



**Labor Market Analysis of Skills Related
to Veterinary Science in Massachusetts**

Overview

This analysis includes four separate streams of information.

- Employment and wage data are created by the Massachusetts Department of Economic Research and include estimates on both the numbers of individuals employed in target industries and occupations and the compensation earned by those workers.
- Occupational profiles include summary information from the United States Department of Labor, Employment and Training Administration Occupational Profiles for Software Developers and Web Developers
- American Veterinary Medicine Association Veterinary Technology Student Skills Standards were used to form a preliminary skills framework.
- Job postings data were collected from all online job postings across all of Massachusetts from March 2022, and the verbiage from those online advertisements aggregated and then parsed for perspective on the skills, credentials and employers most frequently mentioned.

These data will provide the bulk of the content that will be presented at the stakeholder summit. Attendees there will be asked to validate¹, refine or reject the elements of the preliminary instructional framework.

To make the structure of the analysis more digestible, three separate analyses are included. Each will play an important role in creating the skills profiles which will be presented to the stakeholder committees.

Analysis Stream #1: Labor Market Position

Trends in postsecondary completions for related programs of study

Employment and Wage estimates for related occupations

Table 1: Position of This Program Within the Family of Instructional Programs

01	Agriculture	
01.00-01.12	Various	
01.13	Agriculture/Veterinary Preparatory Programs	
	01.1302	Pre-Veterinary Studies
	01.1399	Agriculture/Veterinary Preparatory Programs, Other
01.80	Veterinary Medicine	
	01.8001	Veterinary Medicine
01.81	Veterinary Biomedical and Clinical Sciences	
	01.8101	Veterinary Sciences/Veterinary Clinical Sciences, General
	01.8102	Comparative and Laboratory Animal Medicine
	01.8103	Large Animal/Food Animal and Equine Surgery and Medicine
	01.8104	Small/Companion Animal Surgery and Medicine
	01.8105	Veterinary Anatomy
	01.8106	Veterinary Infectious Diseases
	01.8107	Veterinary Microbiology and Immunobiology
	01.8108	Veterinary Pathology and Pathobiology
	01.8109	Veterinary Physiology
	01.8110	Veterinary Preventive Medicine, Epidemiology, and Public Health
	01.8111	Veterinary Toxicology and Pharmacology
	01.8199	Veterinary Biomedical and Clinical Sciences, Other
01.82	Veterinary/Animal Health Technologies/Technicians	
	01.8201	Veterinary Administrative Services, General
	01.8202	Veterinary Office Management/Administration
	01.8203	Veterinary Reception/Receptionist
	01.8204	Veterinary Administrative/Executive Assistant and Veterinary Secretary
	01.8299	Veterinary Administrative Services, Other
01.83	Veterinary/Animal Health Technologies/Technicians	
	01.8301	Veterinary/Animal Health Technology/Technician and Veterinary Assistant
	01.8399	Veterinary/Animal Health Technologies/Technicians, Other
01.99	Agricultural/Animal/Plant/Veterinary Science and Related Fields, Other	
	01.9999	Agricultural/Animal/Plant/Veterinary Science and Related Fields, Other

Six postsecondary institutions offer this same program on a collegiate level:

- Bristol Community College
- Holyoke Community College
- University of Massachusetts-Amherst
- Massasoit Community College
- Mount Wachusett Community College
- North Shore Community College
- Tufts University

Completions of programs within the postsecondary Veterinary Sciences family have seen a dramatic increase over the last ten years, although the rate declined noticeably in 2021 to a near decade low.

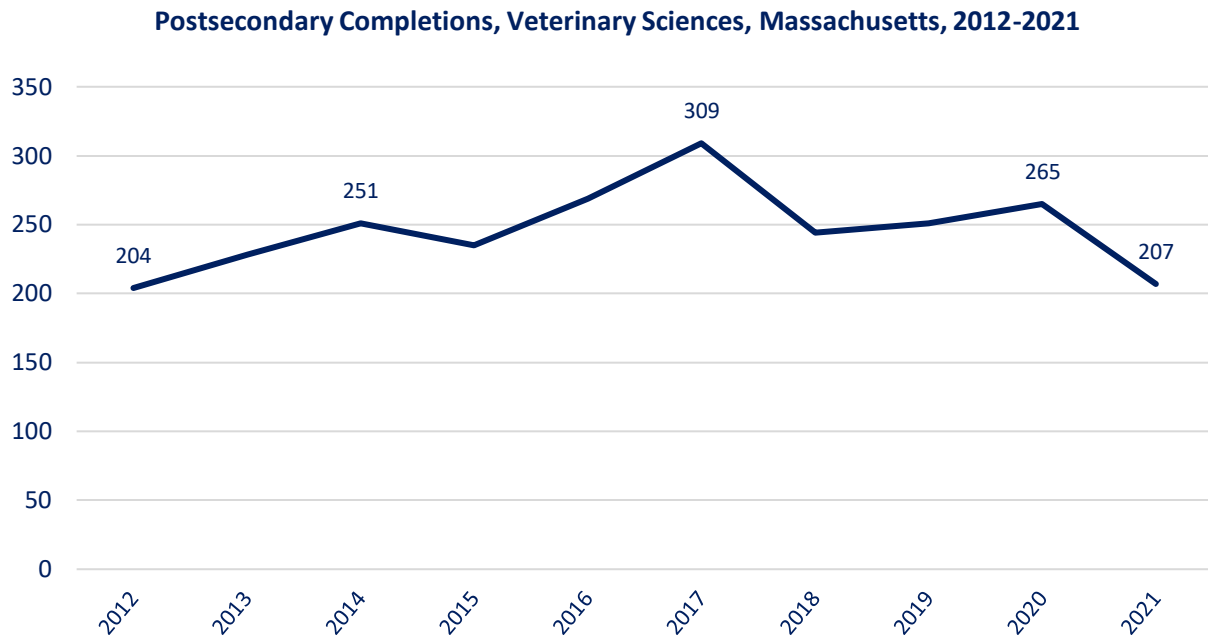


Table 2: Postsecondary Completions by Program, Top Ten, 2021

Program	2021 Completions
Veterinary/Animal Health Technologies/Technicians	97
Veterinary Medicine	96
Veterinary Biomedical and Clinical Sciences	14
Veterinary Administrative Services	0

Table 3: Target Occupations

Occupation	2022 Jobs	Annual Openings	Median Annual Earnings	Location Quotient (2022)	% Older Than 55
Veterinarians	1,948	123	\$103,542	1.03	26.6%
Veterinary Technologists and Technicians	3,539	358	\$44,221	1.22	10.4%
Veterinary Assistants and Laboratory Animal Caretakers	1,669	274	\$37,357	0.69	10.4%

Combined, there are more than 7,100 jobs in these occupations in Massachusetts in 2022. That total is 15% higher than what we would expect to see in a state with this population based on national averages. In particular, veterinary technicians are found in Massachusetts at more than 20% higher than the national rate. In an average year, employers in Massachusetts fill around 700 openings in these occupations.

These careers also pay more in Massachusetts than the national average. Across the United States, these careers average a salary of \$43,431 per year, while in Massachusetts, the average is \$51,356, a difference of more than 18%.

In March 2022, there were 212 unique online job postings for these occupations in Massachusetts. There were more postings for Veterinary Technologists and Technicians (127) than the others. There were 82 postings targeting Veterinarians and 56 for Veterinary Assistants and Animal Caretakers.

Analysis Stream #2: Skills Profiles

Perspectives on the tasks and technologies most relevant to the target occupations per the United States Department of Labor, Training and Employment Administration Occupation Profiles

- Veterinarians
- Veterinary Technologists and Technicians
- Veterinary Assistants and Animal Caretakers

Skills Profiles

Veterinarians

United States Department of Labor, Employment and Training Administration Occupational Profiles

Also known as:

Companion Animal Practitioner, Doctor of Veterinary Medicine (DVM), Emergency Veterinarian (Emergency Vet), Large Animal Veterinarian (Large Animal Vet), Mixed Animal Veterinarian (Mixed Animal Vet), Small Animal Veterinarian (Small Animal Vet), Veterinary Medicine Doctor (DVM), Veterinary Surgeon (Vet Surgeon), Veterinary Surgical Specialist (Vet Surgical Specialist), Zoo Veterinarian (Zoo Vet)

Core Tasks

- Treat sick or injured animals by prescribing medication, setting bones, dressing wounds, or performing surgery.
- Inoculate animals against various diseases, such as rabies or distemper.
- Examine animals to detect and determine the nature of diseases or injuries.
- Collect body tissue, feces, blood, urine, or other body fluids for examination and analysis.
- Operate diagnostic equipment, such as radiographic or ultrasound equipment, and interpret the resulting images.
- Educate the public about diseases that can be spread from animals to humans.
- Counsel clients about the deaths of their pets or about euthanasia decisions for their pets.
- Advise animal owners regarding sanitary measures, feeding, general care, medical conditions, or treatment options.
- Euthanize animals.
- Attend lectures, conferences, or continuing education courses.
- Train or supervise workers who handle or care for animals.
- Perform administrative or business management tasks, such as scheduling appointments, accepting payments from clients, budgeting, or maintaining business records.
- Plan or execute animal nutrition or reproduction programs.
- Conduct postmortem studies and analyses to determine the causes of animals' deaths.

Supplemental Tasks

- Specialize in a particular type of treatment, such as dentistry, pathology, nutrition, surgery, microbiology, or internal medicine.
- Direct the overall operations of animal hospitals, clinics, or mobile services to farms.
- Inspect and test horses, sheep, poultry, or other animals to detect the presence of communicable diseases.
- Establish or conduct quarantine or testing procedures that prevent the spread of diseases to other animals or to humans and that comply with applicable government regulations.
- Research diseases to which animals could be susceptible.
- Provide care to a wide range of animals or specialize in a particular species, such as horses or exotic birds.
- Determine the effects of drug therapies, antibiotics, or new surgical techniques by testing them on animals.
- Inspect animal housing facilities to determine their cleanliness and adequacy.
- Drive mobile clinic vans to farms so that health problems can be treated or prevented.

Table 4: Technologies

Category	Example
Data base user interface and query software	IDEXX Laboratories IDEXX VPM
	Microsoft Access
Document management software	Adobe Systems Adobe Acrobat
Electronic mail software	Microsoft Outlook
Internet browser software	Web browser software
Medical software	American Data Systems PAWS Veterinary Practice Management
	InformaVet ALIS-VET
	Sneakers Software DVMax Practice
	Vetport
Office suite software	Microsoft Office software
Presentation software	Microsoft PowerPoint
Spreadsheet software	Microsoft Excel
Word processing software	Microsoft Word

Table 5: Tools

Category	Example
Air rifles or air handguns	Capture rifles
	Dart guns
Angiography contrast medium delivery sets	Angiography catheters
Animal catching devices	Animal catching poles
	Animal snares
Animal husbandry equipment	Cattle chutes
	Dehorner
	Hoof picks
	Hoof testers
Animal shearing or clipping equipment	Electric animal clippers
Animal weighing scales	Electronic animal scales
Arterial line catheters	
Autopsy chisels or osteotomes	Osteotomes
Bar code reader equipment	Barcode scanners
Benchtop centrifuges	
Binocular light compound microscopes	Optical compound microscopes
Blood collection syringes	
Blood gas analyzers	
Cardiac output CO monitoring units	Cardiac monitors
Cardiovascular system veterinary products	Thoracic drainage catheters
Cast cutters or saws	Cast cutting saws
Chemistry analyzers	Automated chemistry analyzers
Chest tubes	
Coagulation analyzers	
Cosmetic dentistry curing lights	Visible light curing units
Crown or bridge removers	Crown pullers
Cryosurgery units	
Dental burs	
Dental carvers	
Dental cord packers	
Dental elevators	Periosteal elevators
Dental files or rasps	Dental files
Dental finishing or polishing discs	Prophylaxis angles
Dental forceps	Extraction forceps
Dental handpieces	High-speed dental handpieces
	Low speed dental handpieces
Dental impression trays	Veterinary dental impression trays
Dental material pluggers or tips	Dental amalgam carriers

Category	Example
	Dental material pluggers
Dental mirrors or mirror handles	Dental examination mirrors
Dental mouth prop or bite block or gag	Veterinary dental mouth props
Dental probes or explorers	Dental explorers
Dental reamers	
Dental root tip picks	
Dental scalers	Hand scalers Ultrasonic dental scalers
Dental spreaders	
Dental x ray units	Veterinary dental x ray equipment
Digital cameras	
Electrosurgical or electrocautery equipment	Electrosurgery units
Endoscopic hemostatic balloons, needles and tubes	Hemostats
Endoscopic instrument sets	Arthroscopic surgical equipment
Endoscopic instrument sets	Fiberoptic endoscopes
Endotracheal tubes	Endotracheal ET tubes
Enema kits	Enema equipment
Enteral feeding administration sets	Enteral feeding equipment
Full body immersion hydrotherapy baths or tanks	Veterinary immersion hydrotherapy equipment
Gas anesthesia apparatus or machines	Veterinary anesthesia machines
Glucose monitors or meters	Glucometers
Goggles	Safety goggles
Goniometers or arthrometers	
Handheld refractometers or polarimeters	Handheld refractometers
Hematology analyzers	
Hemocytometers	
Intermittent positive pressure breathing IPPB machines	Mechanical intermittent positive pressure ventilators
Intravenous infusion pumps for general use	Intravenous IV fluid pumps
Intravenous or arterial fluid warmers	Intravenous IV fluid warmers
Intravenous syringe infusion pumps	Intravenous syringe pumps
Intravenous tubing with catheter administration kits	Intravenous IV administration sets
Intubation laryngoscopes	Laryngoscopes
Laboratory animal restraints or harnesses	Avian restrainers
Laboratory balances	Laboratory scales
Laparoscopes or laparoscopic telescopes	Laparoscopic equipment
Livestock identification equipment	Tattoo equipment
Hematology differential cell counters	Differential cell counters
Medical acoustic stethoscopes	Mechanical stethoscopes
Medical cinefluoroscopy units	Fluoroscopy units

Category	Example
Medical computed tomography CT/CAT scanners, tubes	Computed tomography CT scanners
Medical gamma cameras for general use	Gamma ray cameras
Medical linear accelerator IMRT 3-dimensional units	Image guided IMRT equipment
Medical magnetic resonance imaging MRI scanners	Magnetic resonance imaging MRI systems
Medical radiation films or badges	Radiation detecting film badges
Medical radioisotope scanners	Nuclear scintigraphy equipment
Medical radiological shielding aprons, masks or drapes	Lead aprons Thyroid collars
Medical radiological shielding gloves	Lead gloves
Medical staplers for external use	Skin staplers
Medical syringes with needle	Single dose syringes
Medical ultrasound or doppler or echocardiograph transducer accessories	Echocardiogram equipment
Medical ultrasound or doppler or pulse echocardiograph or echocardiograph units for general diagnostic use	Veterinary ultrasound equipment
Medical x ray darkroom accessories	X ray film processors
Medical x ray intensifying screens	X ray intensifying equipment
Medical x ray units for general diagnostic use	Digital x ray equipment Portable veterinary x ray equipment Stationary x ray equipment
Microbiology analyzers	Automated microbial identification systems
Microcentrifuges	Microhematocrit centrifuges
Microscope slides	
Mobile medical services automated external defibrillators AED or hard paddles	Semiautomated or automatic external defibrillators AED
Mobile or transportable medical linear accelerators	Linear accelerator equipment
Multiparameter vital sign units	Mobile multiparameter monitors
Muzzles	
Notebook computers	Laptop computers
Ophthalmic irrigation or aspiration supplies	Eye lavage kits
Ophthalmic surgical knives or blades	Ophthalmic surgical blades
Ophthalmic tonometers	
Ophthalmoscopes or otoscopes or scope sets	Ophthalmoscopes Otosopes
Orthopedic splint systems	Veterinary orthopedic splints
Oxygen therapy delivery system products	Oxygen administration equipment
Periodontal chisels	
Periodontal curettes	
Personal computers	
Protective gloves	Safety gloves

Category	Example
Pulse oximeter units	Pulse oximeters
Respiratory monitoring kits	Respiration monitors
Restraints	Nose tongs
Resuscitation masks	Ambu bags
Scanners	Digitizers
Specimen collection container	Specimen collection containers
Steam autoclaves or sterilizers	Steam autoclaves
Surgical bone cutting forceps	Bone cutting forceps
Surgical bone hand saws or wire saws or saw handles	Surgical bone saws
Surgical calipers or rulers or protractors	Surgical calipers
Surgical chisels or gouges	Bone chisels
Surgical clamps or clips or forceps	Dressing forceps
	Sponge forceps
	Staple removal forceps
	Veterinary obstetrical forceps
Surgical curettes or loops or curette sets	Bone curettes
Surgical gloves	
Surgical isolation or surgical masks	Protective face shields
	Surgical masks
Surgical lasers	Laser surgery units
Surgical microscopes or loupes or magnifiers	Operating microscopes
	Surgical magnifiers
Surgical mouth gags	Veterinary surgical mouth gags
Surgical needle holders	Needle holders
Surgical pneumatic or battery or electric saws or drills or pin drivers	Battery-operated orthopedic drills
	Orthopedic drills
Surgical punches or punch holders	Biopsy punches
Surgical rasps or files	Bone rasps
Surgical retractors	Lip retractors
Surgical rongeurs	Bone ronguers
Surgical scalpels or knives or blades or trephines	Surgical scalpels
Surgical scissors	Bandage scissors
	Mayo scissors
Surgical suction machine or vacuum extractor or ultrasonic surgical aspirator	Bone marrow aspirators
	Ultrasonic aspirators
Suture needles	
Tablet computers	
Therapeutic heating or cooling units or systems	Veterinary patient warming systems
Tourniquets	

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Treadmill exercisers for rehabilitation or therapy	Veterinary rehabilitation treadmills
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Veterinary blood pressure testers	Ultrasonic blood pressure monitors
Veterinary castration instruments	Castrating knives
Veterinary clinical thermometers	Digital veterinary thermometers
Veterinary electrocardiograph ECG	Animal electrocardiograph ECG units
Veterinary injection or suction unit	Aspiration catheters
	Ear syringes
	Insemination equipment
	Veterinary suction equipment
Veterinary nail trimmers or cutters	Hoof knives
	Hoof trimmers
	Nail trimmers
Veterinary speculums	Veterinary oral specula
	Veterinary vaginal specula
Volumetric pipettes	Volumetric glass pipettes

Detailed Work Activities

- Operate on patients to treat conditions.
- Prescribe medications.
- Treat acute illnesses, infections, or injuries.
- Immunize patients.
- Examine patients to assess general physical condition.
- Collect biological specimens from patients.
- Analyze test data or images to inform diagnosis or treatment.
- Operate diagnostic imaging equipment.
- Communicate health and wellness information to the public.
- Counsel family members of clients or patients.
- Manage healthcare operations.
- Provide health and wellness advice to patients, program participants, or caregivers.
- Treat animal injuries or illnesses.
- Maintain medical or professional knowledge.
- Supervise medical support personnel.
- Train medical providers.
- Determine protocols for medical procedures.
- Conduct research to increase knowledge about medical issues.
- Provide care for animals.
- Maintain medical facility records.
- Perform clerical work in medical settings.
- Schedule patient procedures or appointments.
- Inspect facilities for cleanliness.
- Inspect facilities or sites to determine if they meet specifications or standards.
- Develop medical treatment plans.
- Drive vehicles to transport individuals or equipment.
- Analyze medical data to determine cause of death.

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	Insemination equipment
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	Nail trimmers
Veterinary speculums	Veterinary oral specula
	Veterinary vaginal specula
Volumetric pipettes	Volumetric glass pipettes

Detailed Work Activities

- Operate on patients to treat conditions.
- Prescribe medications.
- Treat acute illnesses, infections, or injuries.
- Immunize patients.
- Examine patients to assess general physical condition.
- Collect biological specimens from patients.
- Analyze test data or images to inform diagnosis or treatment.
- Operate diagnostic imaging equipment.
- Communicate health and wellness information to the public.
- Counsel family members of clients or patients.
- Manage healthcare operations.
- Provide health and wellness advice to patients, program participants, or caregivers.
- Treat animal injuries or illnesses.
- Maintain medical or professional knowledge.
- Supervise medical support personnel.
- Train medical providers.
- Determine protocols for medical procedures.
- Conduct research to increase knowledge about medical issues.
- Provide care for animals.
- Maintain medical facility records.
- Perform clerical work in medical settings.
- Schedule patient procedures or appointments.
- Inspect facilities for cleanliness.
- Inspect facilities or sites to determine if they meet specifications or standards.
- Develop medical treatment plans.
- Drive vehicles to transport individuals or equipment.
- Analyze medical data to determine cause of death.

Analysis Stream #3: Industry Recognized Credentials

Competency models from the American Veterinary Medicine Association Program Skills Standards

Industry Recognized Credentials

American Veterinary Medicine Association Veterinary Technology Student Skills Standards

1. OFFICE AND HOSPITAL PROCEDURES, CLIENT RELATIONS, AND COMMUNICATION

Management

Skill: Participate in facility management utilizing traditional and electronic media and appropriate veterinary medical terminology and abbreviations.

Tasks:

- Schedule appointments, admit, discharge and triage according to client, patient and facility needs through phone and in-person contact*
- Recognize and respond to veterinary medical emergencies*
- Create and maintain individual client records, vaccination certificates, and other appropriate forms*:
 - develop computer skills*
 - be able to utilize veterinary practice management software*
 - be familiar with veterinary on-line services* (e.g. laboratory submissions, client financing plans, continuing education, discussion groups)
- Perform basic filing of medical records, radiographs, lab reports, etc.*
- Create and maintain all appropriate facility records and logs in compliance with regulatory guidelines (e.g., radiography, surgery, anesthesia, laboratory, controlled substance)*
- Manage inventory control*
- Recognize roles of appropriate regulatory agencies*
- Maintain appropriate disposal protocols for hazardous materials*
- Establish and maintain appropriate sanitation and infection control protocols for a veterinary facility, including patient and laboratory area*
- Handle daily client-based financial transactions*

Decision-making abilities: Taking into account the characteristics of the facility, patients and clients, the veterinary technician will effectively contribute to the professional and efficient operation of the facility in order to provide maximum benefits to clients, patients, and the facility.

Communication

Skill: Communicate in a professional manner in all formats – written, oral, non-verbal, and electronic.

Tasks:

- Demonstrate an understanding of interpersonal skills and team dynamics*
- Utilize interpersonal and public relations skills*
- Demonstrate telephone etiquette* (e.g. through role playing, educational resources, etc.)
- Recognize the legality of the veterinary-client-patient relationship*

- Develop and provide client education in a clear and accurate manner at a level the client understands (i.e., oral and written form, including educational handouts) *
- Apply crisis intervention/grief management skills with clients*

Decision-making abilities: Taking into account the patient, client, staff and circumstances, the veterinary technician will effectively and accurately acquire and convey information utilizing an appropriate communication mode.

Laws and Ethics

Skill: Follow and uphold applicable laws and the veterinary technology profession's ethical codes to provide high quality care to patients.

Tasks:

- Understand and observe legal boundaries of veterinary health care team members*
- Interact professionally with clients and fellow staff members*
- Demonstrate a commitment to high quality patient care*
- Respect and protect the confidentiality of client and patient information*

Decision-making abilities: Given knowledge of legal limitations and applicable ethical standards, the veterinary technician will carry out her/his duties within appropriate legal boundaries and maintain high ethical standards to provide high quality service to clients, patients, employers and the veterinary profession.

2. PHARMACY AND PHARMACOLOGY

Administration

Skill: Safely and effectively administer prescribed drugs to patients.

Tasks:

- Read and follow veterinarian's pharmacy orders*
- Recognize groups of drugs, their mechanisms, and clinically relevant side effects*
- Recognize the safe and effective manner in which vaccines must be administered; recognize and explain common side effects*
- Accurately perform appropriate calculations; use weights and measures correctly*
- Explain appropriate drug administration route methods, and when used*
- Demonstrate the ability to monitor therapeutic responses*
- Demonstrate the ability to accurately record medical information*
- Demonstrate understanding of controlled substance regulations*
- Demonstrate compliance with all federal and state regulatory guidelines for drug purchase, storage, administration, withdrawal, dispensing, disposal, and inventory control (e.g., biologics and therapeutic agents, pesticides, and hazardous wastes)*

Decision-making abilities: Given the characteristics of the patient, the instructions of the veterinarian and the medication to be used, the veterinary technician will calculate the correct amount of medication in the prescribed form and administer it by the prescribed route to maximize therapeutic benefits and minimize the potential for adverse effects. The veterinary technician shall also be able to differentiate between abnormal and normal responses to medication.

Dispensing

Skill: Accurately dispense and explain prescribed drugs to clients.

Tasks:

- Given a drug order, properly prepare medications for dispensing, including performing accurate calculations*
- Demonstrate compliance with regulations governing prescription drugs versus over-the-counter drugs*
- Demonstrate understanding of regulations governing maintenance of controlled substances log book*
- Demonstrate compliance with all federal and state regulatory guidelines for drug purchase, storage, administration, withdrawal, dispensing, disposal, and inventory control (e.g., biologics and therapeutic agents, pesticides, and hazardous wastes)*
- Relay drug information to clients (e.g., handling, storage, administration, side-effects, drug interactions, safety, reasons for use of drug)*

Decision-making abilities: Given the characteristics of the patient, the instructions of the veterinarian and the medication to be used, the veterinary technician will (1) accurately calculate and dispense the correct form and dose of medication and (2) communicate necessary client information in order to maximize safety, compliance with prescribed therapy and successful treatment of the patient. The veterinary technician should also be proficient at performing inventory control procedures.

3. NURSING

Patient Assessment

Skill: Demonstrate and perform patient assessment techniques in a variety of animal species.

Tasks:

- Recognize common domestic animal species and breeds*
- Describe and use common animal identification methods*
- Recognize and assess body language and behaviors (including pain assessment scales) for various animal species*
- Demonstrate effective and appropriate humane restraint techniques to include efforts to reduce stress during handling for various animal species:
 - properly restrain dogs and cats for procedures*
 - engage and remove dogs and cats from cages*

- apply dog muzzle safely*
- apply Elizabethan collar*
- use restraint pole and other restraint aids*[GROUP]
- halter, tie, and lead horses/ponies/donkeys/mules*
- restrain pocket pets and exotics
- restrain (cattle, small ruminants, and horses/ponies/donkeys/mules)*
 - apply twitch (horses/ponies/donkeys/mules)*[GROUP]
 - apply bovine tail restraint*
 - apply ruminant halter (cow, small ruminant)*
- restrain pigs
- load large animals
- safely operate cattle chute*[GROUP]
- Obtain a thorough patient history*
- Demonstrate the ability to obtain objective patient data:
 - temperature (dog, cat, horse/pony/donkey/mule, cow)*
 - pulse (dog, cat, horse/pony/donkey/mule, cow, small ruminant)*
 - respiration (dog, cat, horse/pony/donkey/mule, cow, small ruminant)*
 - auscultate heart/lungs (dog, cat, horse/pony/donkey/mule, cow, small ruminant)*
 - assess hydration status
- Properly collect diagnostic specimens for analysis (ex: urine, blood, feces, specimens for cytology)*
- Perform venipuncture:
 - cephalic (dog, cat)*
 - jugular (dog, cat, horse/pony/donkey/mule, ruminant)*
 - saphenous (dog, cat)*
 - sublingual (dog)
 - ear (pig)
 - coccygeal (cow)
 - anterior vena cava (pig)
- Collect urine sample:
 - catheterize male dog*[GROUP]
 - catheterize female dog
 - catheterize female cat
 - catheterize male cat
 - collect voided urine sample (dog or cat)*
 - perform cystocentesis (dog or cat)*[GROUP]
 - catheterize large animal
- Prepare diagnostic specimens for shipment*

Decision-making abilities: Given the characteristics of the patient, the veterinary technician will safely and efficiently obtain subjective and objective patient data that will allow accurate evaluation of the patient's physical status with minimum stress and maximum safety.

Patient Care

Skill: Understand and demonstrate husbandry, nutrition, therapeutic and dentistry techniques appropriate to various animal species.

Tasks: Husbandry

- Grooming:
- Demonstrate understanding of therapeutic bathing, basic grooming, and dipping of dogs or cats*
 - trim nails (dog, cat)*
 - trim hooves (ruminant, horse/pony/donkey/mule)
 - apply equine tail and leg wraps*
 - express canine anal sacs*
 - clean and medicate ears (dog, cat)*
 - clean sheath (horse/pony/donkey/mule)
- Perform microchip scanning and implantation
- Environmental conditions: implement sanitation procedures for animal holding and housing areas*
- Demonstrate understanding of permanent identification*
- Demonstrate understanding of breeding/reproduction techniques*
- Demonstrate understanding of care of orphan animals
- Demonstrate understanding of nursing care of newborns*

Decision-making abilities: Given the characteristics of the patient, the veterinary technician will implement appropriate husbandry techniques to enhance wellness and reduce risk of disease, injury and stress.

Tasks: Nutrition

- Understand life stage energy and nutrient requirements of well animals (dog, cat, horse/pony/donkey/mule, cow)*
- Identify common grains and forages
- Understand key nutritional factors in disease conditions*
 - be familiar with therapeutic foods*
- Understand current developments in nutritional supplements and additives including benefits and potential toxicities*
- Understand and identify substances that when ingested result in toxicity:
 - identify common poisonous plants*
 - be familiar with substances (organic and inorganic) that cause toxicity*
- Develop and communicate hospital nutrition protocols*

Decision-making abilities: Given the characteristics of the patient, the veterinary technician will understand appropriate and inappropriate dietary components for various life stages and therapeutic regimens (e.g., therapeutic foods) in order to promote optimal health, enhance recovery and manage chronic disease conditions. The veterinary technician will also explain nutritional recommendations to clients and reinforce owner compliance.

Tasks: Therapeutics

- Administer parenteral medications:
 - subcutaneous (dog, cat, ruminant)*
 - intramuscular (dog, cat, horse/pony/donkey/mule)*
 - intradermal (ruminant, dog)
 - intramammary (mastitis therapy only) (ruminant)
 - intravenous (dog, cat, ruminant, horse/pony/donkey/mule)*
- Administer enteral medications:
 - balling gun (ruminant)*
 - dose syringe (ruminant, horse/pony/donkey/mule)*
 - hand pilling (dog, cat)*
 - dose syringe (pig)
 - oral speculum and stomach tube (ruminant)
 - nasogastric intubation (dog or cat, horse/pony/donkey/mule)
- Administer topical medications (including ophthalmic)*
- Perform ocular diagnostic tests (including tonometry, fluorescein staining and Schirmer tear test)*
- Administer enemas*[GROUP]
- Gastric intubation (dog or cat)* [GROUP]
- Gastric lavage (dog)
- Collect/evaluate skin scrapings*
- Fluid therapy:
 - administer subcutaneous fluids*
 - place intravenous catheters (cephalic*, saphenous*, jugular)
 - maintain and care for catheters*
 - determine/maintain fluid infusion rate*
 - monitor patient hydration status*
 - develop familiarity with fluid delivery systems*
- Apply and remove bandages and splints*
- Remove casts
- Develop understanding of wound management and abscess care*
- Perform physical therapy:
 - hydrotherapy
 - post-operative
 - orthopedic
 - neurological
 - explain care of recumbent patient*
- Perform critical care:
 - maintain chest, tracheostomy, esophagostomy tubes
 - collect and crossmatch blood for transfusion* [GROUP]
 - blood typing
 - perform blood transfusions (autotransfusions may be considered)
- Apply established emergency protocols (simulation acceptable):
 - maintain emergency medical supplies/crash cart*

- perform first aid and cardiopulmonary resuscitation*
- use resuscitation bag*
- apply emergency splints and bandages*

Decision-making abilities: Given the directions of the veterinarian and the characteristics of the patient, the veterinary technician will carry out appropriate therapeutic techniques in order to achieve maximum health benefits for the patient.

Tasks: Dentistry

- Perform Comprehensive Oral Health Assessment and Treatment (COHAT) (scaling and polishing) (manual and machine)*
- Understand client education regarding home care*
- Float teeth (horses/pony/donkey/mules)
- Trim teeth (rabbits, rodents, pigs)

Decision-making abilities: Given the characteristics of the patient, the veterinary technician will recognize a patient's dental health status and perform techniques, as prescribed by a veterinarian, appropriate to the species and its condition in order to promote and maintain dental health.

4. ANESTHESIA

Patient Management

Skill: Safely and effectively manage and maintain patients in all phases of anesthesia.

Tasks:

- Calculate dosages of appropriate anesthetic-related drugs*
- Administer anesthetic-related drugs (injection, endotracheal tube, mask)*
- Place endotracheal tubes in patients *
- Utilize clinical signs and appropriate equipment to monitor patient status during anesthetic procedures* (e.g., esophageal stethoscope, blood pressure monitor, capnometer, electrocardiogram, pulse oximeter)*
- Evaluate patient and implement pain management protocols as directed*
- Recognize and respond appropriately to patients in compromised states*
- Perform appropriate resuscitation procedures as needed (e.g., calculate and administer appropriate anesthetic antagonists and emergency drugs as directed)*
- Complete controlled substance log* (does not need to be official controlled substance log; mock logs may be utilized)
- Record and maintain anesthesia records*

Decision-making abilities: Given the characteristics of the anesthetized patient and the procedure being performed, the veterinary technician will work with the veterinarian to:

- Assess the patient's risk status and determine appropriate anesthetic and peri-anesthetic protocols to provide effective pain management and maximum anesthetic safety and effectiveness.

- Choose and utilize appropriate techniques and equipment to accurately and effectively monitor the patient's ongoing status before, during and after anesthesia to provide for adequate anesthesia, analgesia and a safe recovery.

Equipment/Facility Management

Skill: Safely and effectively select, utilize and maintain anesthetic delivery and monitoring instruments and equipment.

Tasks:

- Maintain and operate anesthetic delivery and monitoring equipment:
 - pulse oximeter*
 - capnometer*
 - esophageal stethoscope*
 - electrocardiograph (e.g., recognize abnormal rhythms/audible sounds, properly apply leads)*
 - anesthetic machines, including rebreathing systems, non-rebreathing systems and masks*
 - endotracheal tubes*
 - resuscitation bag*
 - scavenging systems*
 - oxygen sources*
 - blood pressure monitoring devices*
 - laryngoscopes*
 - ventilator
 - defibrillator
 - temperature monitoring device* (e.g. thermometer, etc.)

Decision-making abilities:

- Given the characteristics of the anesthetic instruments and equipment being used, the veterinary technician will recognize and respond appropriately to equipment malfunctions or inappropriate equipment setup to ensure proper function and provide maximum benefit to ensure safety of the patient and staff.
- Given the requirements of the anesthetic protocol, the veterinary technician will select, evaluate and adjust equipment to ensure proper function and provide maximum benefit to ensure safety of the patient and staff.

5. SURGICAL NURSING

It is essential that technicians have knowledge of routine surgical procedures and related equipment, including surgeries in these categories:

- ovariohysterectomy – (dog, cat)*
- cesarean section – all common species*
- orthopedic procedures*
- orchiectomy – all common species*

- tail docking*
- onychectomy – (dog, cat)*
- laparotomies – all common species*
- dystocias in common species*
- dehorning – (cattle, goats)*
- prolapsed organs – common types, species, and incidence*

Students must have participated in surgeries in these categories:

- ovariectomy – (dog, cat)*
- orchietomy – (dog*, cat*, other common species)

Patient Management

Skill: Understand and integrate all aspects of patient management for common surgical procedures in a variety of animal species.

Task:

- Properly identify patients and surgical procedures*

Decision-making abilities: Given the characteristics of the patient and the surgical procedure to be performed, the veterinary technician will use medical records and patient identification methods to assure that the patient and scheduled procedures are correct.

Task:

- Patient assessment:
 - organize medical records/consent forms*
 - review pre-operative evaluation*
 - evaluate current patient status*
 - organize and implement anesthesia*

Decision-making abilities: Given the characteristics of the patient and the surgical procedure to be performed, the veterinary technician will obtain the patient's vital signs, note any specific physical abnormalities, ensure pre-surgical tests have been completed, ensure coordination between surgical and anesthesia teams, and report the patient assessment to the veterinarian.

Task:

- Palpate the urinary bladder and express it as needed*
- Prepare surgical site using aseptic techniques*

Decision-making abilities: Given the characteristics of the patient and the surgical procedure to be performed, the veterinary technician will identify the appropriate area of hair to be removed and select appropriate methods to reduce microbial flora on the skin in the area of surgical site in order to decrease the chance of surgical wound contamination.

Task:

- Position patient for common procedures*

Decision-making abilities: Given the characteristics of the patient and the surgical procedure to be performed, the veterinary technician will position the patient appropriately to provide maximum convenience for the surgeon and maximum safety and benefit for the patient.

Task:

- Provide surgical assistance:
 - demonstrate proper operating room conduct and asepsis*
 - provide aseptic surgical assistance with care of exposed tissues*
 - demonstrate ability to perform aseptic surgical scrub and drying of hands*
 - demonstrate ability to don surgical cap and mask, and aseptically don gown and gloves*
 - aseptically handle and pass instruments and supplies*
 - operate and maintain suction and cautery machines*
 - understand the principles of operation and maintenance of fiber optic equipment*
 - perform basic suturing techniques

Decision-making abilities: Given the characteristics of the patient and the surgical procedure to be performed, the veterinary technician will understand and utilize appropriate aseptic techniques to assist operative personnel in order to provide maximum safety and benefit to the patient.

Task:

- Coordinate pain management with the anesthesia/surgical team*

Decision-making abilities: Given the characteristics of the patient and the surgical procedure to be performed, the veterinary technician will assure that anesthetic and post-operative pain management protocols are appropriate to provide maximum safety and benefit to the patient.

Task:

- Provide post-operative care:
 - pain management*
 - fluid therapy*
 - adequate nutrition*
 - wound management*
 - bandaging*
 - discharge instructions*
 - suture removal*

Decision-making abilities: Given the characteristics of the patient and the surgical procedure to be performed, the veterinary technician will understand and administer the appropriate methods of post-operative care to assure maximum safety and benefit to the patient.

- Procedural Management

Skill: Understand and provide the appropriate instruments, supplies and environment to maintain asepsis during surgical procedures.

Tasks:

- Prepare surgical instruments and supplies*
- Prepare gowns, masks, gloves, and drapes*
- Operate and maintain autoclaves*
- Sterilize instruments and supplies using appropriate methods*
- Perform pre-surgical set-up*
- Identify and know proper use for instruments*
- Identify common suture materials, types, and sizes*
- Provide operating room sanitation and care*
- Maintain proper operating room conduct and asepsis*
- Perform post-surgical clean-up (e.g., equipment, instruments, room, proper disposal of hazardous medical waste)*

Decision-making abilities: Given the characteristics of the patient and the surgical procedure to be performed, the veterinary technician will properly select, wrap and sterilize appropriate instruments and supplies and prepare and maintain the surgical environment to ensure maximum safety and benefit to the patient.

6. LABORATORY PROCEDURES

Specimen Management

Skill: Demonstrate knowledge of proper handling, packaging and storage of specimens for laboratory analysis to ensure safety of patients, clients, and staff.

Tasks:

- Select and maintain laboratory equipment*
- Implement quality control measures* [GROUP]
- Understand how to ensure safety of patients, clients and staff in the collection and handling of samples*
- Prepare, label, package, and store specimens for laboratory analysis*
- Decision-making abilities:
 - Given the characteristics of the patient and the requested analysis, the veterinary technician will properly prepare, handle and submit appropriate samples for diagnostic analysis in order to ensure maximum accuracy of results.

- Given the characteristics of laboratory instruments and equipment, the veterinary technician will determine proper maintenance and quality control procedures necessary to ensure accurate results.

Specimen Analysis

Skill: Properly perform analysis of laboratory specimens.

Tasks:

- Perform urinalysis:
 - determine physical properties (e.g., color, clarity, specific gravity)*
 - test chemical properties*
 - examine and identify sediment*
- Perform CBC to include:
 - hemoglobin*
 - packed cell volume*
 - total protein*
 - white cell count*
 - red cell count*
- Perform microscopic exam of blood film:
 - prepare film and stain using a variety of techniques*
 - perform leukocyte differential – normal vs abnormal*
 - evaluate erythrocyte morphology – normal vs abnormal*
 - estimate platelet numbers*
 - calculate absolute values*
 - correct white blood cell counts for nucleated cells*
- Calculate hematologic indices*
- Coagulation tests – perform one of the following*: [GROUP]
 - buccal mucosal bleeding time
 - activated clotting time (ACT)
 - prothrombin time (PT)
 - partial thromboplastin time (PTT)
 - fibrinogen assay
- Perform blood chemistry tests (BUN, glucose, common enzymes)*
- Perform serologic test (ELISA, slide/card agglutinations)*
- Identify blood parasites:
 - *Dirofilaria sp/Acanthocheilonema sp* (formerly *Dipetalonema sp*)*
 - Other blood parasites of veterinary importance
- Perform parasitologic procedures for external parasites and identify:
 - mites*
 - lice*
 - ticks*
 - fleas*
 - flies*
- Perform diagnostics procedures for parasites:

- Antigen kit*, direct*, Knotts*
- flotation solution preparation
- fecal flotation *
- fecal sedimentation *
- direct smear *
- centrifugation with flotation*
- adhesive tape retrieval of pinworm ova
- perform fecal egg count using McMaster method
- Identify common parasitic forms:
 - nematodes*
 - trematodes*
 - cestodes*
 - protozoa*
- Perform coprologic tests
- Perform microbiologic procedures/evaluations:
 - collect representative samples*
 - culture bacteria and perform sensitivity tests*
 - identify common animal pathogens using commercially available media and reagents* [GROUP]
 - collect milk samples and conduct mastitis testing (e.g., CMT, bacterial culture)* [GROUP]
 - perform common biochemical tests* [GROUP]
 - perform staining procedures*
 - culture and identify common dermatophytes*
- Perform cytologic evaluation:
 - assist in collecting, preparing and evaluating transudate, exudate and cytologic specimens (joint, cerebrospinal, airway, body cavity)
 - perform fine needle tissue aspirates and impression smear preparation (differentiate benign vs. malignant)
 - prepare and stain bone marrow specimens
 - collect, prepare, and evaluate ear cytology*
 - collect, prepare, and evaluate canine vaginal smears* [GROUP]
 - evaluate semen
 - understand timing and types of pregnancy testing
 - assist with artificial insemination
- Perform necropsy procedures:
 - perform a postmortem examination or dissection on non-preserved animal* [GROUP]
 - collect samples, store and ship according to laboratory protocols *[GROUP]
 - explain how to handle rabies suspects and samples safely*
 - handle disposal of dead animals
 - perform humane euthanasia procedures

Decision-making abilities:

- Given the characteristics of the patient, the specimen submitted and the results of the analysis, the veterinary technician will be able to recognize accurate vs. erroneous results in order to provide maximum diagnostic benefit.
- Given the laboratory specimen collected and characteristics of the patient, the veterinary technician will determine appropriate methodology and carry out analytical procedures necessary to provide accurate and precise diagnostic information.
- Having determined the accuracy of analytical results, the veterinary technician will work with the veterinarian to determine if a need exists for additional laboratory tests that will provide useful diagnostic information.

7. IMAGING

Skill: Safely and effectively produce diagnostic radiographic and non-radiographic images.

Tasks:

- Implement and observe recommended radiation safety measures*
- Implement radiographic quality control measures*
- Properly utilize radiographic technique charts*
- Demonstrate an understanding of the modifications of diagnostic imaging techniques as they apply to mice or rats, guinea pigs, lizards, and amphibians*
- Position live animals and produce diagnostic radiographic images (dogs*, cats*, horses/ponies/donkeys/mules*, and birds)
- Position live animals or intubated non-preserved specimens, and utilize dental radiographic equipment to produce diagnostic intra-oral full mouth dental radiographic images (dog or cat)*
- Appropriately label, file, and store images*
- Demonstrate an understanding of completing a radiographic log for systems, reports, files, and records*
- Perform radiographic contrast studies – perform one of the following*: [GROUP]
 - GI Series
 - Pneumocystogram
 - Intravenous pyelogram
- Other
- Perform on a sedated canine radiographic techniques utilized in screening for canine hip dysplasia* [GROUP]
- Demonstrate proper maintenance of radiographic equipment, including recognition of faulty equipment operation*
- Use and care of ultrasonography equipment
- Use and care of endoscopic equipment

Decision-making abilities:

- Given the characteristic of the patient and the radiographic study that has been requested, the veterinary technician will properly (1) prepare radiographic equipment,

(2) measure and position animals using topographic landmarks, (3) choose an appropriate radiographic technique to minimize the need for repeat exposures (4) produce the latent image, (5) analyze the final radiograph for quality in order to provide maximum diagnostic benefit.

- Given a radiograph, the veterinary technician will be able to determine if the image is of diagnostic quality. If the image is not diagnostic, the veterinary technician will be able to offer options to correct deficiencies in order to provide maximum diagnostic benefit and minimize personnel radiation exposure from unnecessary repeat exposures.
- Given knowledge of the health risks associated with radiographic procedures and effective safety procedures, the veterinary technician will exercise professional judgment to minimize risks to personnel and patients during radiographic procedures to ensure safety.
- Given the characteristics of the patient and the non-radiographic imaging study that has been requested, the veterinary technician will properly (1) prepare the imaging site and equipment and (2) position patients appropriately for the study being conducted.

8. LABORATORY ANIMAL PROCEDURES

Skill: Safely and effectively handle common laboratory animals used in animal research.

Tasks: Mice or rats, and rabbits

- Recognize and restrain (mouse/rat, rabbit)*
- Determine sex and understand reproduction (mouse/rat, rabbit)*
- Perform and/or supervise basic care procedures:
 - handling (mouse/rat, rabbit)*
 - nutritional needs/diet*
 - provide food, water, and enrichment in a species-appropriate manner (mouse/rat, rabbit)*
 - trim nails
 - identification*
- Perform methods of injection:
 - subcutaneous (mouse/rat, rabbit)*
 - intramuscular (rabbit)
 - intradermal (rabbit)
 - intraperitoneal (mouse/rat*) [GROUP]
 - intravenous
- Collect blood samples
 - Intravenous (mice/rat, rabbit) [GROUP]*
- Perform oral dosing (mouse/rat)* [GROUP]
- Have working knowledge of anesthetic and recovery procedures*
- Identify and describe clinical signs of common diseases*
- Perform necropsy and collect specimens
- Clean and medicate ears (rabbit)
- Anesthetize mouse/rat, and rabbit

Tasks: Non-human primates

- Understand restraint of non-human primates
- Demonstrate knowledge of zoonotic diseases and modes of transmission
- Decision-making abilities: The veterinary technician will be familiar with the basic principles of animal research and understand the utilization of laboratory animals in animal research. The veterinary technician will also have knowledge of federal, state, and local animal welfare regulations.

Analysis Stream #4: Job Postings Analysis

Job postings data were collected from all online job postings across all of Massachusetts from March 2022, and the verbiage from those online advertisements aggregated and then parsed for perspective on the skills, credentials and employers most frequently mentioned.

Job Postings Analysis

There were 2,972 unique job postings for Veterinarians, Veterinary Technologists/Technicians and Veterinary Assistants and Animal Caretaker positions in Massachusetts in 2022. The job title most frequently advertised was “Veterinary Technicians,” followed by “Veterinary Assistants.”

Table 6: Job Titles, Job Postings Analysis, Target Occupations in Massachusetts

Job Title	Unique Postings
Veterinary Technicians	821
Veterinary Assistants	371
Veterinarians	351
Associate Veterinarians	278
Relief Veterinarians	172
Animal Technicians	142
Veterinary Technician Assistants	61
Veterinary Hospital Managers	52
Lead Veterinary Technicians	52
Certified Veterinary Technicians	48
Emergency Veterinarians	48
Clinical Veterinarians	46
Veterinary Technician Supervisors	36
Veterinary Oncologists	28
Credentialed Veterinary Technicians	27
Animal Caretakers	25
Veterinary Ophthalmologists	25
Veterinary Technician Externs	24
Animal Research Technicians	22
Veterinary Assistants/Receptionists	18

Table 7: Top Companies, Job Postings Analysis, Massachusetts, 2022

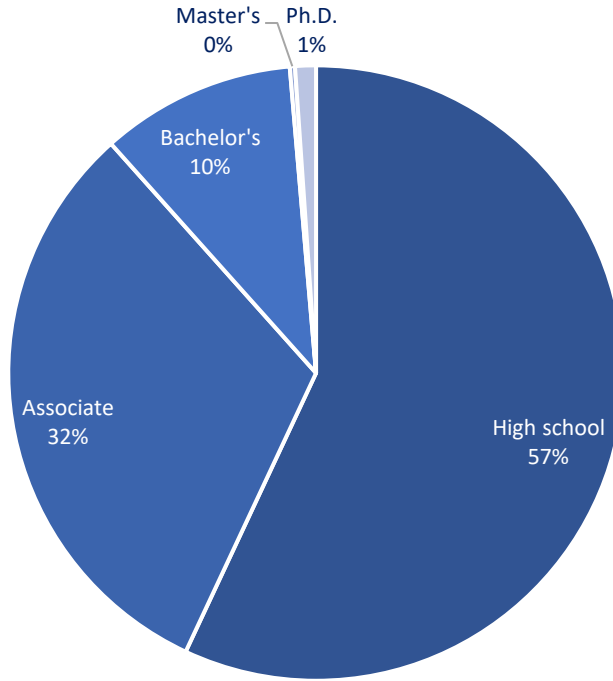
Employer	Unique Postings
VCA Animal Hospitals	364
Banfield Pet Hospital	245
Ethos Veterinary Health	215
Vetco	113
VetCor	100
PetCo	90
Tufts University	74
Salt Lake City Corporation	68
Charles River Laboratories	58
Harvard University	39
Prospect Health	37
PetVet Care Centers	34

Table 8: Top Skills, Job Postings Analysis, Massachusetts, 2022

Skill	% of Postings
Communications	37%
Surgery	28%
Anesthesia	21%
Compassion	15%
Medical Records	14%

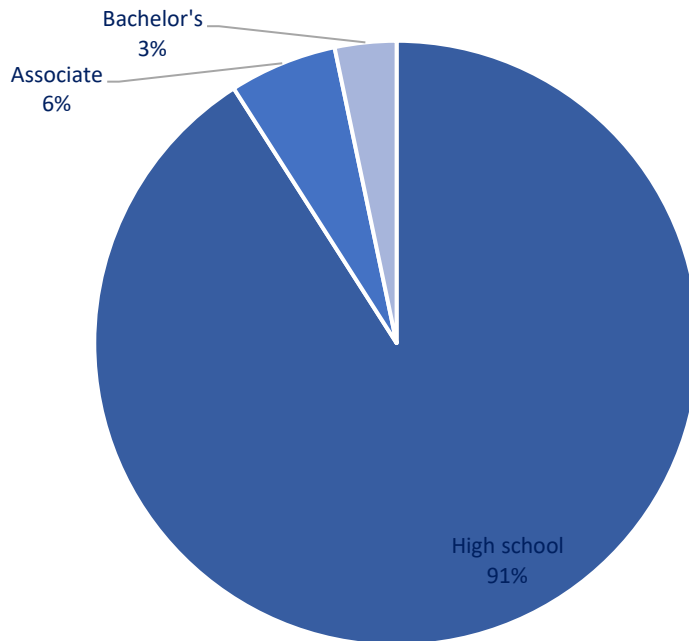
Veterinary Technologists and Technicians

Minimum Educational Requirements, Veterinary Technologists



Veterinary Assistants and Animal Caretakers

Educational Requirements, Veterinary Assistants & Animal Caretakers



Across the Commonwealth, 358 online job postings specifically requested a “Certified Veterinary Technician” in 2022. A number of observations are detailed below.

Certified Veterinary Technician:

358 postings

\$45,700 median advertised salary

Three-year wage trend -22.9%

Employers:

- VCA Animal Hospitals
- Banfield Pet Hospital
- Ethos Veterinary Health
- Vetco
- PetCo

Top Job Titles:

- Veterinary Technician
- Veterinary Assistants
- Associate Veterinarian

Top qualifications

- Board Certified/Board Eligible
- Radiology Certification
- Certified Laboratory Animal Technologist (LATG)