CHAPTER

8

Preventive Health Care for Cats

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OUTLINE

Cats have become the most popular pet in the United States, Canada, and Northern Europe, and 78% of owners consider their cats to be family members (Figure 8-1).[93] Despite the popularity of and affection for the feline species, cats are still the underdog when it comes to veterinary care, especially preventive care. This chapter discusses the benefits of feline preventive health care, the barriers to feline veterinary care, the opportunities for improvement, and the components of a comprehensive feline preventive health care program for all feline life stages. The authors of this chapter were also members of the panel that developed the Feline Life Stage Guidelines by the American Association of Feline Practitioners (AAFP) and the American Animal Hospital Association (AAHA). Although more information is provided in this chapter, the outline for comprehensive care is taken from the guidelines.[99]

BENEFITS OF FELINE PREVENTIVE CARE

Cats, above all other species, need preventive care because they hide pain and illness, a protective mechanism derived from predator avoidance in the wild. Cat owners are more willing to seek veterinary care when they understand and appreciate its importance.[56] To achieve optimal feline health care, veterinarians must educate clients about the benefits of feline preventive care, which include the following:

- Improved quality of life and longevity
- Early disease detection, when diseases are easiest to treat or manage
- Pain prevention and early detection to prevent suffering
- Reduced expenses associated with urgent and sick care
- Development of a baseline of the individual cat's normal values for comparison when cats become ill (e.g., weight comparisons and minimum database), which helps in the early detection of disease and health concerns
- Increased owner–pet bond and decreased relinquishment and euthanasia of pet cats through prevention of undesirable behavior (often normal behavior in ways that owners consider undesirable) and behavioral problems
- Increased client–veterinarian bond and loyalty, which increase compliance with needed preventive care
- Increased quality of life for cat owners (e.g., the human–cat bond can decrease human blood pressure, reduce the chance of a second heart attack, decrease or prevent depression and loneliness, and increase confidence in children)
- Early detection of weight gain or loss

Wellness visits are also a good opportunity to educate owners about the needs of their cat. These visits should be structured to allow time to listen to the owner's concerns and address them.

Current Barriers to Feline Preventive Care: Understanding the Problems

Millions of cats in the United States alone do not receive the veterinary care they need. One of the biggest hurdles

FIGURE 8-1 People consider their cats to be family members that provide companionship and affection. Cats are beneficial for the health of people of all ages and help prevent disease. *(Image courtesy Dr. Deb Given.)*

is that cat owners are often unaware of the medical needs of their cat and the importance of feline preventive care.[56] Troubling statistics indicate that dogs are taken to the veterinarian more than twice as often as cats; dogs generally visit the veterinarian 2.3 times per year, whereas cats see the veterinarian only 1.1 times per year.[56] From 33% to 36% cats do not see a veterinarian even once annually. In households with both cats and dogs, the cats received less veterinary care than the dogs, with adult cats especially lacking in preventive care.[56] Unfortunately, adult cats have many diseases that are overlooked, such as obesity, dental and lower urinary tract diseases, and behavioral problems. Adult cats are also more likely to be surrendered because of behavior problems. Lack of care has an impact on quality of life and longevity.

There is a common misconception that cats are independent and self-sufficient, which makes them easy to care for.[56] One reason for this misconception is that cats hide their pain and illness and may appear healthy or show only subtle signs that often go unnoticed by their owners until the condition is serious. The "Healthy Cats for Life" campaign from the AAFP and Boehringer Ingelheim lists the 10 subtle signs of sickness in cats (http://www.healthycatsforlife.com):

1. Inappropriate elimination behavior
2. Changes in interaction
3. Changes in activity
4. Changes in sleeping habits
5. Changes in food and water consumption
6. Unexplained weight loss or gain
7. Changes in grooming
8. Signs of stress
9. Changes in vocalization
10. Bad breath

Another important problem is the difficulty of getting cats to the veterinary hospital and the veterinary experience itself. This includes the practical difficulties of getting the cat into the carrier and feline fear or stress associated with the car ride and the veterinary visit. Cat owners may also be embarrassed by the way their cat behaves at the veterinary hospital, or they may not like how the veterinarian or veterinary staff handles their cat.[56]

One of the main obstacles to owner compliance is the lack of a clear recommendation by the veterinary team.[1] Cat owners often complain that they did not know the care was necessary, the veterinarian did not recommend the service, or that the need or benefit was not well explained.[56]

The Opportunities

Veterinarians and their staff have huge opportunities to improve feline preventive care and increase the number of feline patients and the frequency of feline veterinary visits in their hospitals. Many of these opportunities were identified in a large study on the impact of the owner–pet and client–veterinarian bond.[56] The AAFP and AAHA Feline Life Stage Guidelines provide evidence-based recommendations to help veterinary teams and clients understand each component of feline preventive care and the associated benefits.[99]

A veterinarian's communication skills, interaction with pets, and ability to educate owners about their pets' needs all drive clients' perceptions of the value of services and the quality of care. Study findings revealed that clear and thorough veterinarian communication with the client could ultimately *increase compliance by as much as 40%*.[56] For example, when the veterinarian recommends and clearly explains the service and benefits to the patient, preventive dental care increases by 64%.[56] Improved communication skills can enhance the way veterinarians and staff members communicate with clients. Lectures on communication are available at every major veterinary conference and through Internet seminars, as well as more general communication resources. Although the study addressed the veterinarian specifically, all members of our veterinary teams should have excellent communication skills.

The ways in which veterinarians interact with their feline patients and whether they encourage a feline-friendly hospital environment influence the the number

of feline patients served and the frequency of examinations. Most clients cannot evaluate the quality of care provided by the veterinarian, but they do know how the veterinarian handles their cats. Clients do not care how much the veterinarian knows until they know how much the veterinarian cares for them and their cats. Information on feline-friendly handling is found in Chapter 1, and the hospital environment in Chapter 2. Whether the hospital is for cats only or companion animals or is a mixed animal practice, the veterinary staff should take steps to make feline veterinary visits more pleasant. Providing a separate waiting room area for cats or placing them directly in an examination room to avoid the stressors of the reception area (e.g., noise, smells, visual cues) is one way the hospital environment can be more feline friendly. If a particular staff member in a companion animal or mixed animal hospital has a special talent for working with cats and their owners, that person can be scheduled to work with all feline appointments. Information to ease the difficulty of getting the cat to the veterinary hospital can be provided when the client makes the appointment.

When seeing a family dog or cat, veterinary team members should routinely inquire about other cats in the household. If there are cats from the same household with existing records at the hospital, checking them while preparing the record for the scheduled patient can help the veterinary team alert clients about what care is needed for the other cats. When seeing a new client, the veterinarian should ask about all the pets in the household and request that all relevant records be transferred to ensure optimal care for all pets in the household.

Developing a partnership with cat owners allows the team to work together to provide cats with high-quality health care. Although cat owners generally are more highly educated than dog owners, they may not have sufficient information to make the best decisions for their cats; they tend to be more likely to seek increased services when the veterinarian communicates effectively.[56] Veterinarians have the opportunity to substantially increase overall preventive care for cats by providing thorough explanations and recommendations to owners regarding the *benefits for their cats*.

Study findings also reveal that the owners with the strongest bonds with their pets are more likely to seek preventive care and follow veterinarian recommendations regardless of cost.[56] Especially during kitten appointments, veterinarians have the opportunity through multiple visits to enhance the owner–cat bond and teach clients about normal cat behavior ways that they can enrich the cat's life and prevent behavioral problems. This is also the perfect time to reinforce the message that clients should contact the veterinarian if they have any questions or concerns regarding their kitten (or cat's) behavior.

Education about necessary care for adult cats (e.g., comprehensive examination and history, dental prophylaxis, and vaccinations) should occur at the last kitten visit. Scheduling the 1-year visit at this time also increases compliance of care for the adult cat.

Promoting adult health care and its benefits in the veterinary hospital is especially important because of the widespread neglect of health care during this life stage and the silent diseases that commonly occur, such as obesity and dental disease. Poor intercat relationships often go unnoticed during this life stage and may lead to behavior problems and surrender of cats to shelters. Early detection and intervention for these problems have a positive impact on cats as they age.

Consistency in the veterinary team's message increases credibility and owner compliance. Unfortunately, recommendations for dental care, parasite prevention, behavior, and vaccines vary widely among veterinary practices. The AAFP–AAHA Feline Life Stage Guidelines provide an evidence-based comprehensive care plan for all the life stages of feline patients, allowing veterinarians to make consistent recommendations and increasing the credibility of the profession.[99]

Consistency of recommendations from all veterinary team members in a hospital is also crucial. It is important to determine whether every cat that is presented for preventive care receives all the recommendations. Making a detailed checklist of every recommended wellness service and reviewing each patient's record to determine which recommendations are appropriate for each visit are paramount to making consistent recommendations and preventing missed services for individual patients.[1] An example of such a checklist is provided in Figure 8-2.

Using existing resources to help educate clients on the importance of preventive or wellness services saves the veterinarian time and increases credibility. Public awareness campaigns such as "Healthy Cats For Life" (http://www.healthycatsforlife.com), "Know Heartworms" (http://www.knowheartworms.org), and "National Pet Wellness Month" (http://www.npwm.com) provide client materials and websites to emphasize and reiterate the veterinarian's recommendations. Veterinary organizations such as the AAFP, the AAHA, the American Veterinary Medical Association (AVMA), the Companion Animal Parasite Council (CAPC), and Catalyst Council have resources and guidelines available to help veterinarians provide consistent wellness strategies.

FELINE LIFE STAGE CARE

Dividing preventive health care into feline life stages allows the veterinarian to focus on the specific physical and behavioral changes and needs during each life stage (e.g., congenital defects in kittens, obesity prevention in

Prearrival checklist note: Check YES if in compliance, NO if not in compliance with protocol

Healthy checklist for:	**Date:**
Doctor:	**Technician:**

Due today for:

☐ 3 mo ☐ 6 mo ☐ 12 mo ☐ Other

Vaccines:

FVRCP	**Due Date:**	**Waived on:**
Rabies	**Due Date:**	**Waived on:**
Leukemia	**Due Date:**	**Waived on:**

Parasite testing and prevention

☐ Yes ☐ No **Fecal** ☐ Yes ☐ No **Intestinal parasite/heartworm prevention**

Microchip

☐ Yes ☐ No **Chip implanted**
☐ Yes ☐ No **Scanned for proper functioning**
☐ Yes ☐ No **Chip ID entered into computer**

Retrovirus testing

☐ Yes ☐ No **FeLV**
☐ Yes ☐ No **FIV**

Health screening appropriate for age:

☐ Yes ☐ No ☐ N/A **Senior panel**
☐ Yes ☐ No ☐ N/A **Adult panel**
☐ Yes ☐ No ☐ N/A **Thyroid panel**
☐ Yes ☐ No ☐ N/A **Thyroid panel ext.**
☐ Yes ☐ No ☐ N/A **Renal panel**
☐ Yes ☐ No ☐ N/A **Renal panel ext.**
☐ Yes ☐ No ☐ N/A **Hepatic panel**

Dental prophylaxis last done:

What diet was last recommended:

Proactive scheduling: Initials of person scheduling appt.: _____

Next appointment (type): Date Due: Scheduled today: ☐ Yes ☐ No

Cat Care Clinic
322 Junction Road
Madison, WI 52717

Personalized healthy checklilst based on AAHA's Healthy Check List, Six Steps to Higher Quality Patient Care, by AAHA Press.

FIGURE 8-2 Making a detailed checklist of every recommended wellness service and reviewing each patient's record to determine which recommendations are appropriate for each visit are paramount to making consistent recommendations and preventing missed services for individual patients. Healthy Check List, Cat Care Clinic. *(Image adapted from AAHA:* Six steps to higher-quality patient care*, Lakewood, Colo, 2009, AAHA Press; courtesy Dr. Ilona Rodan.)*

junior cats, and osteoarthritis management in senior cats). Senior cats have previously been identified as cats 7 years of age and older. Many cats, however, live more than half their lives in their so-called senior years. Because the needs of a younger senior may differ greatly from those of the geriatric cat, the staging was further broken down into mature, senior, and geriatric (Figure 8-3). Discussing the cat's age in comparison with the equivalent human age helps owners recognize that cats age much more quickly than people do.

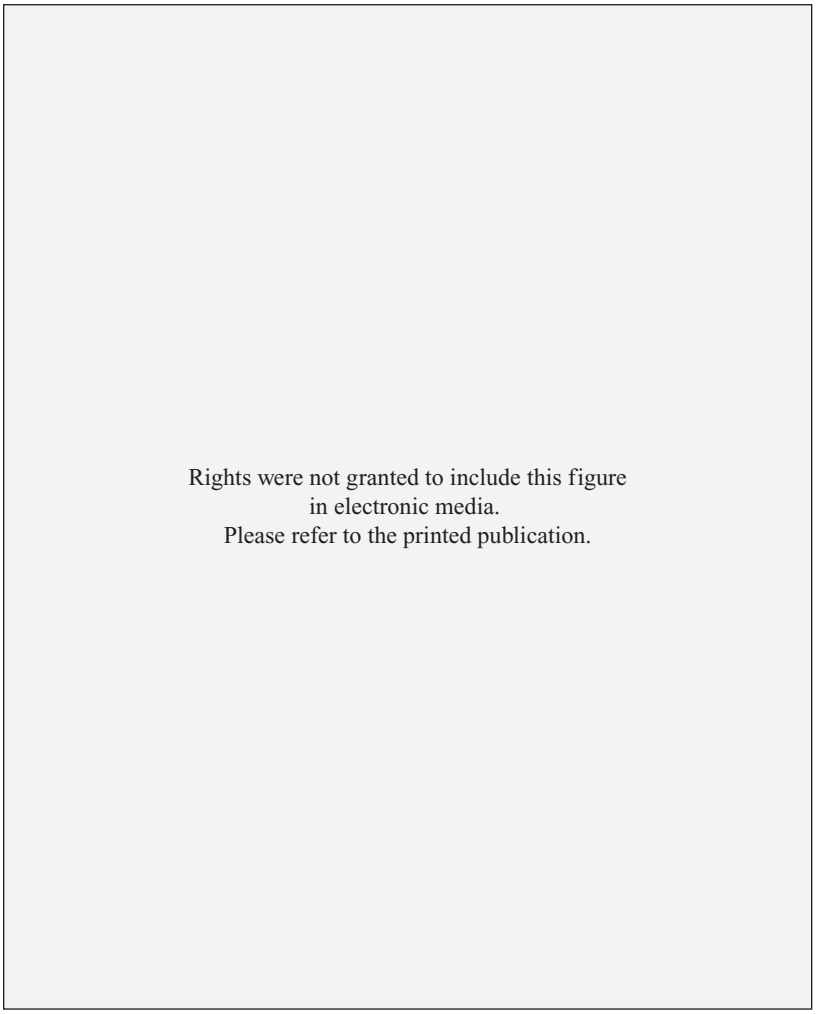

FIGURE 8-3 Different feline life stages and their approximate human equivalents. *(Figure courtesy the Feline Advisory Bureau, http://www.fabcats.org.)*

It is important to remind the client that, as with humans, individual animals and body systems age at different rates and any individual can have a condition that is not common to a particular life stage (e.g., hyperthyroidism in a 5-year-old cat).

Additionally, recommendations must also be based on the individual cat's lifestyle (e.g., indoor always, outdoors with supervision, or free roaming), history, clinical signs, and physical examination findings (see Chapter 3). It is important to ask both open-ended questions (i.e., questions that provide an answer other than "yes" or "no") and specific questions to identify lifestyle and concerns. For example, asking the open-ended question, "What behavioral changes have you noticed since the last visit?" will help with early detection of both behavioral and medical concerns, because the earliest signs of medical problems are usually changes in behavior. In fact, more than 50% of cases seen at a behavior clinic were associated with underlying medical problems.[71] Asking more specific questions (e.g., "Does your cat ever go outdoors?"; "Does your cat catch mice or other live animals?") provides the veterinary team with the information necessary to individualize care for that patient.

Comprehensive or holistic feline preventive care consists of several components to maintain the overall health and welfare of the cat. Although each life stage requires care from each category, the categories are individualized by life stage as needed. Table 8-1 provides recommended topics for client education and action items for preventive care.

Frequency of Examination

A minimum of annual wellness examinations and consultations for all cats is justifiable. Veterinarians and veterinary organizations often recommend semiannual

TABLE 8-1 Wellness Visit: Discussion and Action Items

	General Discussion/Action Items All Ages	Kitten (0-6 Months)	Junior (7 Months-2 Years)
General	**Educate/discuss:** • Recommended frequency of veterinary visits (the panel recommends a minimum of annual exams) • Early and subtle signs of pain or illness; importance of prevention and early detection of disease • Health-care financial planning • Disaster preparedness • Estate planning • Microchipping	**Discuss:** • Breed health care predispositions • Claw care and alternatives to declawing • Congenital/genetic concerns	
Behavior and environment	• Housing (indoor/outdoor) • Hunting activity • Children and other pets in the home • Environmental enrichment (e.g., toys, scratching posts) • Behavior • Travel (regional diseases)	• Confirm adequate resource allocation and play with appropriate toys • Teach commands (come, sit) • Acclimate to car and veterinary visits	• Intercat interactions and social play may decline or deteriorate with maturity. • Provide continued training to allow manipulation of mouth, ears and feet.
Medical/surgical history; sterilization	**Ask about:** • Previous medical/surgical history • Medications • Over-the-counter items (e.g., supplements, parasiticides, alternative medications)	Discuss sterilization, including pros and cons of surgery at different ages.	• Perform sterilization if not yet done. • Discuss establishing baseline data to assess subsequent changes (e.g., weight, BCS, MDB).
Elimination	**Discuss:** • Urinary tract health and methods of encouraging healthy litter habits • Elimination habits (frequency, quantity, and quality) and litter box management (e.g., number, size, location, cleaning)	Litter box setup, cleaning and normal elimination behavior	Confirm that litter box size accommodates growing cat.
Nutrition and weight management	• Discuss eating behavior, diet(s) and feeding recommendations. • Stress importance of regular assessment of weight and BCS.	• Feed to moderate body condition. • Discuss growth requirements and healthy weight management • Introduce to a variety of food flavors/textures.	Monitor for weight changes and feed to moderate body condition. (Caloric needs decrease after sterilization and increase in breeding females.)
Oral health	• Discuss dental health and home care. • Monitor and discuss dental disease, preventive care, dental prophylaxis, and treatment.	**Educate/discuss:** • Mouth handling, teeth brushing, and alternatives • Permanent tooth eruption (timing and signs) **Coordinate:** • Any requested deciduous tooth care with sterilization (simultaneous anesthesia)	Moderate and discuss.
Parasite control	• Tailor laboratory evaluation to lifestyle. • Evaluate changing or different risk on the basis of geographic prevalence and travel. • Discuss zoonotic risks. Heartworm prevention is recommended for all cats in endemic areas.	• Deworming every 2 weeks from 3 to 9 weeks of age, then monthly until 6 months of age • Fecal exams 2 to 4 times during the first year of life	• Continue fecal exams 1 to 4 times per year depending on health and lifestyle factors.
Vaccination	**Core vaccines:** • Feline panleukopenia virus • Feline herpesvirus-1 • Feline calicivirus • Rabies virus **Tailor:** • Vaccine protocols to individuals and state regulations, considering benefits and risks, environment, and referring to current guidelines	FeLV vaccine is highly recommended for kittens in light of their unknown future lifestyle. • Review, complete, continue vaccination series.	• Review, complete, continue vaccination series. • Review vaccine history/viral screening.

BCS, Body condition score; *MDB,* minimum database.
Adapted from Vogt AH, Rodan I, Brown M et al: AAFP-AAHA: feline life stage guidelines, *J Feline Med Surg* 12:43, 2010.

Adult (3-6 Years)	Mature (7-10 Years)	Senior (11-14 Years)	Geriatric (15+ Years)
This age group is often overlooked and would benefit from regular veterinary care.	Specific management of mature and older cats is described in the AAFP Senior Care Guidelines and AAHA Senior Care Guidelines for Dogs and Cats.	Specific management of mature and older cats is described in the AAFP Senior Care Guidelines and AAHA Senior Care Guidelines for Dogs and Cats.	Specific management of mature and older cats is described in the AAFP Senior Care Guidelines and AAHA Senior Care Guidelines for Dogs and Cats.
• Review environmental enrichment. • Teach techniques to increase the cat's activity (e.g., retrieve). • Encourage object and interactive play as a weight management strategy.	Increased importance of easy accessibility to litter box, bed, food.	• Environmental needs may change (e.g., with osteoarthritis): ensure easy accessibility to litter box, soft bed, food. • Educate clients about subtle behavior changes that are not "just old age."	• Ensure accessibility to litter box, bed, food. • Monitor cognitive function (vocalization/confusion), signs of pain/osteoarthritis. • Discuss quality-of-life issues.
Discuss baseline adult data to assess subsequent changes (e.g., weight, BCS, MDB)	• Monitor for subtle changes such as increased sleeping or decreased activity. • Increase focus on mobility, duration, and/or progression of any specific signs.	Increase focus on mobility, duration, and/or progression of any specific signs	Increasing importance for regular review of medications and supplements
	Review the size and edge height of litter box to ensure that the cat can enter easily as it ages.	Adjust litter box size, height, and cleaning regimens as necessary.	Adjust litter box size, height, and cleaning regimens as necessary.
Feed to moderate body condition. Monitor for weight changes, and modify food intake accordingly.	Feed to moderate body condition. Monitor for weight changes, and modify food intake accordingly.	Feed to moderate body condition. Monitor for weight changes, and modify food intake accordingly.	Feed to moderate body condition. Monitor food intake and BCS weight changes.
Moderate and discuss.	Moderate and discuss.	Monitor for oral tumors, inability to eat, and decreased quality of life from painful dental disease.	Monitor for oral tumors, inability to eat, and decreased quality of life from painful dental disease.
Conduct fecal exams 1 to 2 times per year, depending on health and lifestyle factors.	Conduct fecal exams 1 to 2 times per year, depending on health and lifestyle factors.	Conduct fecal exams 1 to 2 times per year, depending on health and lifestyle factors.	Conduct fecal exams 1 to 2 times per year, depending on health and lifestyle factors.
Continue core vaccines according to current guidelines. Evaluate risk assessment and use of noncore vaccines, if indicated, according to current guidelines.	Continue core vaccines according to current guidelines. Evaluate risk assessment and use of noncore vaccines, if indicated, according to current guidelines.	Continue core vaccines according to current guidelines. Evaluate risk assessment and use of noncore vaccines, if indicated, according to current guidelines.	Continue core vaccines according to current guidelines. Evaluate risk assessment and use of noncore vaccines, if indicated, according to current guidelines.

wellness examinations for cats at all life stages. Reasons include the following: Changes in health status may occur in a short period of time; ill cats often show no signs of disease; and earlier detection of poor health, body weight changes, dental disease, and other problems allows for earlier intervention. In addition, semiannual exams provide an opportunity for more frequent communication with the owner regarding behavioral and attitudinal changes and education about preventive health care. Both the AAFP Senior Care Guidelines[74] and the AAHA Senior Care Guidelines for dogs and cats[25] recommend semiannual examinations for apparently healthy cats 7 years of age and older. Cats with previously diagnosed health conditions may require more frequent examinations. Further research is needed to identify the optimal examination schedule to maximize the health and longevity of the cat.

General Preventive Care Recommendations

Meeting the Costs of Veterinary Care

The vast majority of cat owners do not leave a veterinarian because of the cost of care,[56] but clients do want value, which is all about the experience they have at the veterinary hospital. Financial realities must be considered. It is important to address the cost of care and give clients a schedule and treatment plan (including a cost estimate) for upcoming visits so that they can plan for these expenses. The AAHA strongly suggests that all pet-owning families consider their ability to meet unexpected expenses that may be incurred for veterinary care (Box 8-1). The expenses may be met through existing savings, credit card reserves, Care Credit or other medical payment cards, monthly budgeting for pet care expenses, or pet health insurance policies.

Pet health insurance has become a good method of mitigating health care expenses. The proportion of cats insured varies greatly among different countries, but it is almost invariably lower than the proportion of dogs insured. Pet insurance can provide excellent value for the cost and allow patients to receive highly expensive urgent care and crisis management that may not be feasible otherwise. Many policies now offer preventive health care coverage. Each insurance company works differently, and clients are encouraged to review policies carefully. Few clients are aware of pet insurance without a specific veterinary recommendation; the veterinary team should explain benefits and possible limitations of pet insurance. The National Commission on Veterinary Economic Issues (NCVEI) position paper, "A veterinarian's guide to pet health insurance," contains excellent information to help veterinarians and veterinary teams learn more about pet insurance.[100] In the United States there is also a website that helps consumers compare various pet health insurance companies (Pet Insurance Review, see Box 8-1).

Microchipping

Microchipping is recommended for cats of all lifestyles (indoor, indoor–outdoor, and fully outdoor) to ensure permanent identification that cannot be lost and increase the chance that lost cats will be returned to their owners. One study found that 41% of people looking for their lost cats considered them indoor-only pets,[55] which emphasizes the importance of microchipping all cats, regardless of lifestyle. According to the American Humane Association, only about 2% of lost cats ever find their way back from shelters, a major reason being the lack of tag or microchip identification (see Box 8-1). According to another study, owners of almost three quarters of microchipped cats were located because their cats had microchips.[54]

The wellness examination is the ideal time to discuss the importance of identification with owners. The benefits of both visible (e.g., collar and tag) and permanent identification should be explained; the AVMA provides an excellent resource for veterinarians in the United States to make decisions about the type of microchip and methods of microchip implantation (see Box 8-1). The veterinarian should note that the owner has complied with this identification and record the microchip number in the cat's medical history.

Microchip implantation is a minimally invasive procedure that can be done in the examination room without anesthesia or scheduled with an upcoming dental prophylaxis or routine surgical procedure. The standard site for subcutaneous injection of the microchip is on the dorsal midline, just cranial to the shoulder blade or scapula. In the United States microchip implantation should be performed by, or under the supervision of, a licensed veterinarian (see AVMA policy on electronic identification; see Box 8-1). In the United Kingdom microchip insertion is not considered a veterinary practice. Although risks are rare, any adverse reactions should be reported.

All major veterinary organizations endorse the use of electronic identification. The International Standards Organization (ISO) standards have been accepted by Canada, Europe, Asia, and Australia. Although the United States supports ISO standardization, at this time there is still no U.S. standard for microchip frequencies. Animals traveling to countries with adopted ISO regulations should be implanted with microchips that meet the standards, or the cat owner should carry a scanner that can read the non-ISO microchip.[55]

Every cat should be scanned during wellness examinations. Scanning new patients identifies whether they have been previously microchipped; scanning patients known to be microchipped ensures that the microchip is functioning properly and still in the proper location

BOX 8-1
Internet Resources

General Preventive Care Recommendations

- AAHA Statement on Meeting the Cost of Pet Care
  - http://www.aahanet.org/
- Pet Insurance Review
  - http://www.petinsurancereview.com
- AVMA policy on electronic identification
  - http://www.avma.org/issues/policy/electronic_identification.asp
- WSAVA microchip identification
  - http://www.wsava.org/MicrochipID.htm
- AAHA Pet Microchip Lookup Tool
  - http://www.petmicrochiplookup.org/
- Chloe Standard, Inc., Check the Chip
  - http://www.checkthechip.com/

Disaster Preparedness

- American Humane Association—Don't Leave Your Pet's Safety To Chance
  - http://www.americanhumane.org/about-us/who-we-are/american-humane-blog/blog-posts/dont-leave-your-pets-safety.html
- AVMA Saving the Whole Family booklet
  - http://www.avma.org/disaster/saving_family.asp
- Humane Society of the United States, Disaster Preparedness for Pets
  - http://www.hsus.org/hsus_field/hsus_disaster_center/resources/disaster_preparedness_for_pets.html
- ASPCA Disaster Preparedness
  - http://www.aspca.org/pet-care/disaster-preparedness/

Estate Planning

- AVMA Pet Estate Planning
  - http://www.avma.org/onlnews/javma/dec01/s120101e.asp
- Humane Society of the United States—Planning Your Estate?
  - http://www.hsus.org/press_and_publications/press_releases/planning_your_estate_the.html

Environmental Enrichment

- The Indoor Cat Initiative, The Ohio State University
  - http://www.vet.osu.edu/indoorcat.htm
- AAFP Feline Behavior Guidelines, 2004
  - http://www.catvets.com/professionals/guidelines/publications/?Id=177

Claw Care

- AAFP Position Statement on Declawing
  - http://www.catvets.com/professionals/guidelines/position/?Id=291
- AAHA Declawing (Onychectomy) Position Statement
  - http://www.aahanet.org
- AVMA Position Statement on the Declawing of Domestic Cats
  - http://www.avma.org/onlnews/javma/apr03/030415c.asp
- CVMA Position Statement on Declawing
  - http://canadianveterinarians.net/ShowText.aspx?ResourceID=28
- Cornell University, College of Veterinary Medicine: Trimming Your Cat's Claws
  - http://www.partnersah.vet.cornell.edu/pet/fhc/trimming_claws

Testing for Inherited Diseases

- University of California—Davis, Veterinary Genetics Laboratory
  - http://www.vgl.ucdavis.edu/services/cat/
- Washington State University, Veterinary Cardiac Genetics Lab
  - http://www.vetmed.wsu.edu/deptsVCGL/
- University of Pennsylvania, PennGen Laboratories
  - http://research.vet.upenn.edu/Default.aspx?alias=research.vet.upenn.edu/penngen

Dental Care

- American Veterinary Dental Society
  - http://www.avds-online.org/
- Cornell University, College of Veterinary Medicine—Brushing Your Cat's Teeth
  - http://partnersah.vet.cornell.edu/pet/fhc/brushing_teeth
- Veterinary Oral Health Council—Products awarded the VOHC Seal
  - http://www.vohc.org/accepted_products.htm

Parasite Control

- Companion Animal Parasite Council
  - http://www.capcvet.org/
- European Scientific Counsel Companion Animal Parasites
  - http://www.esccap.org/
- Centers for Disease Control and Prevention—Healthy Pets, Healthy People
  - http://www.cdc.gov/healthypets/index.htm
- American Heartworm Society
  - http://www.heartwormsociety.org/

(microchips occasionally migrate). The veterinarian should use a universal scanner that can read microchips of all commonly used frequencies. This routine scanning also reminds owners to keep their microchip database contact information current. More valuable information about microchip scanning is provided by the World Small Animal Veterinary Association (WSAVA; see Box 8-1).

Staff members should be trained to pass the scanner over the cat in different directions; it may be necessary to do this more than once. Scanning should be performed away from computers, metal tables, and fluorescent lighting, and metal collars should be removed first. Batteries should be checked or replaced regularly to ensure that the device is functioning properly.[55] The United States is the only country in which microchip implantation and registration are often separate processes.[54] This lack of a centralized database has led to concerns about the reduced ability to identify pets. To resolve the problem, the AAHA has created the AAHA Universal Pet Microchip Lookup Tool, and Chloe Standard, Inc. has also created a search engine, Check the Chip (see Box 8-1).

Disaster Preparedness and Estate Planning

Although most people are reluctant even to think about it, disaster can occur wherever one lives, whether a natural or other type of disaster. After the Hurricane Katrina disaster in 2005, a Zogby International poll found that 61% of pet owners would not evacuate if they could not bring their pets with them (http://www.zogby.com/news/readnews.cfm?ID=1029). In 2006 the United States Congress addressed this issue by passing the "Pets Evacuation and Transportation Standards (PETS) Act" (Public Law 109-308), which requires state and local emergency management agencies to make plans that take into account the needs of individuals with pets and service animals in the event of a major disaster or emergency. Box 8-1 lists websites that provide helpful information on disaster preparedness.

It is important that owners have a pet estate plan in case their pets outlive them. Clients can be provided with information to support them in making decisions about care in the event of their death or if they are no longer able to take care of their cats (see Box 8-1).

Behavior

Despite continued advances in feline health care, prevention of behavioral problems is the weakest area of most preventive health programs for cats. It is also the most serious problem when it comes to disruption of the human–animal bond and surrender, relinquishment, and euthanasia of pet cats. The following facts indicate the enormity of behavioral problems in cats:

- There is no greater threat to the human–animal bond than behavioral problems.[85]
- Behavioral problems continue to be the most common reason that pet cats are relinquished and euthanized.[87]
- *Normal* feline behaviors that cat owners consider unacceptable are among the most common reasons for abandonment.[2]
- Cats with inappropriate elimination habits have the highest risk of relinquishment, with about 4 million cats euthanized yearly in shelters in the United States.[92]
- Behavioral problems directly affect animal welfare[26] and cause decreased quality of life for cats and their owners.
- Unresolved behavioral problems cause veterinarians to lose approximately 15% of their client base annually.[70]
- Most pets surrendered to shelters were seen by a veterinarian at least once in the year preceding relinquishment.[83]
- Of owners of cats that marked urine vertically, 26% did not contact their veterinarian because they thought that the veterinarian could not help them with the problem; 93% reported that they consulted other sources (+/− the veterinarian).[8]

By preventing behavioral problems, veterinarians have the opportunity to protect and strengthen the human–pet–veterinary bond and increase the quality of life for both cats and cat lovers.[70] It is crucial that veterinarians educate their staff and clients, as well as themselves, about preventive-behavior health care. During wellness appointments there are two ways to help clients with cat behavior: identifying client concerns and behavior changes by taking and reviewing the history and educating clients to prevent behavioral problems.

The medical history is critical for early detection of behavioral problems and collection of information about the cat's lifestyle (i.e., indoor versus outdoor), other cats in the household and how they interact, and other potential stressors for the cat. An excellent question to ask is, "What changes in behavior or undesirable behavior have you noticed?" This allows the veterinarian to detect problems earlier, educate clients about the fact that behavioral changes are often due to underlying medical problems, and address client concerns about unwanted behavior.

The second opportunity to deal with behavioral issues during wellness appointments is by educating clients about normal cat behaviors and environmental enrichment. If owners are properly informed, cats can retain their normal behaviors in ways that are also acceptable to cat owners. Client education should begin at the first appointment and reviewed during each life stage. It has been shown that dog obedience training and the receipt

of advice regarding companion animal behavior reduce the risk of relinquishment to an animal shelter and increase human–companion animal interactions.[87] If cat owners receive the same education, by participating in training or "Kitten Kindy" classes (see Chapter 11) that deal with normal feline behavior and prevention of behavioral problems, they are less likely to relinquish their cats and more likely to have a satisfying human–cat relationship. Veterinarians must also remind clients to call the veterinary hospital with any behavioral questions and concerns, which will, with any luck, keep them from acting on misinformation from other sources. If the veterinarian is unable to help, referring the client to an appropriate specialist is an important way to maintain the human–animal bond as well as the veterinarian–client relationship. A list of board-certified veterinary behavior specialists can be found through the American College of Veterinary Behaviorists (http://www.veterinarybehaviorists.org/); in areas where behavior specialists are not available, referral to those with a special interest and extensive training in feline behavior is a good alternative.

FIGURE 8-4 Indoor cats are often bored. Cats can be taught to walk on a leash, which may afford them a more enriched lifestyle than the cat that is indoors exclusively. *(Image courtesy Dr. Deb Given.)*

Indoor Versus Outdoor Lifestyle

Controversy exists over whether cats should be kept exclusively indoors or allowed to go outside sometimes. These debates usually reflect geographic and cultural differences.[12,17,67,95] An indoor–outdoor lifestyle may provide a more natural and stimulating environment for cats, but it also increases the cat's risk of contracting an infectious disease or experiencing trauma, and it has important environmental consequences, insofar as cats prey on wildlife. Supervised or controlled outdoor access (e.g., a safe outdoor cat enclosure, leash walking) has been recommended to reduce some of the risks associated with access to the outdoors (Figures 8-4 and 8-5). An indoor-only lifestyle may decrease the risks of infectious disease and trauma and increase longevity, but it also may increase the risks of compromised welfare and illness owing to stress associated with lack of environmental stimulation.

FIGURE 8-5 Note how interested this cat is in what it sees, hears, and smells outdoors. *(Image courtesy Dr. Deb Given.)*

Environmental Enrichment

Appropriate environmental enrichment is essential for maintaining the mental and physical well-being of cats housed indoors.[39,70] Environmental enrichment allows cats to carry out their normal behaviors, which are similar to those of their ancestors, in a manner that is acceptable to cat owners. Cats need resources in the home to allow them to perform their normal behavior: scratching posts in desirable locations and cat trees, perches, or shelves to allow for climbing and resting and to increase overall space in the home (Figure 8-6). Normal feeding behavior and multiple toileting (litter box) areas are also necessary. Many cats also like hiding spots, especially in multicat households, households with children, and when company visits. Queens teach kittens to play so that they learn to hunt for food and catch their prey; play is an important component of the cat's day. Cats are social animals and enjoy both interactive toys and hunting games. They also enjoy playing on

FIGURE 8-6 Cat trees placed next to windows increase space vertically and provide a view of the outdoors. *(Image courtesy Dr. Deb Given.)*

FIGURE 8-7 The commercial cat litter box *(left)* is often too small for fully grown cats. The sweater storage box *(middle)* and the dog litter box for animals up to 35 pounds *(right)* are better choices. *(Image courtesy Dr. Ilona Rodan.)*

their own; rotation of toys prevents boredom. There are excellent resources to educate veterinary teams and cat owners about cats' needs and environmental enrichment. The Indoor Cat Initiative (see Box 8-1) provides outstanding information, as does Chapter 46. Another client resource is the book *From the Cat's Point of View* (Bohnenkamp G, Perfect Paws Publishing, 1991; ISBN 0964460114).

Environmental enrichment prevents behavioral problems and is also needed for treatment of most behavioral problems, either as the only treatment or as an important component of the treatment plan. Multimodal environmental modification (MEMO) has also been shown to decrease clinical signs of interstitial cystitis and respiratory and gastrointestinal diseases.[12,14]

The more cats in the household, the more resources are needed to increase feline welfare and help prevent behavioral problems. Litter boxes are an excellent example showing why cats need multiple resources. The recommendation for the number of litter boxes is traditionally one litter box per cat plus one extra, so that a household with three cats should contain four litter boxes, placed in different locations. In a multiple-floor dwelling, a minimum of one box should be placed on each floor to which the cats have access. This allows cats to have easy access to a litter box regardless of where the cat is in the house and reduces the risk of another cat blocking access to the cat or bothering it while it is eliminating. Boxes should be located in easily accessible areas but not high-traffic areas. Most cats prefer unscented clumping litter,[65,70] and some cats may find scented litters aversive. Kittens may be offered a variety of litter box options from which to choose, with one choice being unscented clumping litter.[66] Litter boxes should be scooped at least once daily and changed completely once weekly for clay litter and once every 2 weeks for clumping litter. Cats also prefer litter boxes[66] large enough for them to turn around in; the ideal size is approximately 1.5 times the size of the cat, from the tip of the nose to the base of the tail.[70] Most commercial cat litter boxes are too small; plastic clothes storage boxes and dog litter boxes for dogs up to 35 pounds are excellent choices (Figure 8-7). Cats with arthritis and other health problems that make it difficult to jump over the edge of the box should be provided with a box that has a smaller lip or edge at the front of the box; dog litter boxes already have these. Otherwise, an opening can be cut in a sweater or other plastic box.

Cats learn best when desired behavior is reinforced and rewarded and when undesired behavior is redirected. Clients should be reminded that cats should never be punished verbally or physically.

Client communication should occur both verbally and with supporting client handouts or other educational materials. Excellent client educational handouts are available in the AAFP Feline Behavior Guidelines[70] (see Box 8-1) and include the following topics:

- Introducing a new cat into a household with resident cats
- Litter box care to prevent or treat elimination problems

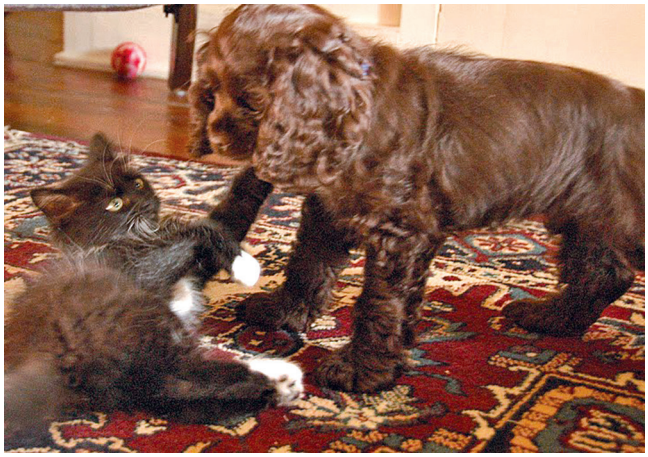

FIGURE 8-8 Cats and dogs can be great friends, playing and sleeping together. It is best to expose them to each other as kittens and puppies, with positive experiences. *(Image courtesy Dr. Deb Given.)*

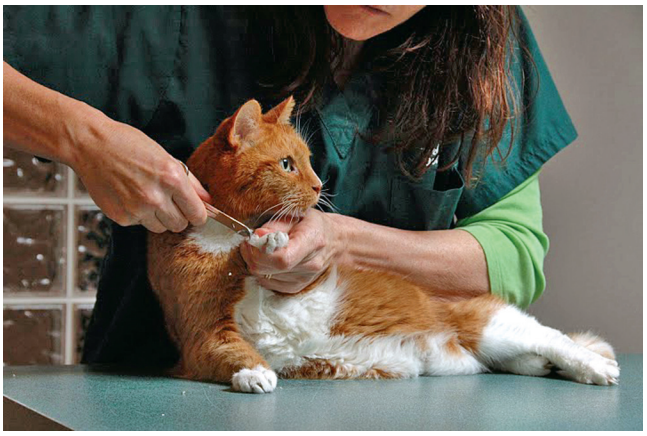

FIGURE 8-9 Teaching clients how to trim their cat's nails and to associate nail trimmings with rewards allows most clients to perform all grooming services at home. *(Image courtesy Dr. Deb Given.)*

- Ways to prevent cats from scratching in undesirable areas
- Feeding tips to prevent obesity in your cat
- Ways to help your cat have pleasant veterinary visits
- Environmental enrichment to enhance the cat's quality of life

Behavior Needs by Life Stage

KITTEN (BIRTH TO 6 MONTHS)

Kittens have a strong drive to play. Intercat social play peaks at about 12 weeks of age,[16] after which object play becomes more prevalent. Toys offer an outlet for normal predatory sequences as part of play and help prevent play biting. The primary socialization period of cats to people is from 3 to 9 weeks of age. If kittens associate positive experiences with exposure to humans during this time, they will be more willing to approach people and be held by them later in life. Kittens should be handled gently and positively and exposed as early as possible to any stimuli or handling techniques the cat may encounter during their lifetime (e.g., children, dogs, nail trims, tooth brushing, car rides) (Figures 8-8 and 8-9). Positive carrier, car, and veterinary experiences that occur early in life can improve future veterinary visits (Figure 8-10). Positive behaviors should always be reinforced by using food or other appropriate rewards; kittens should never be punished because this may elicit defensive aggression.

FIGURE 8-10 This kitten was trained during kitten class to get into the carrier.

JUNIOR (7 MONTHS TO 2 YEARS)

It is important during the junior life stage to continue training the young cat to allow manipulation of mouth, ears, and feet. Intercat relations may change when a cat reaches 1 to 2 years of age (the age at which free-living offspring leave the family unit), and intercat aggression may develop. Stress associated with the change in intercat relationships can lead to inappropriate urination or spraying. It is critical to provide needed resources in multiple areas. Synthetic feline pheromone (Feliway diffusers and spray) therapy is purported to assist in spatial organization, enhance intercat relations, and provide emotional stabilization.[66]

ADULT (3 TO 6 YEARS) AND MATURE (7 TO 10 YEARS)

A decline in play activity in adult and mature cats increases susceptibility to weight gain. Three 10- to 15-minute play sessions daily can lead to a loss of approximately 1% of body weight in 1 month with no food intake restrictions.[18]

SENIOR (11 TO 14 YEARS)

Veterinarians should always evaluate senior cats with behavioral changes (e.g., vocalization, changes in litter box usage) for an underlying medical problem.[74] One study found that 28% of pet cats 11 to 14 years of age develop at least one behavioral problem, increasing to more than 50% cats over 15 years of age.[61] Clients should be educated about subtle behavior changes that are not just part of the normal aging process. Osteoarthritis is common in senior and geriatric cats; placement of ramps so that the cat can get to higher places, soft bedding, and a lower front lip on litter boxes decrease the risk of behavioral problems and improve the cat's quality of life.

GERIATRIC (15 YEARS AND OVER)

The client should be reminded to ensure the cat's accessibility to its litter box, bed, and food and to monitor the cat for signs of pain and osteoarthritis. Geriatric cats may also exhibit a decline of cognitive function, with confusion. Vocalization may be caused by several geriatric conditions (e.g., vision or hearing loss, hypertension, hyperthyroidism, and cognitive dysfunction). It is important to help clients assess quality-of-life issues. A mobility and cognitive dysfunction questionnaire is provided in the AAFP Senior Care Guidelines to help clients identify problems earlier.[74]

Grooming and Claw Care

Scratching is a normal feline behavior used for stretching, conditioning of claws, and marking of territory both visually and with scent. It is important to teach clients that scratching is a normal behavior that can be directed to areas that they consider appropriate. Scratching materials preferred by most cats are wood, sisal rope, and rough fabric. Because cats often stretch and scratch when they awaken, the posts should be placed near the cat's sleeping area. Many cats prefer vertical scratching posts; however, if a cat continues to scratch on carpets, horizontal scratching posts should be offered as well. Vertical posts should be sturdy and tall enough for the cat to be able to fully stretch. In multicat households there should be several scratching posts, both vertical and horizontal, located throughout the house.

Owners can train kittens and cats to use scratching posts by enticing them to the post with catnip, treats, or toys and rewarding behavior on the scratching post. If the cat scratches elsewhere, it should be picked up gently and taken to the scratching post and then rewarded. If the cat continues to go to the other area, the owner should use double-sided adhesive tape or a cover with a texture the cat that the cat finds unappealing. As previously stated, cats should be rewarded or positively reinforced for desirable behavior and never punished verbally or physically.

Feline onychectomy, or declawing, is illegal in Australia, New Zealand, Israel, and many European countries. Although declawing was once considered a routine procedure in the United States, it is now ethically controversial. The current position statements (see Box 8-1) of the AVMA, the Canadian Veterinary Medical Association, the AAFP, and the AAHA state that declawing should be considered only after efforts are made to prevent the cat from using the claws destructively (e.g., scratching posts, nail trimming) or for cats that live with immunocompromised people for whom clawing may present a zoonotic disease or injury risk. Zoonotic disease potential should be discussed and documented in the medical record. If declawing is performed, four-paw declawing is not recommended; keeping the hind claws allows the cat some means of protection, and property destruction and human injury occur less commonly with the rear claws. There are good alternatives to onychectomy, including training cats to use scratching posts and trimming their nails regularly. In most cases clients can be taught to trim nails, especially with kittens. Nails should be trimmed in a calm environment, and the cat should be positively reinforced. In addition to nail-trimming demonstrations, at-home education can be reinforced with client educational handouts or a video on nail trimming (see Box 8-1). The client educational handout "How To Prevent Cats from Scratching in Undesirable Areas" is provided at the end of the AAFP Feline Behavior Guidelines.[70] Another alternative is temporary synthetic nail caps that are usually applied every 4 to 6 weeks.

Although declawing is controversial, there is no scientific evidence that it leads to behavioral abnormalities. Declawed cats should be housed indoors or allowed outside only with strict supervision. If surgical onychectomy is performed, multimodal pain management, including local nerve blocks and perioperative analgesia for an appropriate length of time, is essential.

Although most cats do not need to be bathed, regular combing of the hair coat helps identify skin or coat problems more quickly, prevents matting, and decreases ingestion of excess fur. Certain types of coats may need more care. Brushing affects only the topcoat, but combing allows care of the undercoat as well. Overweight cats may have difficulty grooming themselves and require added attention, especially to the back half of the body.

Neutering

The benefits of ovariohysterectomy and castration are well known. They include prevention of feline overpopulation, infection, and neoplasia of reproductive organs and reduction in spraying and roaming tendencies. To further prevent the overpopulation problem, cats are often neutered at shelters before they are released to

their new owners. Many studies show that pediatric neutering is safe and can be performed when the kitten is as young as 6 weeks of age.[44,88,91] A large study involving 1660 cats showed that early gonadectomy did not lead to significant medical or behavioral problems.[88] Steps should be taken to prevent hypoglycemia and hypothermia during anesthetic procedures in young kittens. For more on early-age spaying and neutering, see Chapter 41.

Minimum Database

The goal of the minimum database in apparently healthy cats is early disease detection and treatment. It is especially important in cats because they hide disease and may not show signs of illness until late in the disease process. The minimum database also serves to provide preanesthetic testing to identify problems that would otherwise not be detected, assisting in decisions about anesthesia. Early detection and treatment can lead to increased quality of life and longevity.

Performing an annual (or more frequent) minimum database allows veterinarians to establish a baseline for each individual patient and its normal values, which helps with early disease detection. A diagnostic test might fall within the normal range of the laboratory reference intervals but still be abnormal for the patient if there is an increasing trend. For example, a patient may have a normal serum creatinine concentration between 0.9 mg/dL and 1.1 mg/dL for several years, and then the creatinine may increase to 1.5 mg/dL the next year; although this value is still in the normal range, it is elevated for this individual patient, and further diagnostic testing and follow-up are indicated. Individual laboratory test comparisons can be made using summary sheets that provide results of all test results in chronologic order, allowing each specific test to be compared over years. Software is also available by which specific test results can be compared and graphed over time.

Laboratory profiles evaluate a number of tests at one time to better assess the overall health status of the patient. Although an individual test may provide some information, performing multiple tests at the same time often yields a more complete diagnostic assessment. Any one test result could be misleading without those from other tests and lead to misdiagnosis or partial diagnosis.[78] For example, serum alanine amino transferase (ALT) may be significantly elevated with hyperthyroidism, but if only ALT is analyzed, the veterinarian may focus on liver problems instead of the many other health conditions that may affect ALT.

There is high value to an individual cat when disease is found early, even when many tests yield normal results. However, routine laboratory testing of otherwise apparently normal animals increases the statistical likelihood of revealing test results that are outside of the normal range but not clinically significant. Interpretation of these values and decisions for further workup require clinical judgment in the context of the individual patient; additional workups are not always innocuous.[74]

The components of the minimum database for the different life stages can be found in Table 8-2. The incidence of many feline diseases increases with age.[74]

Although limited studies have been done to identify the age of onset of hyperthyroidism in cats, hyperthyroidism is considered to be the most common endocrine disorder in cats older than 8 years of age.[62] Total T_4 (TT_4) testing is recommended in all senior and geriatric cats, and veterinarians should strongly consider TT_4 testing in apparently healthy mature cats.[99] Many cats have concurrent chronic renal disease and hyperthyroidism, and each disease can affect the laboratory tests of the other; chronic kidney disease can decrease the TT_4 into the normal range, and hyperthyroidism can lead to a decreased serum creatinine value despite chronic renal disease.[37]

Hypertension, a common problem in senior cats, is most commonly associated with chronic renal disease or hyperthyroidism. Currently, Doppler ultrasound devices

TABLE 8-2 Components of the Minimum Database for Different Life Stages

	Kitten/Junior	Adult	Mature	Senior/Geriatric
Complete blood count + cytology	+/−	+/−	+	+
Chemistries + electrolytes	+/−	+/−	+	+
Urinalysis + sediment	+/−	+/−	+	+
Total T_4		+/−	+/−*	+
Blood pressure		+/−	+/−	+
FeLV/FIV testing	+	+/−	+/−	+/−
Fecal flotation	+	+	+	+

Adapted from Vogt AH, Rodan I, Brown M et al: AAFP-AAHA: feline life stage guidelines, *J Feline Med Surg* 12:43, 2010.
*The panel recommends that veterinarians strongly consider T_4 testing in apparently healthy mature cats. More incidence data are needed to make concrete recommendations.

are the most accurate blood pressure machine for small patients such as cats. To prevent "white-coat hypertension," the veterinarian should measure the cat's blood pressure in the examination room with the owner present. The cat should be allowed to acclimate to the room for at least 5 or 10 minutes; this can decrease anxiety-associated hypertension up to 20 mm Hg.[11] More information on sample collections is found in Chapter 1.

Retrovirus Testing

Feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV) are among the most common infectious diseases of cats; in a study of more than 18,000 cats tested in the United States in 2004, 2.3% were seropositive for FeLV antigen and 2.5% were seropositive for FIV antibody.[50] A similar survey of more than 11,000 cats in Canada found that seroprevalence for FeLV antigen was 3.4% and seroprevalence for FIV antibody was 4.3%.[52] Although vaccines exist for both viruses, testing and segregation of infected cats are the cornerstone for prevention of spread to noninfected cats.

The FeLV and FIV status of all cats should be known. FeLV antigen and FIV antibody enzyme-linked immunosorbent assay (ELISA) tests are the screening tests of choice. Although these are excellent tests, no test is 100% accurate. However, negative test results for either FeLV or FIV are much more reliable than positive test results because of the low prevalence of infection in most cat populations. Positive test results should be confirmed. A cat with a confirmed-positive test result should be diagnosed as having a retroviral infection, not clinical disease; even in sickness, the cat infected with FeLV or FIV may not be sick as a result of the retrovirus infection. In fact, cats infected with FeLV or FIV may live for many years. A decision to euthanize should never be made solely on the basis of whether the cat is infected. Positive tests help identify infected cats so as to prevent exposure to others and influence patient management in preventive and illness care.

Two situations can cause false-positive FIV results: Cats vaccinated against FIV will be seropositive, and kittens younger than 6 months of age may test positive if the queen was infected or vaccinated and passed FIV antibodies to the kitten through the colostrum. Kittens that test positive for FIV antibodies should be retested every 60 days up to 6 months of age. If the kitten is seronegative at 6 months of age, it is unlikely to be infected.

All cats should be tested at appropriate intervals on the basis of risk assessment. This includes testing of all new cats entering a household or group housing (e.g., shelters). Cats with negative tests should be retested in 60 days or more; if retesting for FeLV and FIV separately, the veterinarian should retest for FeLV a minimum of 30 days after initial FeLV testing and a minimum of 60 days after initial FIV testing. This is especially helpful when clients cannot or will not keep the new cat separated from other cats in the household, because FeLV is more commonly transmitted among friendly cats. Testing should also occur before initial vaccination for FeLV or FIV, and annual retrovirus testing is recommended for cats that remain at risk of infection, regardless of vaccination status. Retrovirus testing is discussed in detail in the AAFP feline retrovirus management guidelines.[49]

Ringworm, especially that caused by *Microsporum canis*, is very common in cats housed in shelters; in one study up to 38% of cats housed in shelters were culture positive.[79] Fungal culture testing of all kittens and adult cats adopted from shelters can decrease the spread of this fungal agent to other pets and to people.

Genetic Testing

In the future genetic testing may become a more important part of wellness testing in veterinary medicine. Cats are subject to numerous genetic diseases, the most common being hypertrophic cardiomyopathy (various breeds as well as nonpedigreed cats) and polycystic kidney disease in Persians, Exotic Shorthairs, Himalayans, and any breeds with Persian ancestry.[9] Genetic testing can help breeders reduce the prevalence of genetic diseases (or eliminate them altogether) through informed breeding choices. Pet adopters also can identify cats with possible genetic problems before purchase, which is helpful for breeding and pet purposes. When clients want to purchase a cat of a breed with known genetic diseases, veterinarians can advise them to request results of genetic testing for both parents and, if available, the kitten. Many laboratories offering genetic testing accept samples collected with a cheek swab. Genetic test results should be recorded in the medical record in a location that is easy to find (e.g., master problem list).

For example, hypertrophic cardiomyopathy (HCM) genetic mutations have been identified in Maine Coon and Ragdoll cats. The prevalence of myosin-binding protein C mutation in Maine Coons worldwide is 34%.[29] In humans with this disease, there are many different causative genetic mutations, which also is likely to be the case in the cat, but to date most of these mutations have not been identified. It is important to recognize that absence of the identified mutations does not mean the cat will never develop HCM. The Veterinary Cardiac Genetics Laboratory of Washington State University and the University of California Veterinary Genetics Laboratory (see Box 8-1) offer HCM tests: one for the mutation found predominantly in Maine Coonss,[59] the other for Ragdolls.[60] Both the University of California and the University of Pennsylvania, Section of Medical Genetics, offer other feline genetic tests (see Box 8-1).

Blood typing is also recommended for breeds with a high prevalence of blood type B, such as Cornish and Devon Rex, Birmans, and British Shorthairs. If blood transfusion is needed for cats with blood type B, a donor with the same blood type is required to prevent a severe transfusion reaction (see Chapter 25). It makes sense to obtain the blood type of cats belonging to these breeds when they are kittens and to record the blood type prominently in the medical record.

More information about genetic testing is found in Chapter 44.

Dental Care

Dental disease is extremely common in cats and can affect feline health and welfare.[53] Client education about preventive dental care is crucial because the majority of cat owners do not understand the seriousness of this silent disease. As previously noted, cats rarely show signs of pain, and their difficulty chewing and other problems related to their dental disease may not be obvious. Left untreated, dental disease is often painful, can lead to inappetence, and can contribute to other local and systemic diseases. Fortunately, dental care allows for optimal health and quality of life.[41]

The compliance rate for preventive dental care in the United States is only 9% for cats,[56] which is less than that for any other needed preventive care.[1] As mentioned previously, cat owners generally have a higher level of education than dog owners and may become more compliant if they receive adequate information.[56] Incidence studies and other statistical information may help clients recognize that feline preventive dental care is necessary. In one study of 109 apparently healthy cats, 98.2% had periodontal disease.[34] The prevalence of tooth resorption lesions in cats in the same clinical environment showed lesions to be present in 70% of purebred cats and 38% of mixed-breed cats. These cats were fed only dry food and had annual dental scalings.[33]

Cats of all life stages need both home and veterinary dental care to allow for complete oral health—kittens for retained deciduous teeth and dentition problems and cats 2 years of age and older for periodontal disease and other problems.[41] The wellness examination is the ideal time to discuss dental health. An oral examination is included with each exam, and at least an annual examination is recommended for cats with healthy dentition. Semiannual examinations can help ensure optimal home care.[41] In addition, cats with gingivitis should be evaluated every 6 months, and more frequently if periodontitis is found.[41]

Evaluation of the oral cavity in the conscious feline patient allows the veterinarian to design a preliminary treatment plan[41]; anesthesia is required to perform a complete and thorough oral examination and formulate a precise treatment plan. Dental cleaning, periodontal probing with a dental explorer, and intraoral radiographs allow a complete assessment of the dental patient. Dental radiographs, and not skull films, are critical to evaluate the teeth and determine pathology when it is not otherwise apparent (Figure 8-11). Important pathology was found in one study in 41.7% of cats when no abnormal findings were noted in the awake patient.[98] When abnormal findings were noted in the conscious patient, dental radiographs revealed additional pathology in 53.9% of cats.[98]

Staff and client education is important to reinforce the concepts that most dental disease is hidden and that anesthesia with review of digital or intraoral radiographs is necessary for a complete oral examination. The veterinarian should discuss all safety measures taken to support the cat under anesthesia and pain management to prevent or control pain.

Terminology is also important; most people equate dental care with clean teeth and not oral health; this reduces compliance and client understanding of preventive dental care. Instead of saying, "Your cat needs a dental," veterinarians should explain to clients the benefits of oral health care and what is involved. For example, the veterinarian might say, "Dental prophylaxis is recommended for cats every year, starting at 1 year of age, to prevent periodontal disease."[41] Dental prophylaxis should be done in cats with an essentially healthy mouth or with mild gingivitis.[41] Patients with dental disease should undergo dental treatment or oral surgery. It is important to explain to clients that prophylaxis involves removing plaque and calculus both supragingivally (above the gum line) and subgingivally (below the gum line). Cleaning only above the gum line has no therapeutic effect; it is the plaque and calculus below the gum line that cause periodontal disease, the most common dental disease in cats. Dental prophylaxis includes several important steps, and the American Veterinary Dental Society has developed an excellent

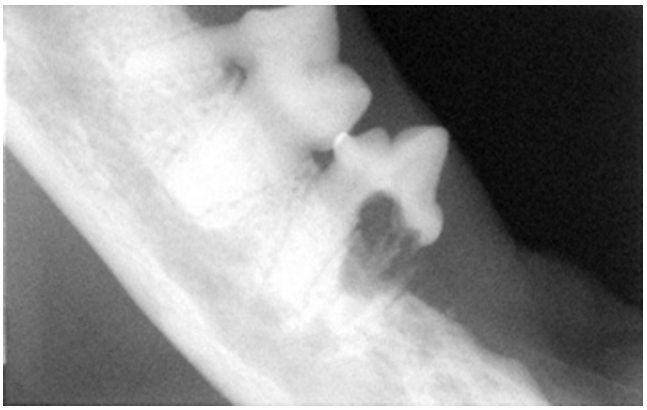

FIGURE 8-11 Dental radiographs identify tooth resorptive lesions that may not otherwise be evident and allow evaluation of other dental structures. *(Image courtesy Dr. Ilona Rodan.)*

educational piece that may be used to educate clients about the steps of dental prophylaxis and other needed dental care (see Box 8-1).

Home dental care should be addressed both at wellness appointments and after dental prophylaxis, with or without dental treatment. Home care can maintain or improve dental health.[77] Tooth brushing is the gold standard of home dental care. It is best to begin client education about tooth brushing when the patient is a kitten. However, even older cats can be trained to accept tooth brushing, and this should be recommended for them routinely. Client compliance for adult cats may increase if education follows dental prophylaxis or treatment because these clients are more aware of dental health problems. Tooth brushing should never be done in a forceful manner or when the client is at risk of being injured. It is best to train the cat with positive reinforcement, starting first by lifting the lips and immediately giving the cat a treat. Then the client can try to give the cat a little seafood or poultry toothpaste, which, with any luck, the cat will find palatable. The conditioning or training may take 1 week or more, but with continued positive reinforcement of the desired behavior, it is successful in most cats. Providing clients with verbal instruction and supplemental information on tooth brushing is helpful; the Cornell Feline Health Center has a helpful video (see Box 8-1).

Additional home care can include dental diets, treats, and chews that have been approved by the Veterinary Oral Health Council (VOHC), which certifies products as effective for plaque or calculus removal (or both); these products can be found on the VOHC website (see Box 8-1). This is especially helpful for clients who are unable or unwilling to brush teeth at home, but is likely not as effective as daily tooth brushing. (See Chapter 21 for more information on dental and oral diseases.)

Nutrition and Weight Management

Providing optimal nutrition is a crucial part of preventive health care for cats at all life stages. Feline nutrition and dietetics are covered in more detail in Chapters 15 to 19, but some of the basics relating to preventive health care are briefly reviewed here.

Diet Basics

Cats are obligate carnivores, with a predatory rather than scavenging natural lifestyle and a preference for consumption of frequent small meals. Their natural diet, which consists mainly of wild rodents, is relatively high in protein and fat, and in studies cats show a preference for synthetic diets that mimic this profile.[27,73] As obligate carnivores, cats have a high protein requirement, and a number of animal-derived nutrients (e.g., the amino acids taurine and arginine; vitamins A, D, and B_3 [niacin]; and the polyunsaturated fatty acids arachidonic acid and docosahexaenoic acid) are obligatory in their diets, although these may not be absolutely essential during all life stages.[6,64]

The precise energy and nutrient requirements of cats vary depending on various factors such as age (e.g., increased nutrient demand during growth and reduced digestibility in older cats), activity levels, neutering status, and pregnancy and lactation. Although home-prepared diets may be used to support all feline life stages, ensuring that all macronutritional and micronutritional needs are adequately provided in such foods can be problematic, and there may be risks associated with the use or feeding of raw foods (e.g., transmission of infectious diseases). Commercially available dry or wet foods that meet the specific nutritional requirements of cats at the appropriate life stage and have been tested in feeding trials are the best way to ensure that a diet is satisfactory.[99] Development of food preferences in cats is complex and incompletely understood. Studies of feeding behavior in cats have demonstrated a so-called monotony effect in which cats may develop an aversion to foods that have formed a large part of their diet. This may be a protective mechanism; eating a variety of foods may reduce the likelihood of an unbalanced or deficient diet. However, although the monotony effect has been demonstrated in both kittens and adults, it appears to be much stronger in free-ranging cats and can be abrogated, at least in part, in cats raised on nutritionally complete diets.[10] Kittens are also strongly influenced in their food preferences by their mothers,[10,101] and a primacy effect may be seen whereby adult cats develop a strong preference for their weaning or normal diet.[10,90]

Feeding Regimens

Many feeding regimens may be successful in maintaining feline nutritional health, including both free access to daily food rations and provision of food in meals. It is impossible to replicate the natural diet or feeding conditions of wild cats, but partially mimicking this by placing dry food in foraging devices (e.g., food balls or puzzles) or dispensing the food in multiple small meals in several widely dispersed places (which may include hiding the food) may help in slowing food intake and providing mental and physical stimulation.[99] Cats should be fed away from toileting areas (e.g., litter boxes), and quiet areas should be chosen, especially for nervous cats. For healthy cats there is no evidence to suggest that feeding a single diet or feeding a variety of diets (or flavors) is beneficial or detrimental, and the preferences of an individual cat may be determined in part by food exposure at the time of weaning.

Neither wet (canned) nor dry commercial foods mimic the texture, consistency, or energy density of the natural feline diet, but both have been demonstrated to be effective in maintaining optimal nutrition. For healthy

cats there is no evidence to suggest that either dry or wet foods are preferable, and the choice depends largely on owner preference.[13,99] However, in certain conditions in which increased water intake is desirable, feeding wet rather than dry foods may help achieve this goal.

Factors to Consider When Changing Diets

A change of diet may be necessary for medical or other reasons at various times in the cat's life. Changing the diet can be problematic for a number of reasons, including those associated with food preference. In individual cats the monotony effect (i.e., the desire to explore alternative food sources) or the primacy effect (i.e., the desire to maintain the same food source) may dominate. Acceptance of a new food is generally easier in cats in which the monotony effect dominates, but because development of food preferences is complex, feeding patterns that would achieve this are difficult to recommend. Neither previous feeding of a single food nor previous feeding of a variety of foods is necessarily associated with increased ease in introducing a new food.

General considerations with the introduction of a new food are to provide an isocaloric intake comparable to that of the old food (unless specific adjustments are necessary) and to offer the new diet along with the old diet for a period of time, perhaps mixing the two and gradually increasing the proportion of the new diet. Mixing the diets may increase acceptance of the new diet, but this also may result in both food types being rejected. A gradual change to a different diet will help increase acceptance of a new diet and also minimize the risks of any gastrointestinal disturbance that might occur with a sudden change. Warming the new diet and increasing its palatability by adding fish juice may help.[99]

Weight Management

Obesity, generally defined as 20% or more above ideal body weight, is prevalent in cats in many Western countries. Estimates of the number of obese or overweight cats vary between 5% and 50%. Obesity is associated with a number of other diseases, such as diabetes mellitus, hepatic lipidosis, osteoarthritis, and lower urinary tract disease.[19,103] Obesity is most prevalent in middle-aged cats, and recognized risk factors include neutering, gender (it is more prevalent in males), lack of exercise (indoors only, no other animals in the house), and the owner's tendency to underestimate the cat's body condition.[4,19,81,82] Interestingly, a study from the Netherlands showed an association between the degree of obesity in dogs and the body mass index of the owners, but no such relationship was found for cats and their owners.[69] Nevertheless, the complex human–pet interactions associated with feeding are undoubtedly an important component in the high prevalence of obesity.[47]

Neutering appears to be a major contributory factor to the development of obesity, with both male and female cats being less active after neutering and undergoing hormonal changes that also contribute to obesity, such as reduced lipoprotein lipase, adiponectin activity, and insulin sensitivity and increased leptin, prolactin, and insulin-like growth factor-1 expression.[7,40,58]

Prevention of obesity after neutering is a crucial goal in preventive veterinary medicine, and careful discussions with clients should include the need to restrict caloric intake after neutering by carefully measuring daily food allocations and avoiding *ad libitum* feeding, the importance of encouraging activity, and the potential value of altering diet type (e.g., increased moisture, air, or fiber) to help control caloric intake. Regular monitoring of body weight and body condition score along with appropriate adjustments of caloric intake are vital. Neutered cats are likely to need approximately 30% fewer calories than typically indicated in feeding guidelines printed on cat food packaging.[103] Using food balls, hiding food, and encouraging foraging through other means can be valuable ways both to increase exercise and to prevent overeating at meal times (Figure 8-12).[99]

Parasite Control

Effective control and prevention of parasites is of considerable importance both to promote the health of kittens and cats and to prevent zoonotic infections. Control of ectoparasites is found in Chapter 22, and specific endoparasite infections are covered in Chapter 23. This section focuses on preventive health care as it relates to the major endoparasite infections.

Various studies have been published evaluating the prevalence of gastrointestinal parasites in cats by fecal or postmortem examination. Results of some of these

FIGURE 8-12 Hiding kibbles and toys in a puzzle box simulates hunting for food. *(Image courtesy Dr. Ilona Rodan.)*

TABLE 8-3 Prevalence of Selected Gastrointestinal Parasites Found in Seven Different Studies

	Gates & Nolan[32]	Gow et al[36]	Barutzki & Schaper[5]	Yamamoto et al[102]	Calvete et al[15]	Nichol et al[68]	Palmer et al[72]
Year	2009	2009	2003	2009	1998	1981	2007
Country	U.S.	U.K.	Germany	Japan	Spain	U.K.	Australia
Number of cats	1566	57	3167	1079	58	92	572
Toxocara cati	7.5%	15.7%	26.2%	21.8%	55.2%	53.3%	3.2%
Toxascaris leonina	0.1%	0	0			1.1%	0.3%
Ancylostoma spp.	0.5%	0	0.3%	13.2%	29.3%		0%
Isospora felis	3.7%	7%	15.3%	4.5%		4.3%	5.6%
Isospora rivolta	1.2%	0	7.9%	2.2%			2.7%
Taenia taeniaformis	0.3%	0	2.6%	0.2%	8.6%	12.0%	0
Dipylidium caninum	0.8%	0	0.1%	1.4%	20.7%	38.4%	0.2%

studies are shown in Table 8-3. The data from different countries and studies are clearly not comparable insofar as the prevalence of infection largely depends on the age, background, and lifestyle of the cats examined and is also affected by the detection technique used. In general, nematode (with the exception of hookworms) and protozoal infections are more common in young cats, whereas cestode and hookworm infections tend to be more common in adults. Infections are generally also more common in stray or feral cats and in cats from multicat environments. Also, there are geographic variations in the prevalence of parasites, with some having a restricted distribution.

Although a variety of diagnostic tests are valuable in assessing the presence of endoparasites, fecal flotation techniques are commonly employed in veterinary clinical practice to diagnose and demonstrate infection with common endoparasites such as helminths, nematodes, and coccidia. Commonly used solutions for fecal flotation techniques include zinc sulfate (331 g $ZnSO_4$ in 1 L water, for a specific gravity [SG] of 1.18 to 1.20), magnesium sulfate (450 g $MgSO_4$ in 1 L water, for a SG of 1.20), and saturated salt (350 g NaCL in 1 L water, for a SG of 1.18 to 1.20). However, studies in dogs (which can be assumed to be applicable to cats) indicate that using a modified Sheather's sugar solution that produces a higher SG of 1.27 (454 g granulated sugar dissolved in 355 mL hot water with 6 mL formaldehyde to prevent microbial growth) is considerably more efficient in diagnosing common infections. This method yields fewer false-negative results (studies used 2 g feces mixed with 10 mL flotation solution), especially when dealing with heavier worm eggs such as *Taenia* spp. Furthermore, the use of a centrifugation–flotation technique (280 g for 5 minutes) followed by a standing time of 10 minutes was also much more sensitive than using a simple standing flotation technique, even allowing up to 20 minutes standing time for the latter.[22] These studies emphasize the importance of using the correct techniques to optimize results from routine fecal examinations.

According to the CAPC (see Box 8-1) in the United States, client awareness of intestinal parasites is low, and knowledge of the zoonotic risks is even lower. Among the zoonotic parasites, *Toxocara cati* has recently been increasingly recognized as a potential cause of visceral and ocular larval migrans in humans.[28] Both the CAPC and the European Scientific Counsel Companion Animal Parasites (ESCCAP) (see Box 8-1) publish guidelines on the diagnosis and prevention of parasitic infections of dogs and cats. Together, the 2008 CAPC guidelines and the 2006 ESCCAP guidelines carry a number of recommendations, including the following:

- Parasite control should be guided by veterinarians and should be adapted to the individual needs of the animal (e.g., those dictated by regional and epidemiologic data, the lifestyle of the cat, such as access to intermediate and paratenic hosts, and the health status and history of the cat).
- Pet owners should be informed of the risks of parasitic infections to their pets and to humans, and responsible pet ownership should be promoted.
- Pet populations should be protected from the risks associated with increased travel of pets between geographic areas, and the impact this can have on the spread of parasites should be considered (ESCCAP, 2006).
- Regular year-round broad-spectrum parasite control (including heartworm, where indicated) should be undertaken for the life of the pet.

- Regular fecal examinations are recommended, two to four times in the first year of life and one to two times per year in adults (CAPC, 2008). Fecal testing can be used to monitor the effectiveness of preventive programs.
- Pets should be fed commercial diets or cooked foods to prevent raw meat–transmitted parasites.
- Good hygiene measures should be taken, including cleaning up feces regularly (at least daily) to reduce environmental contamination and zoonotic risks. Particular attention should be given to worm control in cats with free access to outdoors given the difficulty of controlling where they defecate (ESCCAP 2006), and children's sandboxes should always be covered when not in use.
- All staff within the veterinary clinic should be aware of protocols to control parasitic infections, and these protocols should be applied in a consistent way.
- Special care should be taken in giving accurate information to immunocompromised pet owners or caregivers and other groups that may be more susceptible to zoonotic disease, such as infants and young children, people with learning difficulties, and people with occupational risks.

Client-oriented information is available from both CAPC and ESCCAP to help educate owners, and the United States Centers for Disease Control website (see Box 8-1) also provides information on a variety of zoonoses. A detailed and comprehensive review of feline endoparasites is beyond the scope of this chapter, but a brief overview of the major worms of concern with routine prophylaxis is provided in the following sections.

Toxocara cati *and* Toxascaris leonina

Toxocara cati and *Toxascaris leonina* are prevalent ascarid (roundworm) nematode infections in cats, and most cats are thought to become infected at some point in their lives. Generally *T. cati* is more commonly encountered than *T. leonina*, and both are more common in kittens and young cats than adults. Adult worms measuring 8 to 15 cm in length are found in the small intestine, with ova being shed in the feces after a prepatent period of approximately 5 to 7 weeks for *T. cati* and around 9 to 12 weeks for *T. leonina*. The life cycle can be either direct (through ingestion of infective ova) or indirect (through ingestion of infected paratenic hosts such as rodents, birds, worms, or mollusks). In contrast to dogs, there is no transplacental migration with *Toxocara* spp. in cats, although infection with *T. cati* leads to liver–lung migration of larvae, and because larvae may also be present in the milk of queens, they can be transmitted to neonatal kittens. Diagnosis of infection is through fecal flotation techniques to demonstrate the presence of ova. However, routine fecal examination may not always detect the presence of an infection, and because these ascarids are prevalent and *T. cati* should be considered a zoonosis, routine prophylaxis (discussed later) is always recommended.

Dipylidium caninum

In general *Dipylidium caninum* is the most prevalent cestode infection of cats, although geographic and lifestyle variations exist. Mature worms are 20 to 50 cm in length and shed motile proglottids (containing egg sacs) in the feces. The proglottids, which resemble rice grains, may also be observed around the perineum, and egg packets can be seen microscopically in the feces. Flea larvae ingest eggs from the environment, and the life cycle is completed when cats ingest infected fleas during grooming. The prepatent period is approximately 3 weeks. Because fleas are the intermediate host, cats may be infected from a young age. Humans are occasionally infected also by ingesting infected fleas.

Taenia taeniaformis

Taenia taeniaformis is generally the most prevalent *Taenia* spp. infecting cats, although geographic variations occur. *Taenia* spp. are usually found in cats that are active hunters or are fed raw meat, which is the primary source of infection (intermediate hosts). Adult worms are approximately 60 cm in length and shed proglottids in the feces. Rodents and lagomorphs act as intermediate hosts for *T. taeniaformis,* and after ingestion there is a prepatent period of 4 to 11 weeks. Diagnosis is by observation of proglottids or identification of taeniid eggs in feces by flotation or sedimentation.

Ancylostoma *and* Uncinaria *spp.*

Cats are host to several hookworm species, the most widely distributed of which is *Ancylostoma tubaeforme.* Although *Uncinaria stenocephala* has a wide geographic distribution, cats are relatively resistant to infection with this worm. Adults in the small intestine are typically 1 to 3 cm long, eggs are passed in the feces, and larvae that develop are infective for either cats or paratenic hosts. Cats are infected by cutaneous penetration of larvae, ingestion of larvae, or ingestion of an infected paratenic host (e.g., rodents), and there is a prepatent period of 2 to 4 weeks. There is no evidence of transplacental or transmammary transmission of hookworms in cats, but humans can also be infected (cutaneous larva migrans). Infection can be demonstrated by detecting eggs in feces by flotation.

Dirofilaria immitis

Although more resistant to infection than dogs (the prevalence of infection in cats is generally approximately 10% of that seen in dogs), cats can host heartworm, with small numbers of adult worms developing in some (in

the right ventricle and pulmonary artery). Infections in cats are usually more severe than in dogs, and *Dirofilaria immitis* is an important cause of morbidity and mortality in cats. There is a wide geographic distribution for *D. immitis,* with infection being more prevalent in tropical and subtropical climates where the mosquito intermediate hosts exist. Diagnosis of *D. immitis* infection in cats relies on a combination of antigen and antibody tests and also echocardiography, which may demonstrate adult worms in the right side of the heart, the caudal vena cava, or the pulmonary arteries.[51] Radiographs of the chest may show enlargement of the caudal lobar arteries and a bronchointerstitial lung pattern (heartworm-associated respiratory disease) that may mimic feline asthma. Treatment of cats infected with adult *D. immitis* is not recommended because this can induce fatal reactions, which underscores the importance of prophylaxis to prevent infection with this parasite in cats.

Routine Endoparasite Prophylaxis in Kittens

Because prenatal infection does not occur in kittens, both the CAPC and ESCCAP recommend starting prophylactic roundworm and hookworm therapy at 3 weeks of age, with treatment being repeated every 2 weeks until the kitten is 9 weeks of age. The CAPC then recommends that kittens receive monthly therapy along with the nursing queen. In heartworm-endemic areas, choosing a monthly preventive therapy for heartworm that also has efficacy against roundworms is a sensible approach to control.

Routine Endoparasite Prophylaxis for All Life Stages

The ESCCAP guidelines note that annual or twice-annual therapy for roundworms and hookworms does not have any significant impact on patent shedding of eggs, and continued monthly therapy is appropriate, especially in situations of increased risk, such as when the cat resides in a household with children or is allowed free access outdoors (where they may be defecating and contaminating the environment). Monthly therapy for hookworms and roundworms is also recommended by the CAPC as ideal for adults. In lower-risk situations, ESCCAP recommends a minimum therapy frequency of four times a year. Whether a narrow- or broad-spectrum anthelmintic is used depends on the risk of exposure to other parasites, and fecal testing two to four times a year not only helps monitor the effectiveness of the prophylaxis but also may allow identification of parasite infections not covered by the routine anthelmintics being used.

Infection with cestodes is more common in adults than kittens, and the risk is directly related to contact with, and access to, intermediate hosts. Prevention of predation, provision of commercial foods or fully cooked meat only, and avoidance or prevention of flea infestations will minimize the risk of cestode infection. However, when such risks cannot be completely controlled, routine prophylaxis is indicated and a broad-spectrum anthelmintic (rather than a narrow-spectrum type that controls only ascarids and hookworms) should be selected.

Both indoor and outdoor cats are at risk of infection with heartworm, and routine prophylaxis is important in areas where the parasite is endemic or when cats may move to such areas (e.g., cats that vacation with owners in such areas). In these cases monthly prophylaxis is recommended. Testing (serum antigen and antibody tests) of cats before commencement of therapy is recommended by both the CAPC and the ESCCAP to detect any cats already infected; using products that are adulticide in an infected cat may create a life-threatening reaction, and adulticide treatment is therefore not generally recommended for cats at this time. There is no evidence that it improves survival in infected cats, and the death of adult worms can be life threatening. However, the American Heartworm Society (see Box 8-1) recommends monthly doses of oral ivermectin or milbemycin oxime or topical moxidectin or selamectin as chemoprophylaxis against heartworm infection from 8 weeks of age in cats in endemic areas, and administration of these drugs is not precluded by a positive serum antigen or antibody test. Many heartworm preventives also provide control of other parasites, and the spectrum of activity of some anthelmintics used in cats is shown in Table 8-4.

TABLE 8-4 Spectrum of Activity of Selected Anthelmintics and Combinations of Anthelmintics

Drug	Ascarids	Hookworms	Cestodes	Heartworm
Piperazine	X	X		
Pyrantel	X	X		
Benzimidazoles	X	X	X*	
Praziquantel			X	
Milbemycin	X	X		X
Ivermectin		X		X
Pyrantel/praziquantel	X	X	X	
Selamectin	X	X		X
Imidacloprid/moxidectin	X	X		X
Milbemycin/praziquantel	X	X	X	X

*Not *Dipylidium caninum.*

Vaccination

Prevention of disease is the ultimate goal of veterinarians, and the widespread use of vaccines undoubtedly has contributed greatly to achievement of that goal. However, the current prevalence of vaccination in cat populations is not sufficiently high to achieve a good level of herd immunity, and elimination of infectious agents,[42] with only an estimated 25% of cats in North America ever being vaccinated.[84] The practical implication of this statistic is that a more realistic goal is containment and control of infection in defined populations of cats (e.g., multicat environments), along with protection of the individual animal against disease and infection. However, the value of reaching a much wider population of cats with vaccination should not be underestimated, and the WSAVA Vaccine Guidelines Group (VGG) has stated that the aim should be to vaccinate *every* animal but each individual animal less frequently.[21]

Vaccination is not an entirely innocuous procedure, and side effects sometimes occur. The prevalence of adverse events associated with vaccination has recently been reported to be less than 1%, depending on the vaccine and method of data collection.[31,35,63] It is important to note that most of these reactions are mild and transient. In one study risk of an adverse reaction after vaccination was greatest for cats of approximately 1 year of age, and lethargy with or without fever was the most commonly reported reaction.[63] Female cats were at greater risk than male cats of the same neuter status. Although breed was not associated with increased risk in this study, in another report based on a passive surveillance system in the United Kingdom, some breeds were overrepresented.[31] Occasionally, though, severe and life-threatening events can occur, such as hypersensitivity reactions or injection-site sarcomas.[20,42] Such devastating effects, although rare, challenge the assumption that vaccine choice and vaccination intervals are not important considerations. Adverse events should be reported to both the product manufacturer and the appropriate regulatory authority. In the United States this is the Department of Agriculture, Center for Veterinary Biologics (http://www.aphis.usda.gov), in Canada this is the Canadian Food Inspection Agency (http://www.inspection.gc.ca), and in the United Kingdom this is the Veterinary Medicines Directorate (http://www.vmd.gov.uk).

Although in the past there was a tendency to recommend annual booster vaccinations for all or most vaccines, scientific data are increasingly becoming available to demonstrate the true duration of immunity (DOI) after the use of different vaccines, which provides a more rational basis for the recommendations regarding the frequency of booster inoculations. There has also been an interest in measurement of immune responses to predict resistance to infection and determine whether revaccination is required. For most feline infectious agents, the presence of serum antibodies indicates that the cat has the immunologic memory required to mount a rapid anamnestic response if exposed to the agent. Unfortunately, local immune responses, particularly important for certain respiratory and gastrointestinal tract pathogens, are not easily measured. Information about vaccine-induced serum antibody responses and resistance to infection has been collected primarily for feline panleukopenia virus (FPV), feline herpesvirus (FHV-1), and feline calicivirus (FCV). For FPV cats with serum antibodies from vaccination within the previous 7 years are protected against challenge.[80] However, the situation is not as clear for FHV-1 and FCV because vaccination against these pathogens does not reliably induce sterilizing immunity. The predictive value of serum antibody titers to determine the need for revaccination is unclear.[80] It is important to note that antibody tests offered by laboratories should not be assumed to be equivalent and virus neutralization assays are probably the best predictor of resistance to infection. Finally, failure to demonstrate serum antibodies against FPV, FCV, or FHV-1 does not necessarily indicate susceptibility to infection but should be taken as an indicator that revaccination is likely beneficial.

Three international panels have been established to provide guidelines on feline vaccination protocols (Table 8-5): the AAFP Vaccine Advisory Panel, which most recently reported in 2006[80]; the WSAVA VGG, which reported in 2007[21]; and the European Advisory Board on Cat Diseases (ABCD), which reported in 2009.* The major recommendations, made by all three of these bodies, are summarized as follows:

- Vaccines should not be given needlessly.
- An annual health examination is advisable irrespective of whether vaccines are given.
- Owners should be involved with discussions, and the risks and benefits of vaccination should be explained so that informed consent is given.
- Adverse reactions to vaccines should be properly reported to vaccine manufacturers and regulatory authorities.
- Vaccines should be classified as *core* (i.e., vaccination of *all* cats is justifiable) and *noncore* (i.e., vaccination can be justified only in certain circumstances).
- Booster vaccination schedules include extended intervals (beyond the traditional 12 months), especially for the core vaccines (for which more data are available), but choices should be made on an individual basis, and protocols cannot be formulated that are suitable for all cats in all circumstances.

Certain circumstances may influence a cat's ability to respond to vaccination. Cats and kittens should always receive a complete physical examination before

*References 3, 24, 30, 38, 43, 57, 76, 94, 97.

TABLE 8-5 Summary of Feline Vaccination Recommendations from the AAFP, WSAVA, and ABCD Vaccine Guideline Groups

Vaccine	Initial Series: Kittens (<16 Weeks)	Initial Series: Adults (>16 Weeks)	Boosters
CORE VACCINES			
FPV	First dose at 8 weeks (or as early as 6 weeks), booster every 3-4 weeks until 16 weeks old	Two doses, 3-4 weeks apart	Booster 1 year after last kitten vaccine, then no more often than every 3 years
FHV-1 + FCV	First dose at 8 weeks (or as early as 6 weeks), booster every 3-4 weeks until 16 weeks old	Two doses, 3-4 weeks apart	Booster 1 year after last kitten vaccine, then no more often than every 3 years
Rabies: Canarypox virus-vectored	Start as early as 8 weeks, revaccination 1 year later	Two doses, 1 year apart	Annually, or every 3 years, depending on local laws and product licensing
Rabies: Killed virus	Start as early as 12 weeks, revaccination 1 year later	Two doses, 1 year apart	Annually, or every 3 years, depending on local laws and product licensing
NONCORE VACCINES			
FeLV	Start as early as 8 weeks, booster 3-4 weeks later	Two doses, 3-4 weeks apart	Booster 1 year after last kitten vaccine, then annually for cats at ongoing risk (ABCD recommends booster vaccines every 2-3 years after 3-4 years of age)
FIV	Start as early as 8 weeks, booster every 2-3 weeks for 2 additional doses (3 doses required)	Three doses required, administered 2-3 weeks apart	Booster 1 year after last kitten vaccine, then annually for cats at ongoing risk
FIP	First dose at 16 weeks, booster 3-4 weeks later	Two doses, 3-4 weeks apart	Annual booster recommended by vaccine manufacturer
Chlamydophila felis	Start as early as 9 weeks, booster 3-4 weeks later	Two doses, 3-4 weeks apart	Annual booster for cats at ongoing risk
Bordetella bronchiseptica	Single dose as early as 8 weeks	Single dose	Annual booster for cats at ongoing risk

FPV, Feline panleukopenia virus; *FHV,* feline herpesvirus; *FCV,* feline calicivirus; *FeLV,* feline leukemia virus; *FIV,* feline immunodeficiency virus; *FIP,* feline infectious peritonitis.

vaccination to determine age, existence of illness, and factors that may affect the immune response. Maternally derived antibodies (MDAs) may affect the ability of kittens to respond to vaccination. In most kittens MDA is lost by 9 to 12 weeks of age, but this may occur either earlier (6 weeks of age or earlier) or later (as late as 16 weeks of age) depending on the individual and the pathogen. Little data exist to determine whether senior cats respond to vaccination as do younger cats. In the absence of data, healthy senior cats and those with stable chronic diseases should receive vaccinations as do younger cats.[80]

In cats with acute disease, high fevers, or debilitation, vaccination should be delayed until the cat has recovered.[80] Vaccination of cats with chronic but stable illnesses may be done at the discretion of the veterinarian. Another common situation facing veterinarians is vaccination of cats on chronic corticosteroid therapy. Corticosteroids may cause suppression of immune responses, but studies evaluating vaccine efficacy and safety in cats receiving corticosteroids are lacking. The concurrent use of corticosteroids at the time of vaccination should be avoided when practical.[80]

Core vaccines can be administered to healthy FIV- and FeLV-infected cats, and noncore vaccine should be used only if justified by risk of exposure. Cats with FeLV may not receive protection from vaccination comparable to that achieved in uninfected cats.[80] Healthy FIV-infected cats are able to mount an immune response to vaccination. It is not known if cats with FIV may develop vaccine-induced disease. The administration of killed virus vaccines is recommended when possible.

Generally, vaccines are administered at intervals of 3 to 4 weeks. The minimum interval between vaccinations is 2 weeks, and the maximum recommended interval is 4 weeks.[80] If a kitten is presented for a booster vaccination 6 weeks or longer after the previous dose, at least two doses of vaccine should be administered, 3 to 4 weeks apart.[80] Adult cats of unknown vaccination status may receive a single modified live virus core vaccination, with a booster 1 year later. If a killed virus core vaccine product is used, adult cats should receive two injections, 3 to 4 weeks apart, with a booster vaccination 1 year later. The exception is rabies vaccine, wherein one injection is given with a booster 1 year later. Any brand of vaccine is suitable as a booster; it is not

necessary to use the same brand as for the previous immunization.

Kittens are typically enrolled in socialization classes between 7 and 14 weeks of age, too young to have received a complete set of vaccinations. Ideally class size should be limited to fewer than eight kittens, and kittens should receive at least one FPV, FHV-1, and FCV vaccine at least 10 days before the first class.[80]

Feline Panleukopenia Virus

Vaccination against FPV is usually highly effective, with most vaccinated cats being completely protected against disease and infection. Although vaccination is highly efficacious, FPV remains a prevalent virus and all three feline vaccine guideline groups (FVGGs) recommend FPV as a core vaccine. In kittens vaccination should start as early as 6 to 8 weeks of age, and inoculations should be repeated every 3 to 4 weeks until the cat is 16 to 20 weeks of age. Giving a final vaccine at 16 to 20 weeks of age helps ensure optimal vaccine efficacy in those cats in which high levels of MDAs may prevent an effective response at an earlier age. Modified live vaccines should not be used in kittens younger than 4 weeks of age or in pregnant queens because of the risk of cerebellar damage in the developing brain. In high-risk situations, modified live injectable vaccines may provide a more rapid onset of immunity, whereas intranasal vaccines may be less effective. In FeLV- and FIV-infected cats and in immunocompromised cats, using a killed rather than a modified live vaccine is recommended.

Studies have demonstrated a prolonged DOI after successful vaccination with FPV, and therefore all three FVGGs have recommended a booster at 1 year of age followed by boosters no more frequently than every 3 years.

Feline Herpesvirus and Feline Calicivirus

Both FHV-1 and FCV are ubiquitous viruses; infection is extremely common, and vaccination plays a major role in controlling disease. Vaccination is important in protecting cats from disease and reducing the severity of disease in infected cats, although it does not necessarily prevent infection with these viruses (partly because there are many different strains of FCV, and partly because of the inherent difficulty in inducing sterilizing immunity against these viruses). Vaccinated cats can also become carriers and pass infection to others. Because of the prevalent nature of these viruses and the severe disease they sometimes cause, all three FVGGs recommend these as core vaccines. Similar to FPV, recommendations are to start vaccination at 6 to 9 weeks of age and repeat every 3 to 4 weeks until 16 weeks of age. Early vaccination (from around 4 to 6 weeks of age) is particularly appropriate in high-risk situations or where MDA status is questionable. As with FPV, in FeLV- and FIV-infected cats and those that are immunocompromised, killed vaccines are recommended.

Both the AAFP and WSAVA guidelines suggest giving the first booster at 1 year of age, followed by booster inoculations every 3 years (although the AAFP suggests considering additional boosters if the cat is going to enter a known high-risk situation, such as a boarding cattery). In contrast, the ABCD guidelines generally recommend annual boosters for FHV-1 in all but low-risk situations and boosters every 3 years for FCV. However, the ABCD defines low-risk cats as those that are kept strictly indoors and have no contact with other cats; it might be arguable as to whether these cats should be defined as low risk insofar as their lifestyle affords little or no exposure to respiratory viruses and therefore little or no opportunity for natural boosting of immunity.

Although at least one commercial vaccine has been made available that has incorporated a virulent-strain FCV isolate, the AAFP has pointed out that because outbreaks of virulent systemic disease are caused by unique and variable mutations of existing FCV isolates, the incorporation of one such variant in a vaccine is unlikely to be of appreciable benefit in protecting against other virulent strains that may emerge.

Feline Leukemia Virus

Infection with FeLV has been one of the major infectious causes of death in domestic cat populations. For many years test-and-removal policies were the main way of controlling FeLV infection, and while this is still appropriate in breeding colonies, there is no doubt that the introduction of effective FeLV vaccines has played a very important role in controlling this disease among pet cats. A number of FeLV vaccines are available, and there are marked differences in the way a number of these vaccines have been developed, which may lead to appreciable differences in efficacy among them.[89,96] All three FVGGs regard FeLV vaccination as noncore insofar as not all cats are necessarily at risk for infection (the virus generally requires prolonged close contact between cats for efficient transmission). Vaccination of kittens is begun at 8 to 9 weeks of age, with a second vaccine given 3 to 4 weeks later. Testing for FeLV is recommended before vaccination, and because no FeLV vaccine can guarantee complete protection, vaccination should not be seen as a failproof way to protect FeLV-free cats living with FeLV-infected cats.

The AAFP has recommended that strong consideration be given to vaccinating all kittens against FeLV. This is a logical recommendation worthy of serious consideration because it is rarely, if ever, possible to predict with absolute certainty what environment and lifestyle a kitten will ultimately have (and therefore what the

potential future risk of exposure may be) and because kittens are also the most susceptible age group to infection with the virus.

Where required, the AAFP and WSAVA groups recommend annual booster vaccinations for FeLV, whereas the ABCD group recommends annual boosters until 3 to 4 years of age and then boosters every 2 to 3 years. The latter recommendation has merit in that the DOI for FeLV vaccines may be longer than 12 months (although specific studies evaluating this are lacking), and traditionally it has been thought that there is an age-related natural resistance to infection, meaning that older cats are less likely to become infected than younger cats.

Rabies Virus

Vaccination against rabies virus is considered a core vaccine by all three FVGGs where rabies is endemic or where vaccination is required by statute, and this is a major zoonotic virus. Rabies vaccination is highly efficacious after a single inoculation and recombinant, vectored, and killed vaccines are available. The three FVGGs generally recommend vaccinating kittens at 12 to 16 weeks of age to avoid any risks of interference from MDA, although earlier vaccination (from 8 weeks) is possible with some vaccines. All three groups recommend a booster at 12 months followed by inoculations every 1 to 3 years depending on statutory regulations and vaccine licensing.

Feline Immunodeficiency Virus

The use of FIV vaccines remains controversial. One of the major difficulties with the currently available FIV vaccine is that it induces an antibody response that is indistinguishable from that induced by natural infection, and thus vaccinated cats will yield positive results on routinely used serologic diagnostic tests (and vaccine-induced antibodies are known to persist for at least 12 months). Some questions also have been raised regarding the efficacy of the vaccine, and although cross-protection with other strains or clades of FIV has been demonstrated in some studies,[45,46,48,75] the vaccine did not induce protection against a virulent United Kingdom–derived FIV isolate in one study,[23] and it has not been widely tested against European isolates of the virus. The AAFP has recommended the FIV vaccine be regarded as noncore, with use restricted to cats at high risk of infection, with antibody testing being carried out immediately before vaccination and vaccinated cats permanently identified as such (e.g., through microchipping). However, the WSAVA does not recommend the FIV vaccine, and the ABCD stipulates that the vaccine is not recommended in Europe for the reasons given.

Feline Infectious Peritonitis

Similar controversy surrounds the use of the currently available feline infectious peritonitis (FIP) vaccine. The AAFP states that this vaccine is not generally recommended, pointing out that although the vaccine (a temperature-sensitive modified live intranasal feline coronavirus [FCoV] vaccine) appears to be safe, significant questions have been raised regarding its efficacy, insofar as only cats seronegative (and potentially FCoV-naïve) are likely to respond to vaccination and show some protection. The vaccine is not licensed for use in kittens younger than 16 weeks of age, and kittens reared in environments where FCoV is endemic (i.e., the ones most likely to benefit from vaccination) are likely already to have been exposed to the virus at that age, making vaccination futile. The WSAVA similarly states that the FIP vaccine is not recommended, whereas the ABCD categorizes it as noncore and recommends that it be considered in kittens likely to be seronegative but that may subsequently enter a FCoV-endemic environment. The ABCD notes that vaccine-induced immunity is likely to be short-lived and recommends regular (annual) booster vaccinations when use is justified.

Chlamydophila felis *and* Bordetella bronchiseptica

Both *Chlamydophila felis* and *Bordetella bronchiseptica* may cause ocular and upper respiratory tract disease and are more prevalent in multicat environments. However, in contrast to FCV and FHV-1, both *C. felis* and *B. bronchiseptica* can be effectively treated with antibiotics, and these agents are not as prevalent as the viral causes of upper respiratory tract disease. Although vaccination may prevent or reduce the severity of clinical disease, and the onset of protection with the intranasal *B. bronchiseptica* vaccine may be very rapid, all three FVGGs recommend that these be regarded as noncore vaccines, with their use restricted to cats at risk of exposure in multicat environments (i.e., where these agents have been demonstrated to be endemic). Antibiotics should be avoided at the time of administering modified live bacterial vaccines, and the ABCD recommends that *B. bronchiseptica* vaccination be avoided in immunosuppressed cats.

Summary

Vaccination plays a vital role in the control of many diseases, but care needs to be exercised in developing vaccination programs tailored to the needs of the individual cat. Vaccination of all cats against certain common and important pathogens can be justified, but for other pathogens the choice of whether to vaccinate should be made carefully on the basis of local epidemiology, the lifestyle of the cat, and discussion of the risk and benefits of vaccination with the cat owner. The stated aim of the WSAVA—to vaccinate every animal

TABLE 8-6 Additional Web Resources for Feline Health Care

Category		Veterinarian	Client/Owner
GENERAL WELLNESS INFORMATION			
Feline Advisory Bureau (FAB)	http://www.fabcats.org	✓	✓
Morris Animal Foundation Healthy Happy Cat	http://www.research4cats.org		✓
Veterinary Partner	http://www.veterinarypartner.com		✓
CATalyst Council	http://www.catalystcouncil.org	✓	✓
AAHA Compliance Study (2003, 2009)	http://www.aahanet.org	✓	
Veterinary Information Network	http://www.vin.com	✓	
Felipedia	http://www.felipedia.org	✓	✓
The Cat Group	http://www.thecatgroup.org.uk	✓	✓
Cornell Feline Health Center	http://www.vet.cornell.edu/fhc	✓	✓
Winn Feline Foundation	http://www.winnfelinehealth.org	✓	✓
BEHAVIOR, ENVIRONMENT, AND THE VETERINARY ENCOUNTER			
OSU Indoor Cat Initiative	http://www.indoorcat.org	✓	✓
Humane Society of US—Indoor Cats	http://www.hsus.org	✓	✓
FAB Cat Friendly Practice	http://www.fabcats.org	✓	
Dumb Friends League: Playing With Your Cat	http://www.ddfl.org		✓
NUTRITION AND DIET			
American College of Veterinary Nutrition	http://www.acvn.org	✓	
MEDICAL/DENTAL CARE			
AAFP Vaccination Guidelines	http://www.catvets.com	✓	
AAFP Zoonoses Guidelines	http://www.catvets.com	✓	
AAFP Retrovirus Testing Guidelines	http://www.catvets.com	✓	
AAFP Feline Senior Care Guidelines	http://www.catvets.com	✓	✓
AAHA Senior Care Guidelines For Dogs & Cats	http://www.aahanet.org	✓	
AAHA Dental Care Guidelines for Dogs & Cats	http://www.aahanet.org	✓	
AAHA/AAFP Pain Management Guidelines	http://www.aahanet.org	✓	
International Veterinary Academy of Pain Management	http://www.ivapm.org	✓	
Veterinary Anesthesia and Analgesia Support Group	http://www.vasg.org	✓	
PARASITE PREVENTION			
Veterinary Parasitology Image Database	http://instruction.cvhs.okstate.edu	✓	
Companion Animal Parasite Council	http://www.petsandparasites.org		✓
VACCINATION			
European Advisory Board on Cat Diseases	http://www.abcd-vets.org	✓	

but each individual less frequently—is highly laudable. For many vaccines increasing data demonstrate a prolonged DOI, and clinicians should strive not to vaccinate more frequently than necessary. Perhaps of note is the fact that in the United States, since 1998, when the AAFP first introduced recommendations suggesting booster vaccination for core vaccines be given less frequently (i.e., every 3 years) and despite apparent widespread uptake of this recommendation, there have been no reports or suggestions of outbreaks of disease that

would otherwise have been prevented by more frequent vaccination.

More information is still needed to reconcile some of the discrepancies among the recommendations of the three international FVGGs and to provide a greater evidence base for ongoing refinement and changes to these recommendations, but a growing international consensus is emerging regarding the way feline vaccines should be employed. It is also noteworthy that the AAFP has made recommendations about the site of administration of feline vaccines to help identify vaccines that may be associated with development of injection-site sarcomas and to enable more effective treatment of these on the rare occasions when they arise. The vaccine site recommendations are as follows:

- FPV, FHV-1, FCV (± *C. felis*): given subcutaneously on the lateral right forelimb below the elbow
- Rabies: given subcutaneously on the lateral right hindlimb below the stifle
- FeLV and/or FIV: given subcutaneously on the lateral left hindlimb below the stifle
- Site of other medications should be recorded

The value of this procedure has been emphasized by a recent publication showing that the use of such recommendations is indeed successful in altering the anatomic distribution of injection-site sarcomas and may therefore have a significant impact on disease management when this devastating side effect occurs.[86]

Client Communication and Resources

Clients face a potentially overwhelming amount of information at each visit to the veterinarian, so effective communication is essential if cats are to receive optimal health care. Studies in human medicine have demonstrated that after consultations with doctors, patients remember only a very limited amount of information accurately, which emphasizes the need for good communication and the use of ancillary aids such as client handouts, DVDs, and reliable websites.

In addition to the literature created by veterinarians for their own clients, a vast number of other resources are available to assist veterinarians and their clients. Websites may be oriented toward pet owners, veterinarians, or both; some useful resources for the feline clinician and cat owner are listed in Table 8-6.

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