remote monitoring cannot be sustained without confidence in a supportive regulatory environment that will encourage the necessary investment in technologies and operations. A key challenge, as well as a source of opportunity will be **the combination of data from different sources**, whether at the individual, clinic or population level. Individual data feeds into population data and population data can serve as evidence to improve clinical decision-making.²²

Our research is helping to prepare the profession for a digitized world by impacting veterinary education, regulation and practice. Our early work on cat weight data has been transported to the clinic and the home, where we have gathered evidence on the effectiveness of using technology for ongoing monitoring to achieve clinical outcomes, such as weight loss. (See *Home monitoring for health outcomes, starting with weight* on page 11). It has also produced helpful demographic information concerning weight across the age distribution of cats.

Our development of Day 1 competencies in health informatics for veterinarians has served as input to engage **educators** in discussions through the American Association of Veterinary Medical Colleges (AAVMC) and as a bridge to **regulators**, who endeavour to adapt to changes in veterinary practice, such as the adoption of telemedicine.

We have surveyed **practitioners** about their perceptions of telemedicine, their communication of medical test result trends and will be investigating how these new modes of practice will affect communication needs. Lastly, we are starting to look at clinical applications of data for predictive analytics.

HOME MONITORING FOR HEALTH OUTCOMES, STARTING WITH WEIGHT

Cat obesity is a significant problem in many countries, with an estimated 60 per cent of cats deemed overweight in the U.S. Obesity has detrimental effects on the health and longevity of pets and is now classified as a disease by the Global Pet Obesity Initiative Position Statement. Excess body fat predisposes cats to many health-related conditions including diabetes, heart disease, urinary issues, skin conditions, orthopedic disease and neoplasia.

Building on our earlier research on the weight and health of cats, made possible through our collaboration with IDEXX, we performed a study to determine whether a home pet health technology ecosystem (PHTE), including a digital scale, smart feeders, activity monitors, and a pet treat camera, was an effective tool in a feline weight loss program (WLP) in multiple-cat households. This was a randomized controlled trial in the U.S. and Canada, comparing a traditional weight loss intervention (comprised of a veterinary weight loss diet and caloric restriction) to a technology-enhanced PHTE weight loss intervention. This study also aimed to evaluate behavioural information provided from the PHTE, along with health-related quality of life.



This investigation suggests that a technology-enhanced weight loss program is accepted by owners and may deliver better outcomes in multiple-cat households compared to traditional approaches alone. The PHTE received favorable reviews and helped deliver higher weight loss rates than a standard WLP (see Figure 1). **Smart feeders and home scales** were perceived by owners as valuable additions to a feline WLP, while activity monitors and pet treat cameras were not ranked as highly. The health-related quality of life increased on average for all cats.

Dr. Barr Hadar and Dr. Ken Lambrecht have presented this work at multiple venues including the Global Animal Nutrition Summit (awarded best poster), the American Academy of Veterinary Nutrition, the American Association of Feline Practitioners and to a Facebook Live Basepaws Feline Webinar attended by over 300 cat enthusiasts.²³



Caption: Dr. Barr Hadar (top, right) and Dr. Ken Lambrecht (bottom) demonstrate technology and answer questions from Basepaws host Dr. Chris Menges (top, left).

Our research illustrates how remote monitoring devices are being used to gain insights on the behaviour and health of pets. Beyond obesity, a PHTE can be used to diagnose and monitor other chronic conditions like osteoarthritis, chronic kidney disease, and diabetes. Recent investigations include the use of activity monitors to model jumping behavior and assess musculoskeletal impairment in cats.^{24,25} The “Pet Insight Project” (<https://www.petinsight.com>) aims to create recognizable accelerometer profiles for common dog behaviours and medical conditions by combining information from accelerometers, observed behaviours, and medical records.

In human medicine, Healthy.io has expanded from FDA-approved home tests for kidney function to wound management, UTI’s and pregnancy monitoring. They use the Fast Healthcare Interoperability Resources (FHIR) standard, which allows for integration into electronic medical records (EMRs).

A major challenge faced by investigators studying technology is its exponential evolution. The optimal home PHTE will evolve as new technologies become available. Best practices need to be established to maximize adoption and increase impact. Devices should be affordable and easy to operate, providing useful data for caregivers that are immediate, simple, and actionable. Technology will ultimately help drive a medical shift from episodic to continuous monitoring and from reactive to proactive precision medicine.

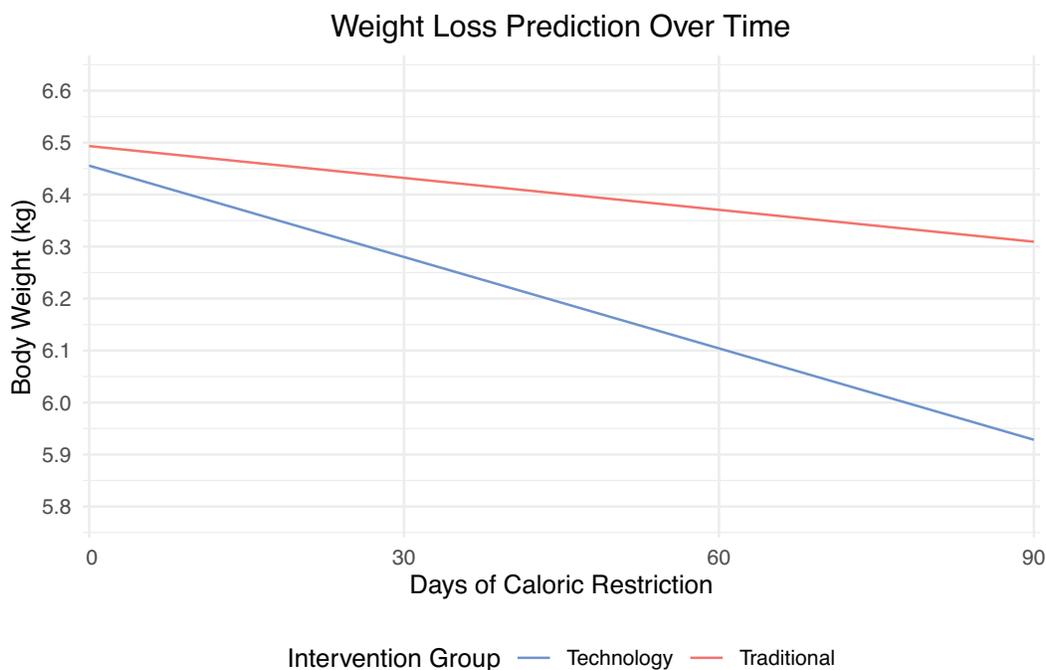


Figure 1: Expected weight change for a 90-day weight loss program for an average cat in technology and traditional groups

VETERINARIANS' PERCEPTIONS OF TELEMEDICINE PRIOR TO COVID-19

We conducted a survey to investigate remote interactions between veterinarians and their clients to determine veterinarians' understanding and use of telemedicine. As there is not a single accepted definition of telemedicine, we asked about the use of specific technologies (e.g. telephone, email, text/instant messaging, live video chat) that facilitate electronic communication, processing and transmission of information.

The survey was conducted between Oct 2019 and Feb 2020, primarily using Facebook groups for veterinarians. This implies a bias toward veterinarians with an affinity for technology, who may be more open to experimenting with telemedicine. The majority of veterinarians who completed the questionnaires (n = 194) were companion animal practitioners in the U.S. and Canada.

We wanted to understand: Whether veterinarians considered they were already practicing telemedicine; What technologies veterinarians were currently using and would like to use more (or less) of; How veterinarians were billing (and would like to bill in the future) for time spent communicating with clients remotely, and; What clinical tasks (triage, diagnostics, treatment, prescription of medication) veterinarians felt they could adequately address remotely.

Forty per cent of the respondents said they did not use telemedicine. Yet, all of them indicated that they used at least one technology for remote communication with clients. Thus, they do not consider use of more established technologies (i.e., telephone and email) as telemedicine. Most users of email were satisfied with its use. By contrast, only 16 per cent of telephone-users wanted to use the telephone more. None of the respondents billed for time spent with clients using remote technologies, though 59 per cent indicated they would like to do so. They felt that guiding clients in the treatment of diseases was the most common clinical task that could potentially be addressed remotely. Veterinarians may be hesitant to charge for time spent with clients remotely for fear that clients would be unwilling to pay for such services.

There have been few publications about veterinary telemedicine prior to COVID-19. This study is being submitted to a peer-reviewed journal and will provide a baseline understanding of veterinary perceptions toward telemedicine before the changes precipitated by the COVID-19 pandemic.



SHARING HEALTH INFORMATICS COMPETENCIES WITH EDUCATORS AND REGULATORS

Evaluation of veterinary education has changed from measuring inputs (what is taught to students) to outcomes (what they are able to do upon graduation). The American Association of Veterinary Medical Colleges (AAVMC) has led the profession in the development and adoption of a framework for competency-based veterinary education (CBVE) with measurable outcomes.

Newly graduating practitioners will require a greater facility with emerging technologies to function efficiently in a digitally enabled world. We worked with a small number of veterinary practitioners who are subject matter experts to develop health informatics (HI) competencies.²⁶

Ouyang et. al. (2021) write: “The primary emphasis of the final HI competency framework was that veterinarians must be able to assess, select and implement technology to optimize the client-patient experience, delivery of healthcare and work-life balance for the veterinary team. Veterinarians must also continue their own education regarding technology by engaging relevant experts and opinion leaders.”²⁶

Our HI competencies can be grouped by theme (Figure 2) or by type of technology (Figure 3) and map to the overall competency-based veterinary education framework for consistency.

Health Informatics Competencies grouped by theme

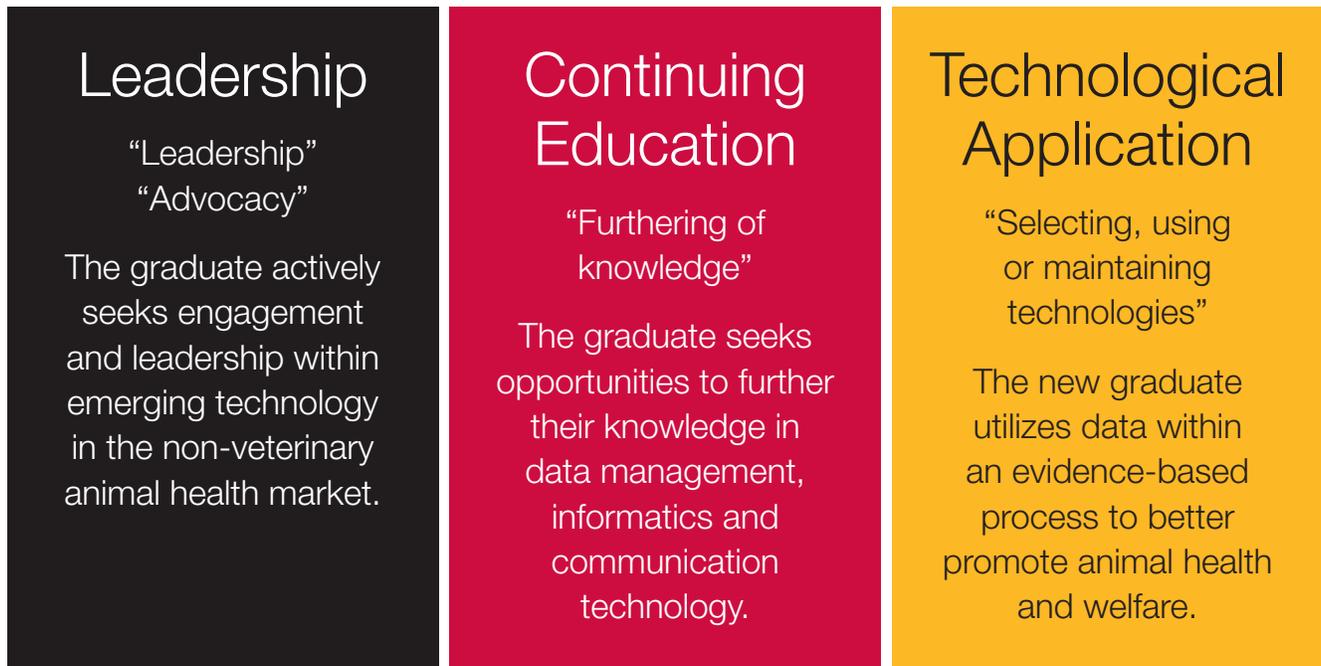


Figure 2

Health Informatics Competencies grouped by type of technology

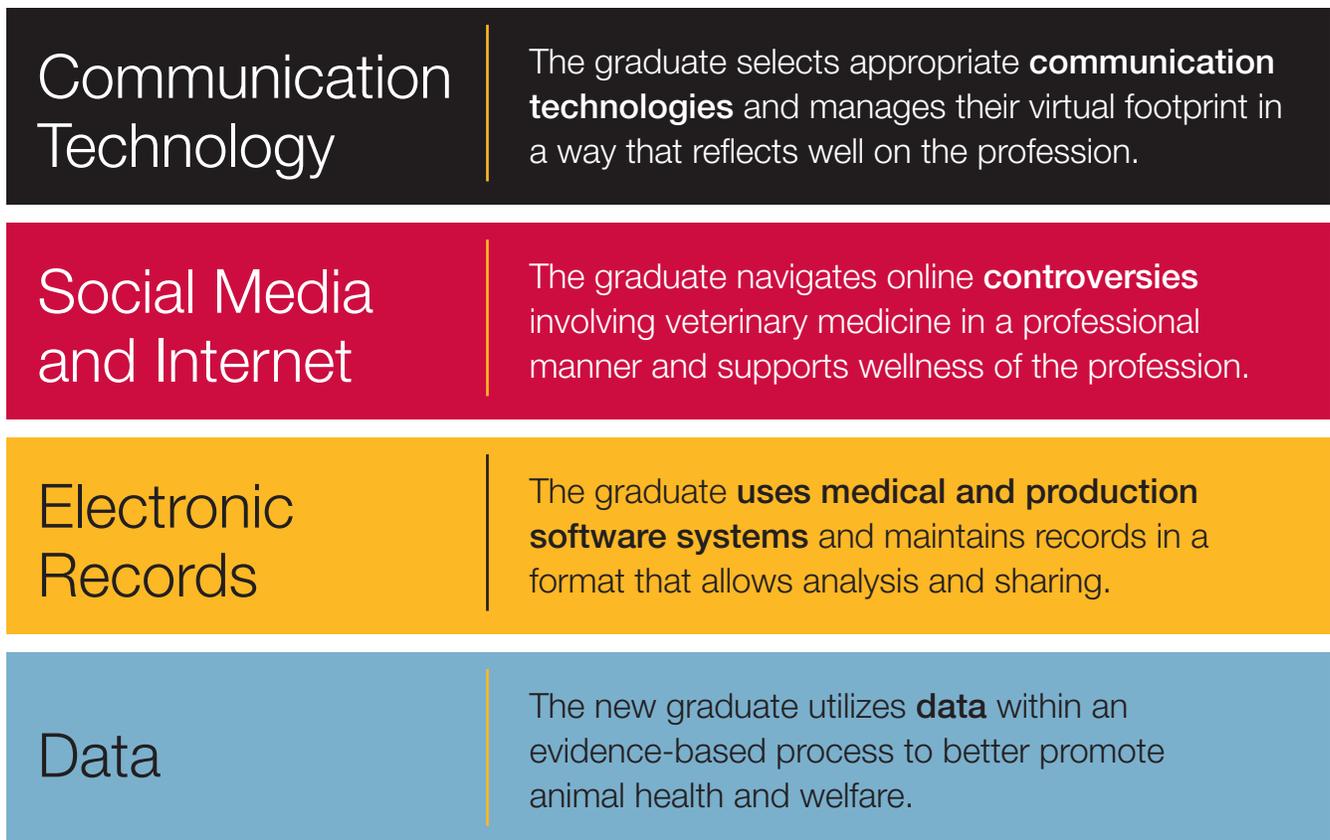
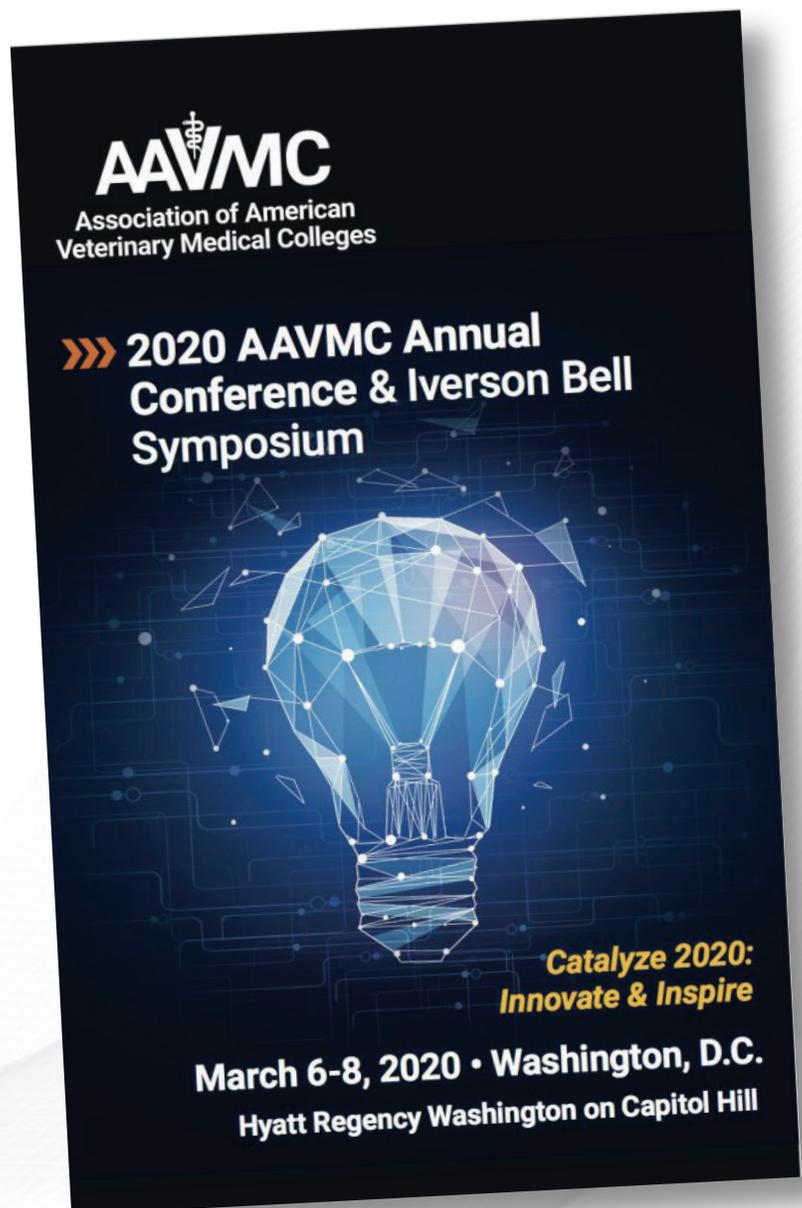


Figure 3

We are pleased to see our work on health informatics competencies being discussed amongst veterinary educators and regulators. A consortium of international veterinary regulators including the College of Veterinarians of Ontario, the American Association of Veterinary State Boards, the Canadian Council of Veterinary Regulators and the International Council for Veterinary Assessment have sought our input on health informatics for their initiative, the *North American Essential Competency Profile for Veterinary Medicine*.

In March 2020, we facilitated a workshop with over 30 veterinary educators on *Preparing Veterinarians for Success* as part of the American Association of Veterinary Medical College's (AAVMC's) Annual Conference in Washington, D.C. Veterinary Deans, Associate Deans and faculty debated how emerging technologies will affect veterinary practice, education and research. Technology was seen as a significant benefit to the personal lives of veterinarians. It could provide more flexibility in modes of practice, telecommuting, and, in fact, may attract different personalities to the profession, which may broaden diversity.



The **education** group focused on Day 1 competencies in: 1) Telemedicine; 2) Artificial intelligence and data; and 3) Sensors. They concluded that new veterinarians should either have the skills to assess the advantages and disadvantages of new technologies themselves or be comfortable seeking input from external experts.



Caption: Collaborators Dr. Ben Ouyang (standing, centre right) and Associate Dean for Professional Programs Jennifer Hodgson (VA-MD College of Veterinary Medicine, standing, right) facilitate a discussion about how emerging technologies will affect veterinary education.

With respect to the impacts of new technologies on veterinary **services**, consensus was reached that the potential outcomes were dichotomous: They could be either positive or negative, depending on the actions of the veterinary profession. The resulting white paper argues it is imperative that veterinarians engage in this space and take the lead in driving positive outcomes.²⁷

There is a long list of specific technologies and related processes that could **enable research** (e.g., virtual collaboration, crowdsourcing subjects, sharing data), or serve as a subject for research (e.g., artificial intelligence and medical records, educational innovations, the future role of the veterinarian).

NEW COMMUNICATION RESEARCH

The rapid shift to telemedicine and curbside practice poses new challenges for communication between veterinarians and their clients, and necessitates consideration of the intervening technologies, presenting additional avenues for study.

Dr. Natasha Janke has produced new communication research under the guidance of Dr. Jason Coe and Dr. Elizabeth Stone, based on a series of focus groups, questionnaires and almost 1,000 audio-video recorded appointments. One relevant finding is the potential for greater involvement of clients in clinical decisions, or shared decision-making. It was seen by pet owners as an opportunity to be involved in their pets' veterinary care decisions. Veterinarians with fewer years in practice and increased appointment length were associated with higher levels of shared decision-making.²⁸

Another relevant aspect is the communication of medical test result trends, such as blood work and pet weight, which will be key, as wellness, prevention, and remote monitoring rise to prominence. Following the trends of a patient's results over time may lead to early detection of disease and identify the need for further diagnostics or modifications in the patient's care with potential to improve health outcomes and the economic growth of the clinic.

Fewer than 10 per cent (76/911) of appointments included any mention of a health parameter trend; of those that did, the majority discussed body weight, followed by blood tests. Significant differences were found between the perceptions of participating veterinarians and clients regarding the frequency with which veterinarians educated clients about characteristics of their pets' blood tests. Pet owners have expressed that they would probably adhere to their veterinarian's recommendations for blood work if their veterinarian explained that it could help them track their pets' health over time.

Veterinarians reported difficulties describing medical test result trends over the phone and wished it was easier to email visual aids such as graphs illustrating the change in their pet's health parameters. However, most veterinarians mentioned that the software used to make the graphs does not allow them to send it in an email.²⁹

Findings indicate there may be an opportunity to enhance the reporting of blood work by creating more client-friendly versions of blood test results and providing easy online access, as the majority of veterinarian participants believed that more information on blood test reports may help client understanding and may improve client relationships.³⁰

A GROWING CADRE OF GRADUATE AND DVM STUDENTS

A complete list of associated Faculty, Graduate Students, Collaborators, Research Students and Alumni can be found at <https://www.popmatix.com/team>. Here we feature our PhD alumni.



Dr. Ben Ouyang, VMD, MS, PhD

Dr. Ouyang has graduated to IDEXX! He started his new position as Senior Statistician in Research and Development in early 2021. He successfully added a PhD in Epidemiology from the University of Guelph to his previous credentials: a VMD from the University of Pennsylvania; and master's degrees in Clinical Sciences (with a focus on epidemiology) and in Applied Mathematics and Statistics from Colorado State University and Johns Hopkins University, respectively.

His thesis was titled *Health Informatics in Veterinary Medicine: State of the Literature, Day-1 Competencies, Perceptions of Telemedicine and Application of Predictive Modeling*. It is comprised of four publishable papers, each of which answers a fundamental question about health informatics:

- 1) What is it? (Scoping review of the literature)
- 2) What do we need to know about it? (Development of health informatics competencies)
- 3) How do veterinarians feel about it? (Telehealth/medicine survey of veterinarians) and
- 4) How can it be applied? (Predictive analytics)

We are confident that Dr. Ouyang will continue to apply his quantitative and qualitative skills to make notable contributions to the field of health informatics to improve the health of our pets.



Dr. Natasha Janke, BScH, MSc, PhD

Dr. Janke has completed her Bachelor of Science with honors, as well as her MSc and PhD in Epidemiology at the University of Guelph and is now a Postdoctoral Fellow at Colorado State University. She studied the information exchange and decision-making that occurs during veterinary visits under the supervision of Dr. Jason Coe and Dr. Elizabeth Stone, looking specifically at shared decision-making and communication of medical test result trends such as blood work and animal weight, over time.

Her thesis was titled: “An exploration of information exchange and decision-making within veterinarian-client-patient interactions during companion animal visits.” Resulting papers have been submitted to peer-review journals regarding:

- 1) Expectations regarding information exchange and decision-making
- 2) Measuring veterinarians’ use of shared decision-making
- 3) Assessing perceptions of information exchange about blood tests
- 4) Communication of health parameter trends, such as blood tests and weight

Dr. Janke will continue her work in medical communications training, developing and delivering continuing education programs for veterinarians and their teams, in fulfillment of her goal to improve human and animal health.



From left to right: Dr. Adam Campigotto (PhD candidate), Dr. Ben Ouyang (PhD graduate) and Dr. Barr Hadar (PhD candidate).



OUTREACH ACTIVITY BY THE CHAIR

DEVELOPING A GLOBAL INFORMATION SYSTEM TO MEASURE ANIMAL HEALTH AND DISEASE

An international consortium led by the World Organisation for Animal Health (OIE) and the University of Liverpool secured U.S.\$7 million from the Bill & Melinda Gates Foundation and the U.K.'s Foreign, Commonwealth and Development Office, to launch The Global Burden of Animal Diseases (GBADs) program.³¹ GBADs will measure animal disease burdens and their impacts on human lives and economies, guiding public policy and private sector strategy, to improve animal health and welfare.³²

As co-leads of the Informatics Theme for GBADs, Dr. Bernardo and Dr. Deborah Stacey (School of Computer Science, University of Guelph), will help to build a global information system, a self-sustaining “knowledge engine,” that will provide access to publicly available and privately generated data on animal disease and health in a secure fashion. Combining data from multiple sources, it will inform critical decisions in animal health, as well as One Health decisions that affect human and environmental health.

As an initial step, Bernardo and Stacey engaged a team of veterinary, computer science and cybersecurity students to look at the accessibility and quality of existing sources of data, and to research data security in the cloud. (One of their cybersecurity students has since been hired by Amazon Web Services.)

THE COLLEGE OF VETERINARIANS OF ONTARIO

Dr. Bernardo, Dr. Hadar and Dr. Kelton joined Jan Robinson, Registrar and CEO of the College of Veterinarians of Ontario (CVO), for a podcast on precision medicine.³³ Dr. Bernardo also serves on the Technical Advisory Group for the CVO.

DIGITAL VETERINARY SUMMIT

Dr. Bernardo served on the Selection Committee for the Digital Technology Innovation Showcase competition at the Digital Veterinary Summit, originally slated to be held in Boston in Aug 2020, but transitioned to online.³⁴

The screenshot shows the website for the Digital Veterinary Summit. At the top, there is a navigation menu with the following items: WHY ATTEND, REGISTER, AGENDA, SPEAKERS, PARTNERS, CONTACT US, and RESOURCES. Below the menu is the title "2020 SELECTION COMMITTEE" followed by five circular portraits of the committee members, each with their name and title listed below.

Name	Title
Eric Garcia	IT & Digital Consultant - Founder Simply Done Tech Solutions
Sébastien Lafon	Founder Adapt1st LLC
Theresa Bernardo	Professor University of Guelph
Daniel Pomp	Founder, GeneSeek (a Neogen Company) Hockey Stick Investments LLC
Bruce Truman	Founder BLT Technology & Innovation Group



WORLD HEALTH ORGANISATION

Dr. Bernardo was an invited expert for a series of World Health Organisation webinars and podcasts on the digitization of health, speaking on the response to COVID-19 (876 attendees from around the world, broadcast in English and Spanish) and the Internet of Things.³⁵

PANAMERICAN ASSOCIATION FOR VETERINARY SCIENCE

Dr. Bernardo is the CVMA's representative to the PanAmerican Association for Veterinary Science (PANVET), which has transitioned to virtual meetings. This year, PANVET (Costa Rica, U.S., Canada, Mexico, Chile, Argentina Colombia) celebrated the signing of an agreement with the Inter-American Institute and the Inter-American Institute for Cooperation on Agriculture (IICA). Dr. Manuel Otero, Director General of IICA, is the first veterinarian to hold this post.

MOVING FORWARD TOGETHER

The IDEXX reinvestment of \$1.5 million to continue the work of the IDEXX Chair in Emerging Technologies and Preventive Healthcare will improve patient health and enhance the sustainability of veterinary practice through the integration of technology and informatics in veterinary medicine. We will continue to pursue our mutual interest in discerning the best use of technology to aid clients as they monitor their animals' health and fitness and adopt a greater role in health care planning and implementation for their pets.

Our previous research demonstrates that useful knowledge and understanding can develop quickly with access to population data regarding the results of health measures like weight. We look forward to expanding our collaboration with IDEXX to discern the longitudinal variables that link early test results to subsequent illness and disease. Big data has the potential to enhance the scientific rigor of veterinary diagnostic and clinical decision-making. It can also contribute to the global understanding of the wellness of animals, people and the planet



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50 Stone Road, Guelph, ON Canada N1G 2W1

519.824.4120

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