Cancer Chemotherapy for the Veterinary Health Team

Cancer Chemotherapy for the Veterinary Health Team

Edited by

Kenneth Crump and Douglas H. Thamm

WILEY-BLACKWELL

A John Wiley & Sons, Inc., Publication

Wiley-Blackwell is an imprint of John Wiley & Sons, formed by the merger of Wiley's global Scientific, Technical and Medical business with Blackwell Publishing.

Registered office: John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK

Editorial offices: 2121 State Avenue, Ames, Iowa 50014-8300, USA
The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK
9600 Garsington Road, Oxford, OX4 2DQ, UK

For details of our global editorial offices, for customer services and for information about how to apply for permission to reuse the copyright material in this book please see our website at www.wiley.com/wiley-blackwell.

Library of Congress Cataloging-in-Publication Data
Crump, Kenneth, 1952-
Cancer chemotherapy for the veterinary health team / Kenneth Crump, Douglas H. Thamm.
p. ; cm.
Includes bibliographical references and index.
ISBN 978-0-8138-2116-0 (pbk. : alk. paper)
1. Tumors in animals–Chemotherapy. 2. Veterinary oncology. I. Thamm, Douglas H. II. Title.
[DNLM: 1. Neoplasms–drug therapy. 2. Neoplasms–veterinary. 3. Drug Therapy–methods. 4. Drug Therapy–veterinary. SF 910.T8]
SF910.T8C78 2011
636.089'6994–dc22
2011002196

A catalogue record for this book is available from the British Library.

This book is published in the following electronic formats: ePDF 9780470960042; ePub 9780470960059; Mobi 9780470960066

Set in 9.5 on 12.5pt Palatino by Toppan Best-set Premedia Limited

Disclaimer

The publisher and the author make no representations or warranties with respect to the accuracy or completeness of the contents of this work and specifically disclaim all warranties, including without limitation warranties of fitness for a particular purpose. No warranty may be created or extended by sales or promotional materials. The advice and strategies contained herein may not be suitable for every situation. This work is sold with the understanding that the publisher is not engaged in rendering legal, accounting, or other professional services. If professional assistance is required, the services of a competent professional person should be sought. Neither the publisher nor the author shall be liable for damages arising herefrom. The fact that an organization or Website is referred to in this work as a citation and/or a potential source of further information does not mean that the author or the publisher endorses the information the organization or Website may provide or recommendations it may make. Further, readers should be aware that Internet Websites listed in this work may have changed or disappeared between when this work was written and when it is read.

1 2011

Contents

Contributors vii
Preface ix
Acknowledgments xi

1 Dispelling the Myths of Animal Cancer and Its Treatment **3**
Douglas H. Thamm

2 Cancer Basics **15**
Kenneth Crump

3 Preparation for Chemotherapy Administration **23**
Kenneth Crump

4 Assessment of the Chemotherapy Patient **37**
Kenneth Crump and Douglas H. Thamm

5 Chemotherapy Handling, Safety, and Disposal **57**
Richard Allen and Kenneth Crump

6 Workflow for Chemotherapy Administration **71**
Kenneth Crump

7 Chemotherapy Agents **93**
Douglas H. Thamm

8 Management of Chemotherapy Side Effects **101**
Douglas H. Thamm

9 Compassionate Client Communication **113**
Erin Allen and Gail Bishop

Glossary 135
Index 141

Contributors

Erin Allen, MSSW, Argus Institute, Clinical Sciences Colorado State University, Fort Collins, CO

Richard Allen, RPh., Diplomate TCVP, Colorado State University, Fort Collins, CO

Gail Bishop, BS, Argus Institute, Clinical Sciences, Colorado State University, Fort Collins, CO

Kenneth Crump, AAS, AHT, Payson, AZ

Douglas H. Thamm, VMD, DACVIM (Oncology), Associate Professor of Oncology, The Animal Cancer Center, Colorado State University, Fort Collins, CO

Preface

More than 1.2 million dogs are diagnosed each year with cancer, a number that trails not far behind the American Cancer Society's estimate of 1.4 million people diagnosed with cancer annually. Animals today have many of the same options for cancer treatment that people consider when treating their own cancers. And every year, more and more devoted owners begin the financial and emotional battle to keep their beloved pets alive.

General practice veterinarians, who may have referred clients to a veterinary cancer specialist in the recent past, now work directly with specialists to offer a convenient and optimal course of chemotherapy for their patients. Spurring the movement toward chemotherapy administration in smaller local practices, the industry now offers safer and cost-effective devices to protect personnel from accidental exposure to cytotoxic drugs. Because these devices can be easily integrated into a practice, training can be completed easily and in a timely manner.

There is great disparity, however, in advanced training opportunities available to veterinary technicians when compared with opportunities available in the human cancer nursing field. Nurse practitioners can seek an advanced degree in oncology nursing and pursue further specialization with certification programs. Oncology nursing students are exposed to the latest approaches to cancer prevention and early detection. Their classroom instruction is supplemented with clinical experiences led by experts in their field. By contrast, virtually every veterinary technician, whether working in a large referral specialty practice or in a small rural general practice, learns to administer chemotherapy on the job.

Cancer Chemotherapy for the Veterinary Health Team is the first handbook of its kind, designed to provide veterinary technicians, and those working as veterinary technicians, concise practical details about the management of the veterinary cancer patient. We have summarized up-to-date information about the patient, the disease, the oncology client, and the treatment of cancer with chemotherapy and organized the major subdivisions into chapters. Key points are included at the beginning of each chapter to facilitate easy access to practical information.

This manual is a comprehensive reference guide to the safe administration of chemotherapy. It dispels myths about treating cancer in pets, teaches techniques of client communication and education, ensures the safety of personnel, and reinforces the value of quality medical care. Veterinary technicians play a central role in the treatment of pets diagnosed with

cancer. Whether you see a few cancer patients each hour or a few cancer patients each year, this book details practical and important information you need to unwind the cycle of unpleasant expectations and create a successful chemotherapy experience for the pet, the owner, and the hospital staff.

Kenneth Crump
Douglas H. Thamm

Acknowledgments

This book would not be possible without the team effort of many people and reflects the direct and indirect contributions of a number of doctors, technicians, and owners dedicated to the treatment of pets with cancer. In addition to our talented contributors, the authors are grateful to Polly Webb, Carol Heun, Evan Kim-Thamm, Dr. Kelly Carlsten, Elizabeth Atencio, Jay Oaks, Charlie Kerlee, and "Samantha" for their assistance with photography, as well as Chelsey Walden-Schreiner and Erica Judisch of Wiley-Blackwell for their enthusiastic guidance and encouragement.

Cancer Chemotherapy for the Veterinary Health Team

1 Dispelling the Myths of Animal Cancer and Its Treatment

Douglas H. Thamm

Key points

- Cancer is a disease we can sometimes cure.
- The four most dangerous words in cancer treatment are "Let's just watch it."
- Obtaining a diagnosis prior to surgery is important.
- Often, the part of the tumor that we can see and feel is only the "tip of the iceberg."
- Pets experience chemotherapy differently from humans.
  - Fewer and less severe side effects
  - Most dogs and cats do not lose a lot of hair from chemotherapy
- The sooner we start chemotherapy, the better chance the drugs have to do their job.
- Radiation therapy is a form of local therapy.
  - Side effects like nausea, fatigue, or bone marrow suppression do not occur.
  - Pets are not radioactive after treatment.

Cancer Chemotherapy for the Veterinary Health Team, First Edition. Edited by Kenneth Crump and Douglas H. Thamm.

Introduction

There is a great stigma attached to a diagnosis of cancer. It is natural for owners of pets with cancer to relate cancer treatment in animals with the experiences they have had with their own treatments, that of their friends, or their family members. Understanding how cancer treatment in animals differs from cancer treatment in humans is critical when informing owners about cancer and discussing treatment options. Pet owners want to make an informed decision when selecting treatment for their dogs or cats with cancer, and the veterinary technician is often called upon to help answer these questions for the owners.

This chapter describes many of the common questions that owners have about animal cancer and its treatment, and some ideas on how to answer those questions. It is presented in a "question-and-answer" format, with explanations and additional information following the answers.

General information, pretreatment diagnostics, and staging

Client: *Is cancer really a problem in animals?*

Technician: Unfortunately, yes. It is the leading "natural" cause of death in adult dogs and the second or third leading cause in cats. Up to 50% of dogs and 30% of cats will be affected by some type of tumor in their lifetime.

Client: *Why does it seem like there is so much more cancer in pets these days?*

Technician: Better health care = longer life. Cancer is an old-age disease, and more pets are living long enough to get old-age-related illnesses.

Explanation
We are getting so good at managing other husbandry-related conditions in our pets (nutrition, infection, parasites, keeping pets indoors and on leashes) that they are now living long enough to develop more old-age conditions, such as heart disease, kidney disease, endocrine disease, and **cancer**. Furthermore, now that there are more cancer specialists and options for treating cancer in pets, it is being reported more frequently.

Client: *Did something in the environment play a role in Sparky's cancer? Was I feeding the wrong food?*

Technician: For most forms of cancer, we don't know of any specific causes.

Explanation
There have been some relationships suggested between certain types of cancer and the environment. For instance, some suggest a relationship between canine lymphoma and certain farm chemicals or living in urban areas. Canine mesothelioma has been linked to asbestos. Second-hand smoke has been a suggested contributor to feline gastrointestinal lymphoma. But in most cases, such associations do not hold up to further investigation. Thus, based on what we currently know, food additives, lawn chemicals, pesticides, or cosmic rays do not seem to significantly increase a pet's risk of most cancers.

Client: *What is the difference between "cancer" and "tumor"?*

Technician: There is no practical difference. Both refer to abnormal masses in the body that occur as a result of cell growth that has become disorganized and no longer responds to the normal signals telling them to stop growing.

Client: *What is the difference between "benign" and "malignant"?*

Technician: ***Malignant*** tumors are those that have the ability to invade surrounding tissues deeply and/or spread to other parts of the body. ***Benign*** tumors do not spread and do not invade very deeply. Small surgery is much more likely to permanently fix a benign tumor than it is to fix a malignant tumor.

Client: *Why should I treat my dog's cancer?*

Technician: Cancer is a disease that we can sometimes cure. Diseases like heart disease, diabetes, and other endocrine diseases, as well as cancer, can all be thought of as chronic diseases. We treat many animals with chronic diseases that are never cured. Even in cases where cure is unlikely, there are many ways we can extend a pet's excellent quality of life with treatment.

Client: *Why can't we just watch the mass and see what happens?*

Technician: The four most dangerous words in cancer treatment are "Let's just watch it." The sooner we know what this is, the sooner we can begin appropriate treatment.

Explanation
Owners may question why a fine needle aspiration or biopsy of a mass needs to be performed, rather than simply monitoring the mass for change. In general, delay in diagnosis only increases the difficulty of treatment because delay allows the tumor to grow. This may mean a larger, more complicated, more risky, or more expensive surgery. Larger tumor size is associated with worse outcomes for several important veterinary cancers. The lump you are dealing with may be benign, but if it is malignant, the time to find that out is now.

Client: *Doesn't performing a fine needle aspiration or biopsy make the tumor "angry" and increase the risk of spread?*

Technician: NO. There is no risk of increased spread from a fine needle aspiration or biopsy.

Explanation
Exceptions to this rule are the following:

(1) Some mast cell tumors may become "inflamed" following a fine needle aspiration due to histamine release, although this does not, in any way, increase the spread. This is rarely serious and can be treated or prevented with an antihistamine, such as diphenhydramine.
(2) Needle aspiration/needle core biopsy of splenic and bladder masses is not recommended due to the risk of local tumor dissemination in the abdomen and/or seeding of the biopsy tract. In these situations, tumor cells can seed either the abdominal cavity after bleeding (spleen) or the body wall as tumor cells are dragged through it by the needle (bladder). Cytocentesis for urine collection in patients suspected or known to have bladder cancer should likewise be avoided.
(3) It is important that needle aspirations and biopsies of cutaneous/subcutaneous masses are planned so that the biopsy tract can be removed when the tumor is removed. This will prevent regrowth along the tract.

Client: *Why don't we just take the tumor off? Why do we need to do a fine needle aspiration or biopsy first?*

Technician: Knowing what we are dealing with before surgery lets us know how big a surgery we need to perform, and whether there are any tests that should be performed beforehand.

Explanation
Obtaining a diagnosis prior to surgery lets the veterinarian know whether additional tests are indicated prior to surgery and helps to plan the surgical approach. This helps avoid situations like "Why didn't you take X-rays before surgery?" and "Why should I have to pay for a second surgery if you 'didn't get it all' the first time?" If surgery is used to obtain a diagnosis, it is important that the owner understands that it may only be another diagnostic test. Based on what is learned from a diagnostic surgery, more tests or treatments might be necessary.

Client: *We already did surgery. Isn't that enough? Why can't we just wait and see if it grows back?*

Technician: If a malignant tumor has been incompletely removed (the so-called dirty cut), the likelihood of regrowth may be high. Tumors that grow back can be much harder to treat.

Explanation
Additional treatment, such as more surgery or radiation therapy, is often recommended if a tumor has been incompletely removed. Locally recurrent tumors (tumors that grow back after surgery) are associated with a worse prognosis in certain diseases, such as canine mast cell tumor and oral melanoma, and are suspected of being worse in others. For this reason, if a tumor is incompletely removed, *the time to be aggressive is the very first time the tumor occurs*.

Client: *Why can't we wait and see if it spreads, instead of treating now?*

Technician: The sooner we start chemotherapy, the better chance the drugs have to do their job. Chemotherapy drugs can kill microscopic tumor cells in the lungs or lymph nodes, and can delay the appearance of spread. It is much harder for these drugs to shrink big tumors than it is for them to kill microscopic tumor cells.

Explanation
In general, the goal of chemotherapy treatment of cancer at high risk for spread is to improve and prolong a pet's quality of life. Chemotherapy works best against microscopic tumor cells. For example, the average survival time for dogs with osteosarcoma that had an amputation and began chemotherapy right away, is ***twice*** as long compared with those that had an amputation and then waited until the tumor has spread to receive chemotherapy.

Cancer surgery

Client: *Why do you have to do such a big surgery for such a little lump?*

Technician: Often, the part of the tumor that we can see and feel is only the "tip of the iceberg."

Explanation
Many malignant tumors are able to extend microscopic "fingers" of the tumor away from the main tumor mass (Figure 1.1). If a small surgery is performed to remove only the visible or palpable tumor mass, these fingers are left behind to regrow. Taking not only the main tumor mass but also a generous margin of normal-appearing tissue all around the tumor (including underneath) increases the likelihood that all of the tumor cells will be removed. This minimizes the likelihood of tumor regrowth.

Client: *Why should I pay for histopathology? Why don't you just take it off and throw it away?*

Technician: If we don't know what we removed, then we wouldn't know the prognosis. We don't know how likely the tumor is to grow back or

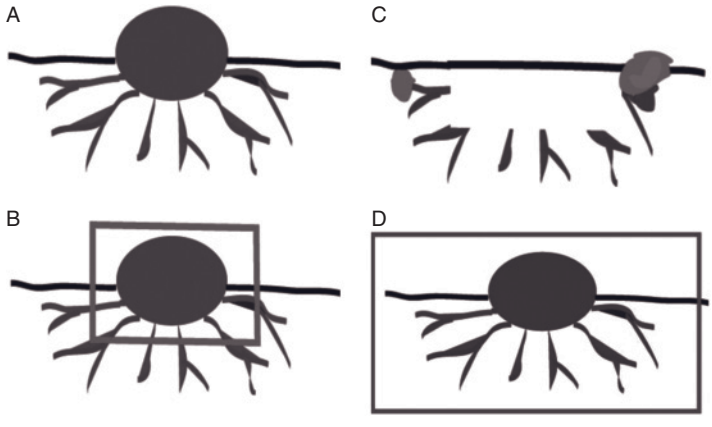


Figure 1.1 Diagram of growth of a malignant tumor. Drawing a figure such as this for owners considering cancer surgery can be very helpful to explain the need to remove a wide margin of normal-appearing tissue. (A) Away from the main tumor mass, which can be seen and felt, "fingers" of microscopic tumor tissue can grow. If a small surgery is performed that only removes the part that can be seen and felt (shown in B), the fingers on the edges have the potential to regrow over time (shown in C). If a large surgery is performed, which includes a large margin of normal-appearing tissue around the tumor and underneath as well, the chances of removing all tumor tissue, including the microscopic fingers, is maximized. This approach is shown in D.

spread, or whether we should be thinking about additional tests or treatments right now.

Explanation
If it's worth removing, it's worth submitting for microscopic evaluation. See "just wait and see" (above) for problems with the "we'll submit it for histopathology if it recurs" approach. Similarly, it is important to submit the entire mass that was removed rather than just parts or a section of a mass. This doubles the useful information you'll receive from the pathology report because **surgical margins** can be interpreted.

Chemotherapy

Client: *My great-aunt Harriet had chemotherapy, and she felt miserable all the time—I'd never do that to my dog!*

Technician: The drugs we use to treat cancer in animals are mostly the same drugs that humans receive. However, animals get much lower doses and fewer combinations of drugs at the same time, to minimize the risk of side effects.

Explanation
Less than one third of animal patients experience unpleasant side effects with the chemotherapy protocols in common use today. Less than 5% experience a severe side effect. The risk of a serious side effect is even less in cats than it is in dogs. If a side effect requires the pet to be hospitalized, it is usually home and feeling better in 24–72 hours. When unpleasant side effects do occur, doses can be reduced, drugs can be substituted, and additional medications can be dispensed to prevent them from happening again. These changes in a patient's chemotherapy protocol are effective 90% of the time. The likelihood of a chemotherapy-related death is less than 1 in 200 patients. See Chapter 7 for additional information about chemotherapy side effects.

Client: *OK, suppose my pet is the one that has a side effect? What kind of things are we likely to see?*

Technician: It's variable, but the most common side effect to see at home would be a few days of digestive upset—some decreased appetite, mild nausea/vomiting, or loose stool. Some animals can develop problems related to a decrease in the white blood cell count. We check this often to make sure that it does not get dangerously low.

Explanation
The likelihood and type of side effects seen varies by drug. In general, the most common side effect is related to the **digestive tract**. By way of comparison, it's usually similar to what you might see with an animal that got into the garbage. Animals experiencing this might need to eat bland food for a few days or take antinausea or antidiarrhea pills at home. Usually, this doesn't last for more than 3–5 days. A few patients may develop very severe vomiting/diarrhea (can't keep anything down, getting weak/dehydrated). Some patients have the potential to develop a low **white blood cell count**. We check this quite frequently, and most of the time, it is not low enough to be dangerous. A dangerous decrease of the white blood cell count puts pets at an increased risk for bacterial infections. In some cases, a patient might need to take oral antibiotics at home. A chemotherapy treatment might be delayed for a few days so the white blood cells can recover. See Chapter 7 for more information about chemotherapy side effects.

Client: *I don't want Fluffy to go bald!*

Technician: Fortunately, most dogs and cats do not lose a lot of hair from chemotherapy.

Explanation
It is true that some dog breeds can lose large amounts of hair from chemotherapy. The breeds that usually lose hair are those that have continuously growing hair coats and require regular grooming (poodles, schnauzers, etc.). The hair loss is rarely total. Most other breeds experience little or no hair loss. That being said, owners may find more hair around the house, and long-haired breeds have the potential for excessive matting. Regular brushing helps to prevent this. Cats can lose whiskers as well as the long, stiff guard hairs from their coats. In dogs and cats, areas that are shaved may regrow hair more slowly than expected. Hair loss from chemotherapy is a purely cosmetic change and is not itchy or painful. Hair that is lost will typically begin to regrow about a month following the completion of therapy.

Client: *I don't want Tiger's last weeks/months/years to be in and out of the hospital, like they were with Uncle Mac when he had cancer.*

Technician: Almost all veterinary chemotherapy treatments are done in an outpatient setting, and the whole visit only takes a few hours. Most treatments involve quick injections or short infusions rather than long infusions (there are exceptions). Overnight stays are almost never necessary. Many protocols involve a series of treatments, followed by careful observation. Giving chemotherapy forever is not usually the plan.

Client: *Will my family/guests/house/other pets be contaminated?*

Technician: Urine and feces pose little risk to owners. Few drugs are excreted for longer than 48–72 hours. Common sense is usually sufficient protection for your household. Accidents in the house during the first 48–72 hours should be thoroughly cleaned using detergent and water. Wear gloves when cleaning the urine or feces, and flush the excreta down the toilet. Normal daily activities are very important in maintaining your pet's good quality of life. Interactions such as grooming, playing, petting, or handling food and water bowls pose no real risk.

Client: *Sam loves to swim in the pond by our house. Can he still do that if he is getting chemotherapy?*

Technician: Absolutely. There are no restrictions on activity while pets are receiving chemotherapy. They can swim, hike, jog, go to dog parks, and so on. We want our pets to still be able to do all the things that make their quality of life good!

Client: *I have chemotherapy pills to give at home. Is there anything special I need to do?*

Technician: It is important to wear gloves when handling oral chemotherapy medications, and chemotherapy pills should never be crushed or split, nor capsules be opened. Similarly, oral chemotherapy should never

be administered in liquid form. All of these things increase your risk of exposure to the drugs.

Client: *But what about her age? Isn't she too old for treatment?*

Technician: Most of the patients with cancer that we treat are older dogs. Everything we know about effectiveness, survival, and tolerability of cancer therapy is from treating older patients.

Explanation
Age is not a disease! Far more important than age in years are the patients' general health (e.g., heart, liver, kidneys) and how they are feeling. We often spend extra time and money to check the overall health of our cancer patients (blood tests, chest X-rays, etc.). This is partly to make sure that there are no other age-related diseases present that could complicate cancer therapy or be more of a problem to the patient than the treatment of the cancer.

Client: *Is there any special food we should be feeding Rusty?*

Technician: We usually recommend that you keep feeding the same food that he has always been getting. Diet changes may increase the chances for stomach upset.

Explanation
There are no diets that are known to be better for cancer patients. Occasionally, we may suggest a food that is higher in calories for a patient that has been losing weight over time. *Raw meat diets should be avoided* in patients receiving chemotherapy. While the risk of sickness from bacterial contamination of raw meat is thought to be low (but not zero) in normal animals, it may be considerably higher in an animal receiving chemotherapy.

Client: *So what are our choices? We either do chemotherapy or put him to sleep?*

Technician: There are usually a lot of different choices for treatment. Some may be more complicated or more expensive than others, but there isn't one thing that works for every pet or every owner.

Explanation
Cancer therapy, in general, is usually not a single, "all-or-nothing" proposition. For many tumor types, a number of treatment options are available, depending on the patient's overall health, family travel concerns, finances, and risks of side effects. For example, treatment choices for canine lymphoma include prednisone alone; prednisone plus doxorubicin; a combination of cyclophosphamide, vincristine, and prednisone; or a multiagent injectable protocol such as the University of Wisconsin (UW)-Madison protocol. All differ in cost, risks of side effects, and number of visits required for treatment. They also differ in how effective they are.

Radiation therapy

Client: *What about radiation therapy for my dog's tumor?*

Technician: Radiation therapy is a *local* treatment. We can use it to treat local diseases when the spread is unlikely. This includes tumors that cannot be removed, or tumors that have not been completely removed and are likely to grow back. We can also use radiation to improve quality of life in some types of painful tumors.

Explanation
Radiation therapy can be very useful for certain tumors. It is a localized treatment used **most often to treat a local disease**. Local disease means tumors with a high likelihood of aggressive local infiltration and regrowth, but has a low risk of spreading to other parts of the body. There are four main ways that radiation therapy can be used:

(1) after surgery for tumors that have been incompletely removed. Examples include low- or intermediate-grade mast cell tumors; soft-tissue sarcomas, including feline vaccine-associated sarcoma; some oral tumors; and perianal tumors;
(2) before surgery in certain cases to make a tumor that is very large or invasive easier to remove;
(3) as the main therapy for certain tumors, such as nasal and brain tumors;
(4) to improve quality of life in some highly metastatic tumors, such as osteosarcoma and malignant melanoma, where pain, swelling, or difficulty eating and drinking can be life limiting.

Client: *So how does radiation therapy work?*

Technician: Radiation therapy is usually like a super-high-energy diagnostic radiograph. The radiation beam is created by electricity and aimed specifically at the tumor. In many cases, a large number of small radiation doses needs to be used to give the normal tissues in the area a chance to heal while doing as much damage as possible to the tumor tissue.

Explanation
Most "definitive" or "full-course" radiation therapy protocols involve a series of 10–25 treatments, given either Monday through Friday, or 3 days per week for several weeks. Although these treatments can be done on an outpatient basis, many animals will spend some of the time in the hospital for travel-related reasons. Most "palliative" or "coarsely fractionated" radiation therapy protocols will involve one to six weekly treatments, given on an outpatient basis.

Client: *But won't she be horribly sick from radiation?*

Technician: Radiation therapy is a form of local therapy. The radiation is only delivered to the site of the disease. Thus, side effects like nausea, fatigue, or bone marrow suppression generally do not occur. However, **each treatment does require a very short anesthesia** or heavy sedation to make sure that the radiation is delivered to the correct spot. There could be adverse systemic effects as a result of the anesthesia, but they are very rare in an otherwise healthy patient.

Client: *What about radiation burns?*

Technician: It's true that animals receiving radiation therapy can develop a sunburn-like reaction at the radiation site but this is temporary. These "acute effects" usually do not start until the second or third week of treatment and are gone 2–4 weeks after radiation therapy is finished.

Explanation
The local side effects from radiation can range from mild redness and itchiness to moist, oozing, painful, or ulcerated skin. Many animals need to wear an Elizabethan collar to prevent self-trauma. They may also receive oral antibiotics and/or pain medications during this period. After completion of the course of radiation, the radiated skin may be permanently hairless or the hair may only partially grow back. Also, the hair in the radiated area may simply turn white. Long-term side effects of radiation are rare, with the exception of the eyes of animals receiving radiation therapy for nasal, oral, or brain tumors. Eyes in the radiation field may develop cataracts, keratoconjunctivitis sicca (dry eyes), or both.

Client: *Will Lucky be radioactive when he comes home?*

Technician: No, dogs pose no risk to their owners when they come home.

Explanation
The standard form of radiation therapy in animals is **external beam**, which means radiation is shined down from an external source, not that different from a diagnostic X-ray. The radiation beam is created by electricity. When the machine is turned off, there is no radiation left behind. Animals undergoing radiation therapy pose no health risks to their owners. They are not radioactive.

Summary

It is natural for owners to have many questions about treatment for their pets with cancer. Having a discussion about animal cancer and its

treatment can be a very important way to help owners make decisions about how to best treat their pets. Many owners will need to know that the treatments discussed are not going to be "too hard" on their companions. Sometimes, pet owners will ask technicians more questions, or different questions, than they will to their veterinarians. Being able to educate owners about cancer and its treatment will help increase the likelihood that pets receive the treatment that they need to remain happy and healthy for as long as possible.

Additional reading

Chun R, Garrett L, MacEwen EG. 2001. Cancer chemotherapy. In: Withrow SJ, MacEwen EG (eds.), *Small Animal Clinical Oncology* (3rd Ed.). Philadelphia: Saunders, pp. 92–118.

Harvey A, Butler C, Lagoni L, Durrance D, Withrow SJ. 2001. A bond-centered practice approach to diagnosis, treatment and euthanasia. In: Withrow SJ, MacEwen EG (eds.), *Small Animal Clinical Oncology* (3rd Ed.). Philadelphia: Saunders, pp. 672–82.

Moore AS. 2002. Radiation therapy for the treatment of tumours in small companion animals. *Vet J* 164(3):176–87.

Thamm DH, Vail DM. 2007. Aftershocks of cancer chemotherapy: Managing adverse effects. *J Am Anim Hosp Assoc* 43:1–7.

Thrall DE. 1997. Biologic basis of radiation therapy. *Vet Clin North Am Small Anim Pract* 27(1):21–3.

Withrow SJ. 2001. Why worry about cancer in pets? In: Withrow SJ, MacEwen EG (eds.), *Small Animal Clinical Oncology* (3rd Ed.). Philadelphia: Saunders, pp. 1–3.

2 Cancer Basics

Kenneth Crump

Growth for the sake of growth is the ideology of the cancer cell.
—Author and environmentalist, Edward Abbey

Key points

- Not all tumors are cancer.
  - A tumor can be *benign*, *premalignant*, or *malignant.*
  - Cancer is, by definition, malignant.
- Cancer is characterized by three criteria: *uncontrolled growth*, *invasion*, and *metastasis*.
- The process by which normal cells become cancer cells is called **multistep carcinogenesis**.
  - There are three basic steps to multistep carcinogenesis: *initiation*, *promotion*, and *progression*.
- When cancer spreads to other locations in the body, beyond just localized tissue invasion, it is called **metastasis**.
  - A cancer must overcome the body's defenses and complete multiple steps in order to metastasize.
- Common cancer categories in veterinary medicine are *carcinomas*, *sarcomas*, and *hematopoietic tumors.*
- The grade of a tumor and the stage of the disease both significantly impact the plan for treatment.
  - The grade of a tumor indicates how closely it resembles the tissue from which it is derived.
  - Stage refers to the extent of the cancer based on the size and location of the primary tumor, the number of tumors, and the degree of tumor spread into lymph nodes or beyond.

Cancer Chemotherapy for the Veterinary Health Team, First Edition. Edited by Kenneth Crump and Douglas H. Thamm.

Introduction

In general, cancer is defined as an uncontrolled growth of cells. In order to better understand cancer, it is helpful to know how tumors form. Usually, cells grow and divide in a controlled and orderly manner. Under normal circumstances, the balance between cell reproduction and internally programmed cell death (called apoptosis) is maintained by the many natural mechanisms of the body. The body tightly regulates both processes to ensure healthy organs and tissues. Sometimes, however, cells continue to reproduce even when new cells are not needed. Alterations and mutations in cell DNA can disrupt the orderly balance of cell reproduction and cell death, causing changes in the normal regulatory process. As a result of unregulated growth, a mass of tissue, called a tumor, can then develop. Virtually any type of normal cell may undergo the changes that eventually create a tumor.

Although every cancer may be considered a tumor, not every tumor is cancer (also called malignant). In this chapter, we explore what makes a tumor malignant, the steps cells take to become a cancer, the different classifications of cancers, how they spread, and how a cancer's grade and stage help predict its progress and its eventual destruction with treatment.

Tumor versus cancer

Although any type of cell can eventually create a tumor, not all tumors become malignant or cancerous. Countless mutations and alterations of cell DNA occur continuously in the body. The cell's ability to recognize and repair these genetic errors prevents the majority of potential mutations from persisting. However, when a solid tissue mass is formed by the continued abnormal growth of cells, it is called a tumor. *Tumor* is not synonymous with cancer. A tumor can be *benign*, *premalignant*, or *malignant*. Cancer is, by definition, malignant.

A **benign** tumor grows in a limited, nonaggressive manner, and does not invade surrounding tissues, nor does it spread to other parts of the body. The term "benign" implies a mild and nonprogressive disease, and most benign tumors are harmless to a patient's health. However, some benign tumors may still produce negative health effects by producing a "mass effect," whereby the patient's normal daily life is impacted by the size or position of the tumor. An example of mass effect is a large benign tumor that has grown at the base of a dog's tail, obstructing normal defecation. The tumor itself poses no threat to the patient's health, but its size and position impact normal daily function. The general criteria for removing seemingly benign tumors in animals are as follows: (1) if the tumor is growing rapidly, (2) if it bothers the patient, or (3) if it bothers the owner.

A **premalignant** tumor is a tissue that is not yet malignant but is poised to become malignant. If left untreated, premalignant tumors are generally associated with a significantly increased risk of cancer. Often, the multiple genetic changes that transform a premalignant tumor into cancer take years to accumulate. During this time, its biological behavior slowly changes from that of a normal tissue to more cancer-like properties. Clinical and laboratory tests are designed to identify premalignant tissue while it is still in early stages, thereby preventing the development of cancer. Appropriate treatment depends on the particular premalignant tumor detected.

Malignant tumors typically become progressively worse and could result in death. They are characterized by three criteria: *uncontrolled growth*, *invasion*, and *metastasis*:

- Malignant tumors fundamentally alter the regulation of their own growth. In order for normal cells to become malignant, the genetic makeup of the cells regulating cell growth must be altered. Natural tumor suppressor genes, which inhibit cell division and survival, are often disabled by these alterations. In this way, the malignant cells become immortal, resulting in **uncontrolled growth**.
- **Invasion** refers to the intrusion into and destruction of adjacent tissues. Whereas a benign tumor may produce a "mass effect," impacting a patient's normal daily life by its size or position, a malignant tumor actually infiltrates its surrounding tissues. The infiltration results in the destruction of surrounding normal tissues, which can lead to pain; fixation of the tumor, restricting mobility; or organ dysfunction. Tumor invasion can impact the function of any structure or organ in the body.
- **Metastasis** describes the spread of a tumor to another location in the body, beyond the primary site. The path it takes and its metastatic destination are both determined by the cell type from which the tumor is derived.
- The word **cancer** is synonymous with malignant tumor.

Multistep carcinogenesis

It is not easy for a normal cell to transform into a tumor cell. Transformation into a cancer cell is even more difficult. The process by which normal cells are transformed into cancer cells is called **carcinogenesis**. Carcinogenesis results from mutations of the DNA of normal cells. More than one mutation is usually necessary for carcinogenesis. In fact, the transformation is called **multistep carcinogenesis** because a series of mutations is usually required before a normal cell can become a cancer cell. There are three basic steps to multistep carcinogenesis: *initiation*, *promotion*, and *progression*.

Step one: Initiation

The first stage, initiation, results in an irreversible change in the DNA of the cell. This may occur randomly or when a carcinogen damages the cell's DNA. After a single exposure to an initiating event, if the cell's repair mechanisms do not repair the DNA damage, then the cell is more prone to becoming a tumor cell. An example of an initiating event might be prolonged exposure to the sun. Because the process of multistep carcinogenesis can take years, the forgotten sunburn you had at summer camp could have initiated a population of skin cells. However, by itself, the initiating event is not sufficient to transform a normal cell into a tumor cell.

Step two: Promotion

During the second stage, promotion, the initiated cell is stimulated to grow and divide faster. It then becomes a population of cells. Only after repeated exposure to the promoting agent does it induce changes in the cell's shape and structure, and increase the rate at which it reproduces. In human cancers, cigarette smoking can act as a promoting event. Happily, the promotion stage of multistep carcinogenesis is usually reversible, as evidenced by the fact that lung damage can often be reversed after smoking stops.

Step three: Progression

The third stage of multistep carcinogenesis is called progression. This step is the "point of no return" for a normal cell. During progression, further irreversible changes are made to the DNA of cells that have undergone the initiation or promotion phases, creating malignant tumor cells. Here is how Hanahan and Weinberg describe the characteristics of malignant tumor cells in their article "The hallmarks of cancer":

Tumor cells

- acquire their own growth signals, leading to unchecked replication;
- ignore normal antigrowth signals, also leading to unchecked replication;
- overcome internally programmed cell death signals (apoptosis) in order to continue to grow, despite DNA errors;
- gain the capacity for limitless reproduction (immortality);
- can build blood vessels, which provide oxygen and nutrients, allowing a tumor to expand beyond the limitations of feeding on sidestream nutrients;
- invade neighboring tissues;
- spread to other locations in the body, beyond localized invasion (metastasis); and
- lose their capacity to repair DNA errors, leading to genetic instability, which accelerates all the other changes.

Therefore, in order for a normal cell to transform itself into a tumor, it must go through the complex process of being irreversibly altered at least twice, once in the initiation phase and once again in the progression phase. The promotion phase is reversible but alters an initiated cell in such a way as to increase the likelihood that it will be changed again by the progression phase.

Metastasis

When a malignant tumor (cancer) spreads to other locations in the body, beyond just localized tissue invasion, it is called **metastasis**. The process of metastasis is a complex game of survival, which rivals any television reality show. The metastasizing tumor cells must survive, overcome a host of challenges, and complete complicated tasks before it can develop a distant offspring. The sequence of events is called the *metastatic cascade*. For a cancer to succeed, it must overcome all of the body's defensive strategies and complete all seven necessary steps.

Step one: Detachment

The first step in the metastatic cascade is for the tumor to detach a cell from the primary tumor mass. This cell must be able to survive without contact with its neighbors, which is very difficult for most normal cells.

Step two: Invasion

Once detached, the tumor cell must find a way to enter either the blood or the lymphatic circulatory system.

Step three: Evasion of host defenses

Within the vascular or lymphatic channels, tumor cells must then withstand the assault by a barrage of cells from the body's immune system.

Step four: Arrest

Having survived the immune system's attack, metastatic tumor cells must come to rest in the small blood vessels and capillaries of their target organs. Different types of cancers have different metastatic target organs.

Step five: Attachment

Once the metastatic tumor cells have rested, they must find a way to stick to the walls of the vessels where they have been resting.

Step six: Extravasation

Fully rested and attached, the tumor cells must begin working their way through the protective vascular or lymphatic walls and into the soup of extracellular matrix. This process is similar to step two, but in reverse.

Step seven: Establishment of new growth

Once they have emerged through the vessel walls and into the extracellular matrix, the cancer cells must survive and proliferate into another tumor. A lot of replication has occurred before any tumor can be detected. For instance, it requires one *billion* cells to make a tumor the size of a garbanzo bean (about 1 cm).

Cancer classifications

Cancers are classified by the type of cell that is presumed to be the origin of the tumor. Common cancer categories in veterinary medicine are *carcinomas*, *sarcomas*, and *hematopoietic tumors*.

Carcinoma

Carcinomas are malignant tumors that arise from epithelial cells. In the body, epithelial cells either cover a surface, line a cavity, or form glands. Examples of epithelial cells are skin cells and cells that line the intestines, as well as cells that form the mammary and salivary glands. Carcinomas represent the most common cancers seen in humans and generally spread (metastasize) first to the lymph nodes draining the tumor area, and then beyond. Common human carcinomas include cancers of the breast, prostate, lungs, and colon.

Sarcoma

Sarcomas are malignant tumors derived from connective tissues, such as fat, muscle, cartilage, and bone. Sarcomas usually metastasize through the circulatory system. Common examples in veterinary medicine include osteosarcoma, hemangiosarcoma, and fibrosarcoma.

Hematopoietic tumors

These are malignant tumors derived from blood-forming cells. These include lymphoma, leukemias, and mast cell tumors.

Generally speaking, benign tumors and malignant tumors use different suffixes in their names, giving visual clues of their risks of spreading. For instance, names of benign tumors most often contain the suffix **-oma**. Therefore, if a patient presents with a large tumor diagnosed as a *lipoma*,

you can tell by virtue of the name that the tumor is benign. Malignant tumors are generally named using **-carcinoma** or **–sarcoma** as a suffix. So, a diagnosis of *osteosarcoma* gives you the visual clue that the disease is malignant. Unfortunately, some names do not follow these rules. For instance, *melanoma* and *lymphoma* use the benign suffix **-oma**, but are, in fact, malignant tumors.

Grade and stage

Cancer is further classified using *grade* and *stage* to help predict its behavior, its rate of spread, and the prognosis for the patient. Having a pathologist grade a tumor and determining the stage of the disease both significantly impact the plan for treatment.

Grade

The grade of a tumor indicates how closely it resembles the tissue from which it is derived. The more a tumor cell microscopically resembles the normal cells of its "parent" tissue, the more likely it will act like its parent tissue. The extent of resemblance to parent tissue is called *differentiation*. The more differentiated the tumor cells appear, the more they resemble their parent tissue.

Based on the microscopic appearance, pathologists commonly describe tumor grade by four degrees of severity: Grades 1, 2, 3, and sometimes 4. Cells of a *Grade 1* tumor are well differentiated. With a close resemblance to their parent tissue, they are likely to grow slowly and only minimally invade surrounding tissues. The cells of a similar tumor with a higher grade would display poorly defined cell architecture and would be considered undifferentiated. This tumor would likely grow rapidly and aggressively invade normal tissues. Generally, a lower grade indicates a better prognosis.

Stage

The grade of a cancer is often confused with the stage of a cancer. Cancer stage refers to the extent of the cancer based on the location of the primary tumor, the tumor size, the number of tumors, and the degree of tumor spread into the lymph nodes or beyond.

Roman numerals I, II, III, and sometimes IV are used to describe the stages of cancer. The higher the numeral, the more advanced the disease has progressed. For instance, Stage I disease indicates the cancer has remained localized to only one part of the body. In Stage IV, the disease has progressed to other organs, or metastasized throughout the body. Naturally, a Stage I disease carries a better prognosis.

Conclusion

Cancer describes many malignant tumors, which destroy normal tissue and impair normal function. To the veterinary professional, cancer is simply a word used to describe a variety of conditions of uncontrolled cell growth. We study it, categorize it, and classify it by a number of criteria. However, few words create more fear in the imagination of pet owners. To the layperson, cancer is the beginning of the end of a relationship with a loved one. It is an uncle who lost a leg or a cousin whose hair fell out. It is a grandmother who has had too many surgeries or a father who lost the battle entirely. Most people's perception of cancer, surgery, and chemotherapy is colored with fear and hopelessness. When treating an animal patient with cancer, overcoming the owners' fear and guilt is the first job for every member of the veterinary team. We must approach the topic of cancer in an educated, encouraging, and compassionate manner.

Additional reading

Argyle DJ, Khanna C. 2007. Tumor biology and metastasis. In: Withrow SJ, Vail DM (eds.), *Small Animal Clinical Oncology* (4th Ed.). St. Louis, MO: Saunders Elsevier, pp. 31–53.

Hanahan D, Weinberg RA. 2000. The hallmarks of cancer. *Cell* 100(1):57–70.

Henry CJ. 2007. The etiology of cancer: Chemical, physical and hormonal factors. In: Withrow SJ, Vail DM (eds.), *Small Animal Clinical Oncology* (4th Ed.). St. Louis, MO: Saunders Elsevier, pp. 12–9.

Modiano J, Breen M. 2007. The etiology of cancer: Genetic factors. In: Withrow SJ, Vail DM (eds.), *Small Animal Clinical Oncology* (4th Ed.). St. Louis, MO: Saunders Elsevier, pp. 3–12.

Onn A, Fidler IJ. 2002. Metastatic potential of human neoplasms. *In Vivo* 16(6):423–9.

3 Preparation for Chemotherapy Administration

Kenneth Crump

Key points

- Risks of accidental exposure to cytotoxic drugs
  - The greatest risks are during preparation and administration.
  - Compounding pharmacies are often contracted to prepare drugs for administration.
- Equipment and supplies for the preparation of chemotherapy drugs
  - Closed-system devices or medication containment devices like PhaSeal® and Onguard® are now available.
- Workspace preparation for the preparation of chemotherapy drugs
  - The minimum requirement is a clean workspace in a small area with good ventilation and minimal traffic.
- Minimizing errors to protect your cancer patients
  - Six steps to increase awareness and protect patients from chemotherapy-related errors
- Equipment and supplies for the administration of chemotherapy drugs
  - Choosing the right catheter for the job
- Workspace preparation for the administration of chemotherapy drugs
  - Overcoming accidents and errors often related to the workspace layout and common distractions

Cancer Chemotherapy for the Veterinary Health Team, First Edition. Edited by Kenneth Crump and Douglas H. Thamm.

Introduction

It is common for members of a veterinary healthcare team to regard themselves as immune from any harm arising from their work. As a result, many of us inadvertently expose ourselves and others to hazardous substances while practicing every precaution to ensure that the substances themselves are protected from contamination. However, even inadvertent exposure to cytotoxic chemotherapy drugs can have very real consequences.

Cytotoxic means *toxic to cells*. Treating cancer cells with a cytotoxic compound can result in a variety of cell fates. The cells may lose cell membrane integrity, rupture, and die rapidly. The cells might just stop actively growing and dividing, or the compounds may force them to activate a program of controlled cell death, called apoptosis. In all of these cases, the cytotoxic chemotherapy compounds cannot tell the difference between the harmful cancer cells and the cells of normal healthy tissue. Normal tissues accidentally exposed to these substances could, over time, suffer any of these cell fates.

Nurses working in human cancer wards can sometimes experience many of the chemotherapy side effects noted by their patients. These may include nausea, dizziness, chronic headaches, hair loss, and dermatitis. More significant side effects like menstrual cycle irregularities, liver damage, infertility, and even miscarriage have also been reported. These side effects can all arise through careless handling and administration of the chemotherapy drugs.

> An oncology nurse working in a human cancer ward was accidentally exposed to a solution of the chemotherapy drug carmustine. When the tubing system fell out of an infusion bottle of carmustine, all of the solution poured down her right arm and leg, and onto the floor. Although she wore gloves, her right forearm was unprotected. The solution also penetrated her clothing and stockings. She immediately washed her arm and leg with soap and water, but did not change her clothes. A few hours later, she began to experience minor abdominal distress and profuse belching. That was followed by intermittent episodes of diarrhea with cramping abdominal pain. Profuse vomiting followed, and then she felt better. Carmustine is known to cause gastric upset, and her symptoms were attributed to systemic absorption of the drug through her skin.

The risk of accidental exposure to chemotherapy agents is greatest during drug preparation and administration. The primary routes of exposure are by inhalation, direct contact, and ingestion of improperly handled drugs. The purpose of this chapter is to provide an overview of the equipment and supplies necessary to safely prepare and administer chemotherapy in a veterinary setting. Additionally, we will examine ways to prepare your workspace in order to minimize the risk of accidental exposure.

Drug preparation

According to the National Institute for Occupational Safety and Health (NIOSH), all chemotherapy drugs should be drawn up, reconstituted, crushed, or otherwise prepared inside a ***biological safety cabinet*** (BSC) or in a negative pressure total exhaust compounding aseptic containment isolator. A BSC has vertical airflow that moves away from the worker, as opposed to horizontal airflow that moves air away from the product and toward the worker. Vertical airflow protects the worker, while horizontal airflow is designed to protect the sterile product from contamination. Air leaving a BSC is filtered and vented to the outdoors. An "isolator" is basically a glove box with external venting (see Chapter 4).

However, for many veterinary practices, such specialized equipment is cost prohibitive. Compounding cytotoxic chemotherapy drugs is especially hazardous if done without proper safety equipment. Furthermore, the drug preparation may be complex and requires special equipment or supplies that are not readily available in most veterinary clinics. For these reasons, compounding pharmacies are often contracted to prepare these drugs for administration and/or to dispense prescriptions for at-home administration by the client.

When a compounding pharmacist prepares chemotherapy for you, ask that a ***material safety data sheet*** (MSDS) and the drug package insert accompany the prescription. The MSDS provides you with procedures for handling the drug in a safe manner. The MSDS, the package insert, and the pharmacist are all valuable resources of information regarding emergency procedures in the event of accidental exposure to the drug, as well as the potential side effects, drug interactions, precautions, or contraindications associated with a particular drug.

> While preparing a vincristine prescription, a pharmacy technician accidentally inhaled an aerosolized mist of the solution. His reaction included sneezing, hot flashes, swollen eyelids, shortness of breath, chest tightness, and congestion. He immediately sought medical attention in the emergency room. He was treated, and by the following morning, all of his symptoms were gone.

Preparing chemotherapy drugs in your practice is a procedure not to be taken lightly. Fortunately, new cost-effective equipment and supplies provide a satisfactory level of safety when used properly. Closed-system devices or medication containment devices like PhaSeal® (Baxa Corporation, Englewood, CO) and Onguard® (B. Braun Medical Inc., Bethlehem, PA) are now available in the United States. They consist of several components that trap drug aerosols, prevent leakage when withdrawing drugs from a vial, allow leak-free drug transfers, and provide for a "dry spike" of an intravenous (IV) bag. Studies have demonstrated the effectiveness of these devices in reducing surface and personnel contaminations.

Equipment and supplies

Standard operating procedure (SOP) manual

An SOP manual is used to ensure safety and consistency in the performance of repetitive tasks. Although it may contain seemingly redundant checks and rechecks of details like the patient's name and the drug's name and dose, the safety of your team and your patient is more important than efficiency. A good list of operating procedures for the preparation and administration of chemotherapy is thorough, understandable, and can be followed by any qualified member of your team. When preparing a chemotherapy SOP, consider the following:

- A good chemotherapy SOP is written with careful consideration by a knowledgeable individual or committee.
- It is concise. Use a step-by-step, bulleted approach rather than a running narrative.
- It is explicit, including every detail necessary to complete the task in your specific practice.
- It includes a flowchart or checklist as a visual picture of the steps and how they relate to one another.
- A good chemotherapy SOP is reviewed and rehearsed before it is put into practice.

Personal protective equipment (PPE)

Imagine the consequences to a professional football player who neglects to wear a helmet, pads, or other PPE. The PPE required for preparing and administering cytotoxic drugs in our profession includes the following:

- ***gown***—disposable, made of fabric that has a low permeability, with a closed front and elastic cuffs;
- ***gloves***—powder free; made of latex, nitrile, or neoprene; double glove or use gloves labeled and tested for use with chemotherapy drugs;
- ***face and eye protection*** when splashing is possible; and
- a ***respirator*** when there is a risk of inhaling drug aerosols.

Drug preparation supplies

The supplies for cytotoxic drug preparation are as follows:

- absorbent pad with nonporous backing
- labels
- appropriate reagents for dilution or reconstitution
  - see drug package insert
- Luer lock syringes and needles
  - Luer lock fittings securely joined by means of a tabbed hub on the female fitting, which screws into threads in a sleeve on the male fitting

- PhaSeal or Onguard (or similar) chemotherapy preparation supplies
- Chemo-spill kit (see below)
- sealable transfer bag
  - a bag to transfer the drug from where it is prepared to where it is to be administered
  - an appropriately labeled "ziplock" freezer bag
- appropriate chemo-waste disposal container
  - see Chapter 4.

Prepare your workspace

The optimum place to prepare chemotherapy drugs is inside a BSC or a negative pressure total exhaust compounding aseptic containment isolator. In the absence of either a BSC or an isolator, designate a specific area within your hospital for this task. All that is required is a clean workspace like a countertop in a small area with good ventilation (but no drafts) and minimal traffic. Since one of the primary routes of exposure is ingestion, eating, drinking, chewing gum, and storing food are all prohibited in the preparation area. Many practices use their small animal isolation ward as their designated area for preparing chemotherapy drugs. It is usually a small area, away from the general flow of traffic through the clinic, and most of the PPE for isolation is similar to that used for chemotherapy preparation. Post signs to protect your colleagues when you are preparing cytotoxic drugs and to eliminate traffic through your work area.

Chemo-spill kit

Keep a clearly labeled chemo-spill kit near the site where chemotherapy drugs are mixed and where they are administered. Chemotherapy spill kits are commercially available or are easy to assemble and maintain on your own. Each spill kit contains *at least* the following:

- a respirator or heavy-duty mask
- eye protection
- two pairs of gloves
  - powder free; made of latex, nitrile, or neoprene
- gown
  - disposable, made of fabric that has low permeability, with closed front and elastic cuffs
- absorbent pads
  - disposable diapers work well
- two large ziplock chemo-waste disposal bags.

When a spill occurs, contain and absorb the spilled liquid with absorbent pads or kitty litter. While wearing gloves, absorb the remaining liquid with

paper towels. Place the paper towels and all other contaminated materials in an appropriate chemo-waste receptacle. Then, clean the contaminated area with water and detergent.

Drug administration

Experts estimate that as many as 98,000 people die in any given year from medical errors that occur in hospitals. That is the equivalent of a jumbo jet airliner crashing each and every day of the year, which is more than the number of people who die annually from motor vehicle accidents, breast cancer, or AIDS.

Although there are no studies regarding the number of animals who die in any given year from medical errors, the statistics on human medical errors underscore the need for ***personal attention to details***. When each member of a medical team takes personal responsibility for the welfare of each patient, then any single member of the team can protect a pet from being harmed by a medical accident.

> A technician with more than a decade of experience in a large multidoctor referral practice gathered supplies to administer chemotherapy to a canine patient. The day was hectic and she had begun to fall behind schedule. When she received the patient's chemotherapy from the in-house pharmacy, the technician rechecked the patient's name and dose on the chemotherapy bag. Both were accurate. Finally, she confirmed with the doctor that she should begin administration. Afterward, when the technician updated the patient's record, she realized that the dog should not have received chemotherapy on that visit. He was scheduled only for a blood test. The "system" had failed that patient in several ways. However, if the technician had simply reviewed the patient's record before administering chemotherapy, she could have prevented significant risk to the dog's health.

As an integral part of a veterinary healthcare team, the veterinary technician stands as the last line of defense between what *could* happen to a patient and what *does* happen to a patient in the hospital. Here are some simple steps you can take to increase your awareness and to protect your patients from being harmed by a chemotherapy-related error.

(1) Review the patient's record.
- Try to review your patient's record before its appointment, and definitely before you begin a treatment. Things to look for in the record:
  - What disease does this patient have?
  - Why is the pet here today?

- What other therapy is the pet receiving?
- Does the owner have any specific concerns?
- Is there anything about this case that you do not understand?

(2) Recheck the patient's blood test results.
- There are more than 50 chemotherapy drugs available to treat cancer, and many of them interfere with the body's ability to make white blood cells.
- Neutrophils (also called "segs") are the most abundant of the white blood cells and form an integral part of the immune system
- An insufficient number of neutrophils could be a cause to postpone a chemotherapy treatment. Your clinic will establish a minimum acceptable number of neutrophils for treatment. Be sure you know that number.

(3) Recheck the drug name and dose.
- After reviewing the record, be sure the drug name and the dose you are about to administer make sense to you. If you discover an inconsistency, or something you do not understand, ask the doctor for clarification.

(4) Recheck the dose calculation.
- ***Math errors*** are the most frequent and are often the most dangerous of medical errors. They are also the most preventable. Take a moment and recalculate your patient's chemotherapy dose. If your answer does not match someone else's answer, stop everything until the error is found.
- Remember that most chemotherapy doses are calculated based on the patient's **body surface area**, rather than its weight. Refer to the meter squared (m^2) chart in Appendix 3.1 to convert pounds or kilograms to body surface area.

(5) Ask questions.
- Your knowledge and understanding are the two greatest assets you offer to your patients and to your veterinary practice. Still, we are likely to ask more questions when ordering a meal than we do during a busy day in the clinic. Asking questions may slow your efficient pace, but when you ask questions, you get answers that help you make better decisions. And better decisions mean better and safer quality of care for your patients. Use these quick tips to make it easier to **A.S.K.**
  - **A**void beginning a question with the word "why."
    - We all react defensively to questions that begin with "why."
  - **S**tay on topic.
    - Avoid vague open-ended questions. Make your questions specific and concise.
  - **K**eep it simple.
    - Ask the question. Get the answer. Move on.

(6) Keep accurate records.
- The information in your patient's record should be easy for everyone to understand and use. It must also be reliable, accurate, and consistent if the information that it supplies is to be relied on. Be clear. Be concise. Be accurate.

Body surface area

Body surface area is equivalent to the surface area of the skin. It is difficult to measure the surface area of the skin, so it is commonly estimated on the basis of formulas that use body weight as part of the equation. The most commonly used formula was published in 1916. The practice of using body surface area to calculate cytotoxic drug doses began in 1966 and has been handed down through generations of clinical oncologists. Why do we still use body surface area? Hippocrates instructed us to *do no harm*. It is extremely difficult to treat our patients using drugs that have such a narrow therapeutic index like anticancer drugs and still *do no harm*. Doses calculated on the basis of body surface area give us a greater sense of accuracy and safety. Use the chart in Appendix 3.1 to convert the body weight of dogs and cats from kilograms to their meter squared (m^2) surface area. Remember that each **kilogram** equals **2.2 lb** (lb ÷ 2.2 = kg).

Equipment and supplies

Catheter decision

We are all creatures of habit. Fortunately, committing some routine tasks to habit increases our efficiency. However, to protect the cancer patient receiving chemotherapy, more than any other patient you serve, it is important that you avoid reaching for the catheter you habitually use and take that extra moment to make a conscious decision to select the best catheter for the job.

Why is selecting the appropriate catheter so important to a patient receiving chemotherapy? Because many of the cytotoxic drugs used to treat cancer are *vesicants*. A vesicant is a substance that causes tissue blistering. Vesicants are highly reactive chemicals that combine with proteins, DNA, and other cellular components to result in destructive cellular changes. Vesicant drugs cause no damage to veins; however, when vesicant medications leak out of a vein and make contact with the surrounding tissue, the damage begins. The severity of the damage depends on the kind and the amount of drug that has leaked out of the vein. Tissue damage can range from mild skin irritation to gaping necrotic wounds, requiring multiple surgical repairs.

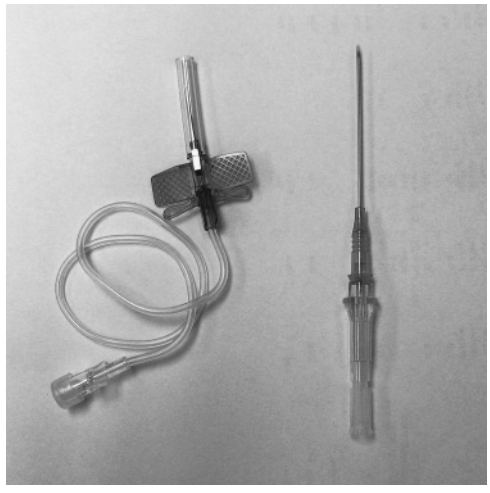


Figure 3.1 Butterfly catheter (left) and over-the-needle catheter (right).

Catheters used in veterinary medicine for peripheral venipuncture come in two styles: butterfly catheters and over-the-needle catheters (Figure 3.1). ***Butterfly catheters*** have a steel needle attached to flexible plastic wings and a short piece of extension tubing. Butterfly catheters are usually not taped in place for longer-term infusions because the needle will lacerate the vein when the patient moves about. An ***over-the-needle catheter*** is used for longer infusions into peripheral veins. Unlike the butterfly catheter, after the needle of an over-the-needle catheter is inserted into a vein, the catheter is then slid over the needle into the vein and the needle is withdrawn.

Although not all chemotherapy drugs are vesicants, there is wisdom in treating them all as though they were. The style of catheter you choose for chemotherapy administration is determined, in large part, by the volume of drug you intend to administer. For volumes less than 1 mL (cc), a butterfly catheter is appropriate. For a drug volume more than 1 mL (cc), a securely placed over-the-needle catheter will significantly reduce the risk of injury to the patient.

When selecting an over-the-needle catheter, it is easy to be lured into a false sense of confidence by selecting a smaller gauge catheter. Unfortunately, though it may seem easier to *place* a smaller gauge catheter into a vein, it is more difficult to *keep* one there. Smaller gauge catheters (22 gauge and smaller) come in very short lengths—usually less than an inch. Animal skin is very elastic, and as an animal patient moves, that elastic skin could pull a shorter catheter out of the vein, leaving it to lie alongside the vein, just beneath the skin. Infusing a vesicant drug through such a dislodged catheter is an invitation to injury. Remember, when it comes to over-the-needle catheters, length does matter.

Figure 3.2 Over-the-needle catheter setup.

Supplies for chemotherapy administration

The following are the supplies needed for chemotherapy administration:

- catheter setup (Figure 3.2)
  - butterfly catheter (21 gauge or 23 gauge) or over-the-needle catheter (18 gauge or 20 gauge, 2 in)
  - PhaSeal or Onguard injection adapter
  - two syringes of normal saline
  - 4 × 4 gauze sponges
  - tape
  - antiseptic cotton balls
  - surgical prep
  - gloves
- PPE
  - see the section on "Personal Protective Equipment (PPE)" on page 26 for details
- an absorbent pad
  - place a disposable plastic-backed absorbent liner under the connection site during chemotherapy administration.
- appropriate chemo-disposal bag
  - see Chapter 4
- Chemo-spill kit
  - Keep a clearly labeled chemo-spill kit near the site where chemotherapy drugs are mixed and where they are administered.

Prepare your workspace

Opportunities for accidents and errors are often related to the workspace layout and common distractions. These opportunities can be overcome with careful attention to your workspace design, your process design, and

the development of SOPs for the administration of chemotherapy drugs in your practice. Listed below are some steps to take to prepare an appropriate workspace to administer chemotherapy:

- ***A busy treatment room is the least suitable place for a chemotherapy treatment.*** Administer chemotherapy in a room that is away from the flow of traffic and where it is easy to regulate personnel in and out of the room.
- Install an ***eyewash station*** where cytotoxic drugs are handled or administered.
  - Affordable eyewash nozzles can be attached to most industrial faucets.
- Post ***signs*** to inform your colleagues that you are administering cytotoxic drugs.
- ***Restrict unnecessary personnel*** from the immediate vicinity where chemotherapy is being administered.
  - Clients often wish to "help" or watch a chemotherapy treatment. For the safety of the client, the patient, and the staff, it should not be allowed.
- Protect your team and animal care staff from inadvertent exposure to chemotherapy drugs and metabolites excreted in the urine, stool, and blood, or into the beddings of cancer patients by ***labeling the patient's cage***.
  - Instruct staff members to wear PPE when cleaning potentially contaminated cages.

Conclusions

The reality of chemotherapy for animal cancer patients is much different from that for human cancer patients. For animals receiving chemotherapy, quality of life for the patient is a primary concern. Doses of drugs and treatment schedules are calculated to minimize the discomfort to the patient while providing the most effective defense against the disease. Cytotoxic drugs can be lifesaving for patients with cancer, but they can also be dangerous to the staff members who handle and administer them. The risk of accidental exposure is greatest during drug preparation and administration, with the primary routes being inhalation, direct contact, and ingestion of improperly handled drugs. Two other routes of exposure important to a veterinary team and their clients include handling discarded items that have come in contact with chemotherapy (syringes, catheters, gloves, etc.) and contact with urine and feces from patients recently treated.

Each member of a veterinary healthcare team stands between what *could* happen to a patient and what *does* happen. It takes more time to prepare and follow clinical safety policies, and it can sometimes be inconvenient to

slow down and recheck our work. The goal of veterinary oncology is to provide for the medical and nonmedical needs of the cancer patient and the client, and to improve the quality of life for both. Protecting the patient, client, hospital staff, and yourself from accidents and errors are quality steps toward that goal. Remember, none of us is medically bulletproof. Doing more things faster is no substitute for doing the right things.

Appendix 3.1 Body surface area conversion chart

Body surface area conversion chart (body weight in kilograms to meters squared)

kg	m^2	kg	m^2	kg	m^2	kg	m^2	kg	m^2
Weight to body surface area conversion chart—dogs									
0.5	0.064	10.0	0.469	20.0	0.744	30.0	0.975	40.0	1.181
1.0	0.101	11.0	0.500	21.0	0.759	31.0	0.997	41.0	1.201
2.0	0.160	12.0	0.529	22.0	0.785	32.0	1.018	42.0	1.220
3.0	0.210	13.0	0.553	23.0	0.817	33.0	1.029	43.0	1.240
4.0	0.255	14.0	0.581	24.0	0.840	34.0	1.060	44.0	1.259
5.0	0.295	15.0	0.608	25.0	0.864	35.0	1.081	45.0	1.278
6.0	0.333	16.0	0.641	26.0	0.886	36.0	1.101	46.0	1.297
7.0	0.370	17.0	0.668	27.0	0.909	37.0	1.121	47.0	1.302
8.0	0.404	18.0	0.694	28.0	0.931	38.0	1.142	48.0	1.334
9.0	0.437	19.0	0.719	29.0	0.953	39.0	1.162	49.0	1.352
								50.0	1.371
Weight to body surface area conversion chart—cats									
kg	**m^2**	**kg**	**m^2**	**kg**	**m^2**	**kg**	**m^2**	**kg**	**m^2**
0.1	0.022	1.4	0.125	3.6	0.235	5.8	0.323	8.0	0.400
0.2	0.034	1.6	0.137	3.8	0.244	6.0	0.330	8.2	0.407
0.3	0.045	1.8	0.148	4.0	0.252	6.2	0.337	8.4	0.413
0.4	0.054	2.0	0.159	4.2	0.260	6.4	0.345	8.6	0.420
0.5	0.063	2.2	0.169	4.4	0.269	6.6	0.352	8.8	0.426
0.6	0.071	2.4	0.179	4.6	0.277	6.8	0.360	9.0	0.433
0.7	0.079	2.6	0.189	4.8	0.285	7.0	0.366	9.2	0.439
0.8	0.086	2.8	0.199	5.0	0.292	7.2	0.373	9.4	0.445
0.9	0.093	3.0	0.208	5.2	0.300	7.4	0.380	9.6	0.452
1.0	0.100	3.2	0.217	5.4	0.307	7.6	0.387	9.8	0.458
1.2	0.113	3.4	0.226	5.6	0.315	7.8	0.393	10.0	0.464

Additional reading

Aboumatar HJ, Winner L, Davis R, Peterson A, Hill R, Frank S, Almuete V, Leung TV, Trovitch P, Farmer D. 2010. Applying Lean Sigma solutions to mistake-proof the chemotherapy preparation process. *Jt Comm J Qual Patient Saf* 36(2):79–86.

Connor TH, Anderson RW, Sessink PJ, Spivey SM. 2002. Effectiveness of a closed-system device in containing surface contamination with cyclophosphamide and ifosfamide in an I.V. admixture area. *Am J Health Syst Pharm* 59:68–72.

Du Bois D, Du Bois EF. 1916. A formula to estimate the approximate surface area if height and weight be known. *Arch Intern Med* 17:863–71.

Freireich EJ, Gehan EA, Rall DP, Schmidt LH, Skipper HE. 1966. Quantitative comparison of toxicity of anticancer agents in mouse, rat, hamster, dog, monkey, and man. *Cancer Chemother Rep* 50:219–31.

Kohn LT, Corrigan JM, Donaldson, MS. 2000. *To Err Is Human: Building a Safer Health System*. Washington, DC: *The National Academy Press.*

Labuhn K, Valanis B, Schoeny R, Loveday K, Vollmer WM. 1998. Nurses' and pharmacists' exposure to antineoplastic drugs: Findings from industrial hygiene scans and urine mutagenicity tests. *Cancer Nursing* 21(2):79–89.

McDiarmid M, Egan T. 1988. Acute occupational exposure to antineoplastic agents. *J Occup Med* 30(12):984–7.

NIOSH. 2004. NIOSH Alert: Preventing occupational exposure to antineoplastic and other hazardous drugs in healthcare settings. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. [http://www.cdc.gov/niosh/docs/2004-165/].

Skov T, Lynge E, Maarup B, Olsen J, Rørth M, Winthereik H. 1990. Risk for physicians handling antineoplastic drugs. *Lancet* 336:1446.

Skov T, Maarup B, Olsen J, Rørth M, Winthereik H, Lynge E. 1992. Leukaemia and reproductive outcome among nurses handling antineoplastic drugs. *Br J Ind Med* 49:855–61.

Sotaniemi EA, Sutinen S, Arranto AJ, Sutinen S, Sotaniemi, KA. 1983. Liver damage in nurses handling cytotoxic agents. *Acta Med Scand* 214(3):181–9.

Valanis BG, Vollmer WM, Labuhn K, Glass A. 1997. Occupational exposure to antineoplastic agents and self-reported infertility among nurses and pharmacists. *J Occup Environ Med* 39:574–80.

Valanis BG, Vollmer WM, Steele P. 1999. Occupational exposure to antineoplastic agents: Self-reported miscarriages and stillbirths among nurses and pharmacists. *J Occup Environ Med* 41:632–8.

Vandenbroucke J, Robays H. 2001. How to protect environment and employees against cytotoxic agents, the UZ Ghent experience. *J Oncol Pharm Pract* 6(4):146–52.

Wick C, Slawson MH, Jorgenson JA, Tyler LS. 2003. Using a closed-system protective device to reduce personnel to antineoplastic agents. *Am J Health Syst Pharm* 60:2314–20.

4 Assessment of the Chemotherapy Patient

Kenneth Crump and Douglas H. Thamm

Key points

- Use a consistent, organized system for obtaining a patient history to ensure nothing is overlooked.
- Ask open-ended questions that are nonjudgmental.
- The veterinary medical record is a legal document and should be written with utmost care and precision.
- Prior to administering chemotherapy, ensure that the patient shows no significant changes since the last recheck.
- The temperature, pulse, and respiration (TPR) is the foundation of a good physical examination.
  - Rectal temperature measurement is optimal.
  - Heart rate and pulse rate may share the same numeric value, but they are not the same piece of information.
  - Animals displaying normal respiratory effort appear comfortable and lack any abdominal effort.
- **Never** estimate a cancer patient's weight.
- Calipers are critical to accurately measure tumor size.
  - Most commonly, the longest dimension of a tumor is measured.
- A complete blood count (CBC) is performed immediately prior to each chemotherapy treatment.
  - White blood cells called *neutrophils* are most likely impacted by chemotherapy.
  - Most chemotherapy drugs do not affect platelets.
  - Anemia is rarely a clinical problem in dogs and cats receiving chemotherapy.

Cancer Chemotherapy for the Veterinary Health Team, First Edition. Edited by Kenneth Crump and Douglas H. Thamm.

- Serum biochemistry profiles and urinalyses are performed before starting chemotherapy on a new patient.
- Additional imaging tests (e.g., radiographs, ultrasound) may be used to determine how well a treatment is working.
  - Imaging is not performed at every visit but may be assessed periodically.
- Response to therapy is assessed by comparing tumor measurements over time.
  - Complete response (CR) is the disappearance of all evidence of cancer.
  - Partial response (PR) is significant tumor shrinkage, but not CR.
  - Stable disease (SD) means the disease has not improved, nor has it worsened.
  - Progressive disease (PD) means the disease has gotten "significantly" worse.

Introduction

The veterinary technician who can obtain a complete and accurate patient history and can perform a quality physical examination plays a critical role in a busy veterinary practice. As you become more proficient at gathering important information about a cancer patient's history and current physical status, you free your veterinarians to complete other necessary work. The time it takes to do these tasks well increases the efficiency of the entire team. However, inaccurate or incomplete information can be worse than no information at all. Faulty information regarding a patient's history or physical parameters can lead to unnecessary tests, useless treatments, and the loss of trust by your clients and your veterinarians.

Patient history

Despite its importance, obtaining a thorough history is often overlooked by veterinarians as well as veterinary technicians. Obtaining a thorough patient history in a clear and organized manner can sometimes be challenging. For example, there are owners who either talk too little or talk incessantly about unrelated issues. The process can be time-consuming, and sometimes even the most efficient people feel as if they are running behind schedule. Remember though, one of the biggest enemies of good time management is poor planning. The more rushed you feel, the less

thorough you will be. The more frantic you are, the less accurate you will be. Using a consistent, organized system for obtaining a patient history is important to ensure that nothing is overlooked. The goal of this section is to describe an organized approach for obtaining a complete and accurate patient history. Although this is presented for the cancer patient and addresses specifically tailored cancer-related questions, this method can serve as a foundation upon which more general questions can be added.

The introduction

The first step in obtaining a medical history is to introduce yourself to the client and to explain what you are doing. Mentioning your name, even to a client you have seen many times before, relieves the client of the responsibility of remembering your name from one visit to the next. This can be particularly important in a larger practice, where clients may see one of several different team members on any given visit.

Always be certain to have reviewed the patient's record and that you know the client's name, and the pet's name and sex before you begin your interview, to prevent awkward mistakes when referring to the client or the pet. In situations where the pet has been taken away from the client before obtaining a history (e.g., taken to the treatment area during an emergency), it is essential to reassure the owner about the pet's status before beginning the interview. If the client is worried that his or her pet is in danger, he or she may not be able to focus on your questions nor provide you with the information you need.

Asking questions

The most important aspect of acquiring a history is to recognize the pet owner's level of understanding and to respect it. The majority of owners do not understand medical jargon. Many can become confused by the acronyms and medical terminologies you use daily; so you must carefully strike a language balance that is appropriate for each client, one that neither confuses them nor insults their intelligence. For instance, while the term PU/PD may have meaning to you, it is likely to be unfamiliar to a client, yet asking if their pet "makes tinkle a lot" may seem an offensively juvenile way to speak to an adult.

It is also important to ask ***open-ended questions*** rather than leading questions. An open-ended question is one that requires the client to fill in the information themselves. A leading question is one that can usually be answered with a "yes" or "no" and seems to guide the client to an appropriate answer. For example, if you are trying to determine the activity level of a patient since its last chemotherapy treatment, it is better to ask the

client to "Describe any changes in Fluffy's activity level since your last visit," rather than asking "Has Fluffy been acting more tired and lethargic since your last visit?" When leading questions are asked, clients sense which response the interviewer prefers, and they are likely to give it. Pet owners are anxious to help resolve their animal's problems. Although you are trying to gather accurate information about their pet, they may feel it helpful to try to guess the right answers to your questions.

Another pitfall in interviewing clients is asking questions that seem judgmental of their care or their management of their pet's disease. Questions that suggest a judgment can cause them to feel uncomfortable about giving truthful answers. For instance, when questioning an owner about their pet's continued vomiting and diarrhea, it would not be helpful to ask, "You didn't forget to give Fluffy her medicine, did you?" Faced with that question, an owner is very likely to respond, "No, of course not," even if the medication had been forgotten. It would be better to ask, "How often do you give Fluffy her medicine?" or "What times of day does Fluffy receive her medication?" Allowing clients to feel comfortable with their answers will improve the chances that you receive accurate information.

The key to history taking is to obtain accurate information by asking enough of the right questions. In asking questions, be aware of your own assumptions. For instance, an owner may tell you that their dog does not have diarrhea, when in fact they do not normally observe their dog defecating. At times, it may be better to ask more than one question: "Do you observe your dog when it defecates?" and if so, "Does your dog have diarrhea?"

In a classic scene from a 1960s Pink Panther movie, the bumbling Inspector Clouseau notices a small dog in the lobby of a hotel. He asks the clerk, "Does your dog bite?" The clerk responds, "No." However, when Clouseau reaches to pet the dog, the little dog tears into his hand. Astonished, Clouseau says, "I thought you said your dog does not bite!" The clerk looks up from what he is reading and says, "That's not my dog."

The information

Medical information is useless unless it is written carefully, neatly, and accurately in a structured medical record form. A ***standardized history form*** allows efficient recording of the information gathered from your interview. Additionally, forms that prompt you remind you to obtain key pieces of information. Record the information in real time and directly into the medical record to prevent any subsequent misunderstandings. Write legibly, in an organized manner, using appropriate medical terminology. Keep in mind that although veterinary medical records are not subject to

the federal and state regulations that are seen in the human medical field, the veterinary medical record is still a ***legal document***, and, as such, should be written with utmost care and precision. The medical history provides a reference for the veterinary healthcare team as it implements and revises its treatment plans for the patient. The history form used at the pet's initial presentation differs from a recheck history form. Upon initial presentation, you gather more extensive background information about the pet's overall health, diet, behaviors, and living conditions. It also includes any pertinent medical history, such as vaccinations, allergies, and previous surgeries. A recheck history form is more focused and generally gathers information from one appointment to the next. Whatever intake history form you currently use in your practice will suffice at initial presentation of a cancer patient. An example of a useful patient history form for recheck appointments of cancer patients can be found in Appendix 4.1.

The following provides a general list of important information to obtain at each visit from a chemotherapy patient. After you introduce yourself, it is useful to begin with a broad, open-ended question that allows the client to voice any general concerns they have. For instance, "How have things been going since the last treatment?"

Once you have noted their response, go more specifically through the patient's behavior. Ask questions about:

- appetite
- attitude
- activity level
- any nausea/vomiting/diarrhea
- anything else
  - breathing problems
  - lameness
  - changes to injection site of previous treatments
  - other pertinent information.

These questions can then be followed by questions about medications:

- What medications is the pet currently taking?
- Do they need any refills?

Finally, confirm with the client what will happen at this visit:

- tests that will be performed,
- drugs that will be administered,
- how long it is all likely to take, and
- discuss the owner's plan for pickup.
  - Will they stop back? At what time?
  - Do they expect a call when the treatment is complete?

Before ending the patient history interview, be sure to ask the client if there are any questions or concerns they would like to discuss with the doctor at this visit. If the client has concerns to be discussed, explain to the client whether those concerns will be discussed before or after the treatment.

Physical examination

Prior to administering chemotherapy, it is critical to ensure that the patient's overall health is good and that there have been no significant changes since the last recheck. Although a thorough physical examination is always performed by a veterinarian, some of the most critical pieces of the physical examination are often performed by the technical staff, and it is important that abnormalities be pointed out to the veterinarian prior to chemotherapy administration.

Temperature, pulse, and respiration (TPR)

The TPR is the foundation of a good physical examination. These values provide a quick reference to a substantial amount of information about the patient. Different parts of the TPR may be altered in a chemotherapy patient, depending on the drugs they received and when, as well as their underlying disease. See Table 4.1 for the normal TPR values for the dog and cat.

Temperature

Rectal temperature measurement is optimal; however, an axillary (armpit) or aural (ear) temperature may be used in patients with swelling or pain in the rectum or surrounding anatomy. These sites are less accurate than a rectal measurement and should only be used when absolutely necessary.

Neutropenia (a low white blood cell count) can sometimes be observed following chemotherapy administration (see below). If the neutrophil count falls too low (typically at 1 week following treatment), the patient becomes at increased risk for infection and may run a fever. Although some

Table 4.1 Normal TPR values for the dog and cat

	Rectal temperature (°F)	Pulse/heart rate	Respiratory rate
Dog	100.0–102.2	60–160/min (smaller dogs = higher rate)	16–32/min
Cat	100.0–102.2	140–220/min	20–42/min

dogs present with elevated temperatures as a result of stress or excitement, a temperature above 103°F might suggest an infection. Some dogs with very serious infections can have a normal or low body temperature, so the absence of a fever does not completely rule out infection. See Chapter 7 for additional information about side effects.

Pulse rate and heart rate

In a normal healthy animal, the pulse rate and heart rate are the same number. Although they may share the same numeric value, they are not the same piece of information. Much can be determined with a stethoscope in the ears of a highly trained medical professional, but a patient's pulse rate and subjective pulse quality are not among them. Those values are best determined with your fingers.

Palpate the peripheral pulses on every patient to determine the pulse rate and pulse quality. The femoral arteries are generally palpated for this and are located high on the medial thigh of dogs and cats. Finding and using the femoral arteries to determine a patient's pulse rate and quality is a learned skill, and requires practice to gain proficiency. Practice on every patient you see (Figure 4.1). Apply pressure over the femoral arteries using your fingertips. Some degree of pressure is required to feel the pulse; however, excessive pressure could compress the artery, occluding the blood flow. Count the number of pulses you feel for 15 seconds and then multiply that number by 4 in order to calculate the pulse rate per minute.

It is also important to auscultate (listen to) the heart while palpating pulses (Figure 4.2). It may be difficult to coordinate holding a stethoscope

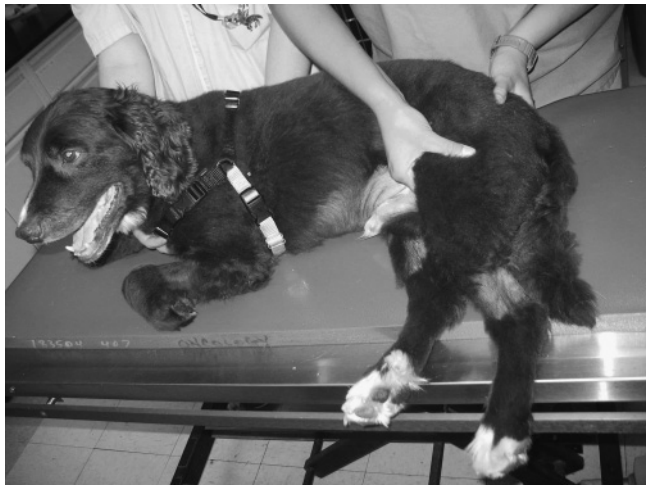


Figure 4.1 Obtaining a femoral pulse. Apply light pressure over the femoral arteries using your fingertips.

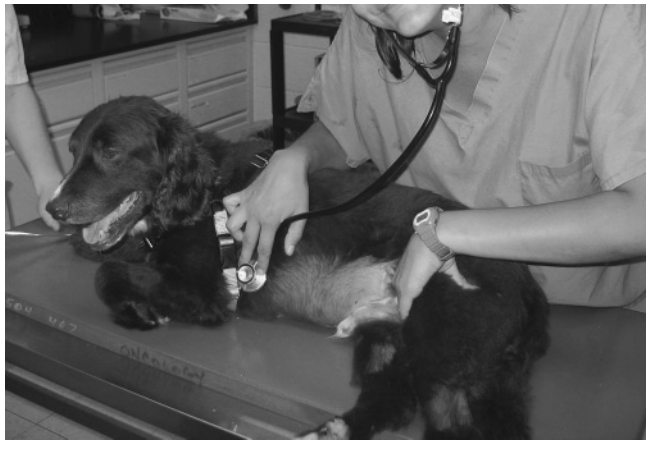


Figure 4.2 Palpating the pulse and auscultating the heart simultaneously. It is important to auscultate the heart while palpating the pulses. There should be a detectable pulse for each heartbeat.

over the heart of a dog or cat while trying to palpate its pulses at the same time (especially if the pet loses interest), so you may want to take and record the pet's pulse before you try this. The heart rate and the pulse rate should be identical, and there should be a pulse of near equal quality produced by every heartbeat. The absence of a palpable pulse (or significant change in pulse quality) with an audible heartbeat is called a ***pulse deficit***. Pulse deficits usually indicate a cardiac abnormality and should be brought to the attention of a veterinarian.

Tachycardia (high heart rate) can be a sign of anemia, excitement, pain/discomfort, or other illness. An irregular heart rate can be a sign of disturbed electrical activity in the heart. Certain drugs, such as doxorubicin, should not be given to dogs with some kinds of heart disease, and thus, additional tests might be necessary to further investigate an abnormal heart rhythm prior to chemotherapy.

Respiratory rate/effort

Respiratory rate and effort should be noted in all patients. Rate is generally done visually first, and then by auscultation to actually hear the lung sounds. The determination of respiratory effort is more subjective. Animals displaying normal effort appear comfortable and lack any abdominal effort.

Depending on the type of tumor a pet has, an increase in respiratory rate or effort could be a sign of tumor spread to the lungs. This could indicate additional tests (e.g., X-rays of the chest), or a change in treatment might be necessary. An abnormal respiratory rate or effort should be brought to the attention of the veterinarian.

Weight

A cancer patient's weight must ***never*** be estimated, and must be measured and recorded at every visit. An accurate body weight is critical for accurate chemotherapy dosing. A small inaccuracy in weight measurement can result in a higher risk of toxicity or reduced effectiveness of treatment. For clarity, it is a good idea to measure a cancer patient's weight in both pounds and kilograms, and to clearly label both in the patient's record. Most American veterinary practices are accustomed to weighing patients in pounds; however, many cancer-related medications are dosed using weight measured in kilograms. Remember also that most chemotherapy doses are calculated based on the patient's body surface area, rather than its weight. Refer to the meter squared (m^2) chart in Chapter 2 to convert weight in kilograms to body surface area.

How has the weight changed since the last visit? Weight loss might indicate poor appetite and decreased food intake, and changes in nutrition might be indicated. If weight is very different from the previous visit, this could indicate an inaccuracy in weighing, and the patient should be weighed again.

Tumor measurements

Although often performed by a veterinarian, sometimes tumor measurements are performed by the technical staff as well. This is the main way to tell whether treatments are working or not. What is expected will depend on the tumor type you are treating. Sometimes, complete disappearance of all measurable disease is expected. For other tumor types, partial shrinkage or absence of any growth is a very acceptable outcome. Investment in *calipers* (Figure 4.3) is critical for accurate assessment of tumor size. These can be purchased at most hardware stores, as well as from various veterinary/surgical supply vendors.

Most commonly, the longest dimension of a tumor is measured (e.g., if the tumor is longer than it is wide or deep, then the length is recorded). Sometimes, tumors are measured in two or three dimensions. It is helpful to have a separate sheet that keeps track of tumor measurements over time to make comparisons easier. In animals with multiple masses, it can be helpful to keep track of mass locations and sizes on a body map: An example of such a map is included in Appendix 4.2.

Laboratory tests

While blood tests are an important part of the management of the chemotherapy patient, they are rarely used in animals to determine if the treatment is working: This is usually determined with tumor measurements. However, blood tests are critical to establish that chemotherapy is safe to

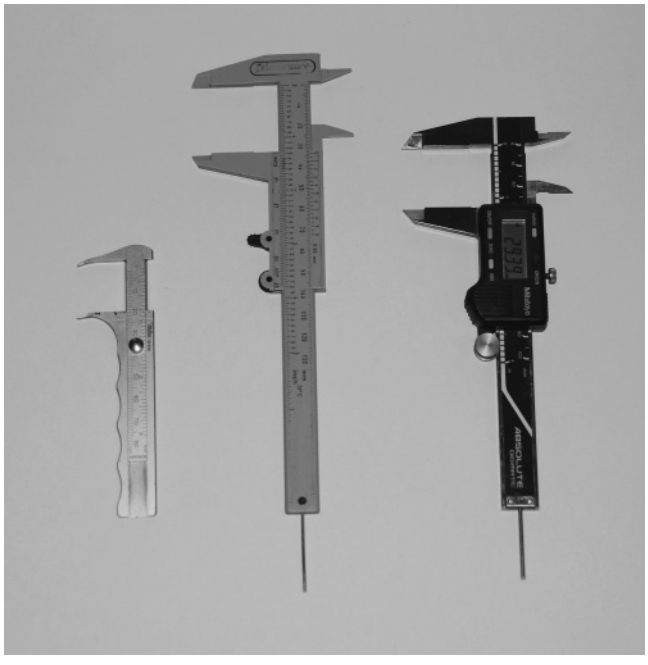


Figure 4.3 Different styles of calipers. Calipers can be purchased at most hardware stores, as well as from veterinary or surgical supply vendors.

administer. Blood from patients undergoing chemotherapy is almost always drawn from the *jugular vein*, rather than from a peripheral vein. This preserves the peripheral veins for chemotherapy administration and reduces the likelihood of chemotherapy being extravasated from a prior venipuncture site.

Complete blood count (CBC)

A CBC is almost always performed immediately before each and every chemotherapy treatment, and sometimes in between treatments as well. While it is optimal to have a CBC performed in-house on the same day as the chemotherapy, it is acceptable to have a CBC performed the day before (not earlier) if the test needs to be sent out to a referral laboratory. If a CBC is performed any earlier than the day before treatment, the results may not be reliable as values may have changed enough to impact treatment decisions.

White blood cells

Of all the cells that are evaluated on a CBC, the one most likely to be impacted by chemotherapy is a subset of the white blood cells called *neutrophils*. Neutrophils are the body's first line of defense against bacteria,

and a decreased number of neutrophils increase the patient's risk of bacterial infection (see Chapter 7 for more information). It is very important that treatment decisions be based on the *absolute neutrophil count* rather than on the total white blood cell count or the percentage of neutrophils. Most drugs can be administered safely if the patient has at least 2000–2500 neutrophils/μL. Dogs with fewer neutrophils may need to have their treatment delayed for a few days. If the neutrophil count is low but greater than 1000/μL, the risk of infection is small. However, if the neutrophil count is less than 1000/μL, the risk of infection is higher, and careful monitoring at home, as well as oral antibiotics, is typically recommended until the neutrophil count recovers.

It is important to let owners know that if the neutrophil count is low, it typically recovers quickly. Also, inform owners that delaying a treatment for a few days until the neutrophil count is acceptable for chemotherapy is not likely to decrease the effectiveness of treatment.

Platelets

While there are a few cancer drugs that can cause a decrease in the number of platelets (usually with long-term use), most do not. Thus, severely low platelets are not often encountered in animals receiving chemotherapy. However, a treatment delay and additional tests may be required in animals with less than 50–75,000 platelets/μL. For this reason, it is important that a manual platelet count, not just a platelet estimate, be obtained. One of the most common reasons for a platelet count to be reported as decreased is due to ***platelet clumping*** (Figure 4.4). Platelet clumping can be assessed as the cause for a low platelet count by scanning the blood

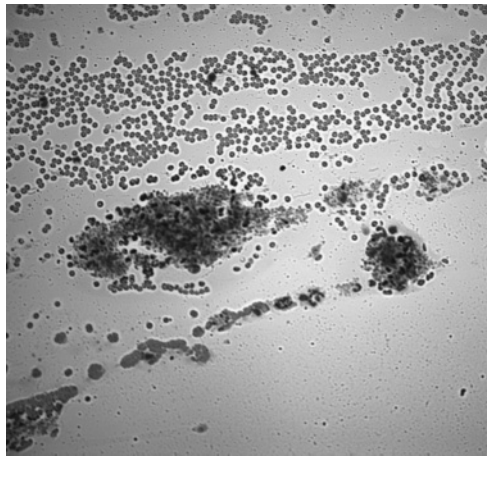


Figure 4.4 Platelet clumps on the feathered edge of a blood smear. Numerous or large platelet clumps can artificially lower the platelet count.

smear, looking for clumps. The risk of clumping can be reduced if the blood sample is obtained via a clean jugular stick with a relatively large-gauge needle.

Red blood cells

Unlike in human cancer patients, anemia is rarely a clinical problem in dogs and cats receiving chemotherapy. Mild, cumulative anemia can be observed, but it is extremely rare for it to be severe enough to require intervention. If a large or sudden drop in red blood cells is noted, it could indicate a different serious problem that requires attention (internal bleeding, ulcer, etc.).

Biochemistry and urinalysis

Serum biochemistry profiles and urinalyses are almost always performed before starting chemotherapy on a new patient, to ensure that organ function is adequate to tolerate chemotherapy and to rule out any other serious medical problems that might be just as important to treat as the cancer is. Occasionally, biochemistry profiles or individual tests may be performed throughout treatment, depending on the disease and the chemotherapy being received.

Calcium

In dogs that present with a high blood calcium (also called paraneoplastic hypercalcemia or hypercalcemia of malignancy), periodic rechecks of calcium can indicate how well the cancer treatment is working. Calcium will usually return to normal in patients whose disease is removed surgically, or those in which complete remission is induced with chemotherapy. Conversely, a rise in blood calcium levels may indicate a relapse of the patient's disease.

Liver values

Some chemotherapy drugs, specifically lomustine, can cause elevations in liver values with chronic use. Thus, in addition to a CBC, liver values (especially alanine aminotransferase [ALT]) are usually checked before each treatment in dogs and cats receiving lomustine.

Kidney values/urine specific gravity

Some drugs, specifically cisplatin in dogs and doxorubicin in cats, as well as nonsteroidal anti-inflammatory drugs like piroxicam, are capable of causing kidney toxicity. For this reason, kidney values (blood urea nitrogen and creatinine), as well as urine specific gravity, are usually checked before

administration of these agents. Sterile urine is not required for urine specific gravity and can be performed on a free-catch sample.

Imaging

In some cases, additional imaging tests (e.g., radiographs, ultrasound) may be used to determine how well the treatment is working. Imaging is usually not performed at every visit due to cost considerations but may be assessed periodically.

If the only measurable disease happens to be inside a body cavity, sometimes repeated imaging to evaluate the size and number of lesions is the only way to know whether a treatment is effective or not. When being used to assess response, imaging is often repeated after two treatments with a given drug (approximately 6 weeks, for most drugs), and then at approximately the same intervals thereafter. Sometimes imaging is performed to ensure that the disease has not spread to another part of the body, especially with tumors at high risk for spread following surgery. Examples of tumors that fall into this category include melanoma, hemangiosarcoma, osteosarcoma, anal sac carcinoma, and mammary gland carcinoma. In these situations, imaging may be repeated every 2–3 months after surgery to make sure that the disease remains under control.

Radiographs (X-rays)

Radiographs are commonly used to assess changes in the lungs and the surrounding structures in cancer patients (Figure 4.5). Most of the time, tumors in the lungs are easy to measure with calipers, much in the same way as tumors on the outside of the body can be measured. Radiographs can also be used to assess changes in bones. Radiographs are less sensitive for looking at or measuring disease in the abdomen.

Ultrasound

Ultrasound is an excellent test for evaluating and measuring tumors in the abdomen (Figure 4.6). It is commonly used to look at tumors in organs like the bladder, liver, spleen, and abdominal lymph nodes. Most ultrasound machines have measurement devices built into them so that abnormal structures can be measured digitally.

Computed tomography (CT) and magnetic resonance imaging (MRI)

Advanced imaging tests such as CT and MRI can be very useful for the initial diagnosis and treatment planning for certain tumors, such as those of the nasal cavity and brain. CT and MRI are rarely used for the serial

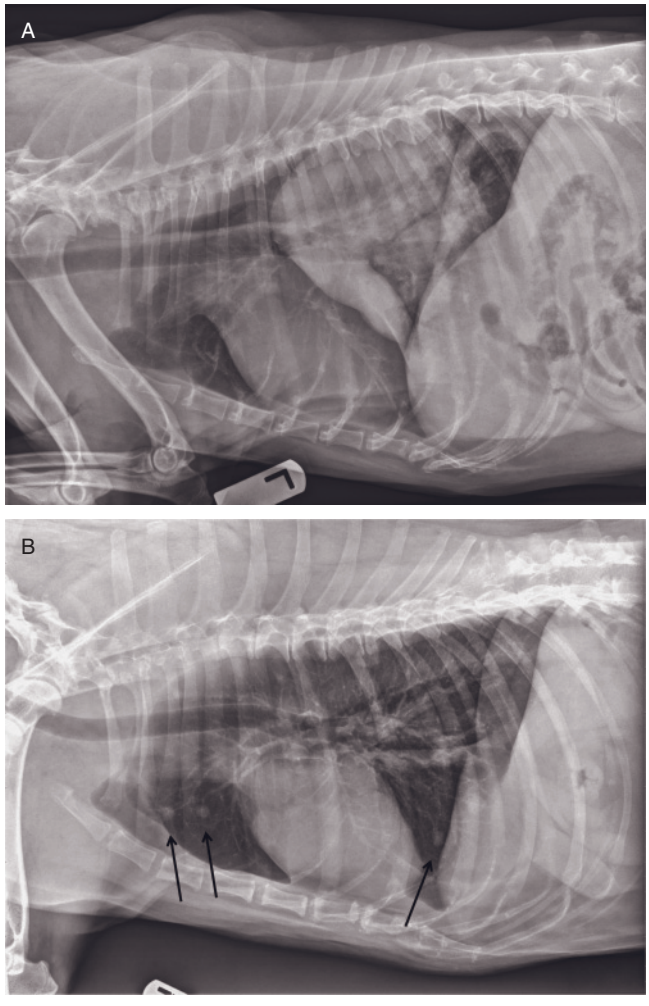


Figure 4.5 (A) Thoracic radiograph from a 10-year-old male castrated springer spaniel with a primary lung tumor. Changes in size of this tumor can be measured serially to assess response to therapy. (B) Thoracic radiograph from a 7-year-old spayed female Labrador retriever with lung metastases from a bone tumor (osteosarcoma). Arrows indicate pulmonary nodules suggesting metastasis. These metastases developed 10 months after amputation, and chemotherapy was performed.

assessment of tumor response due to their high expense and the need for general anesthesia or heavy sedation.

Assessment of tumor response

Although it is primarily the job of the veterinarian to determine how well the treatment is working, it sometimes falls to the staff to interpret

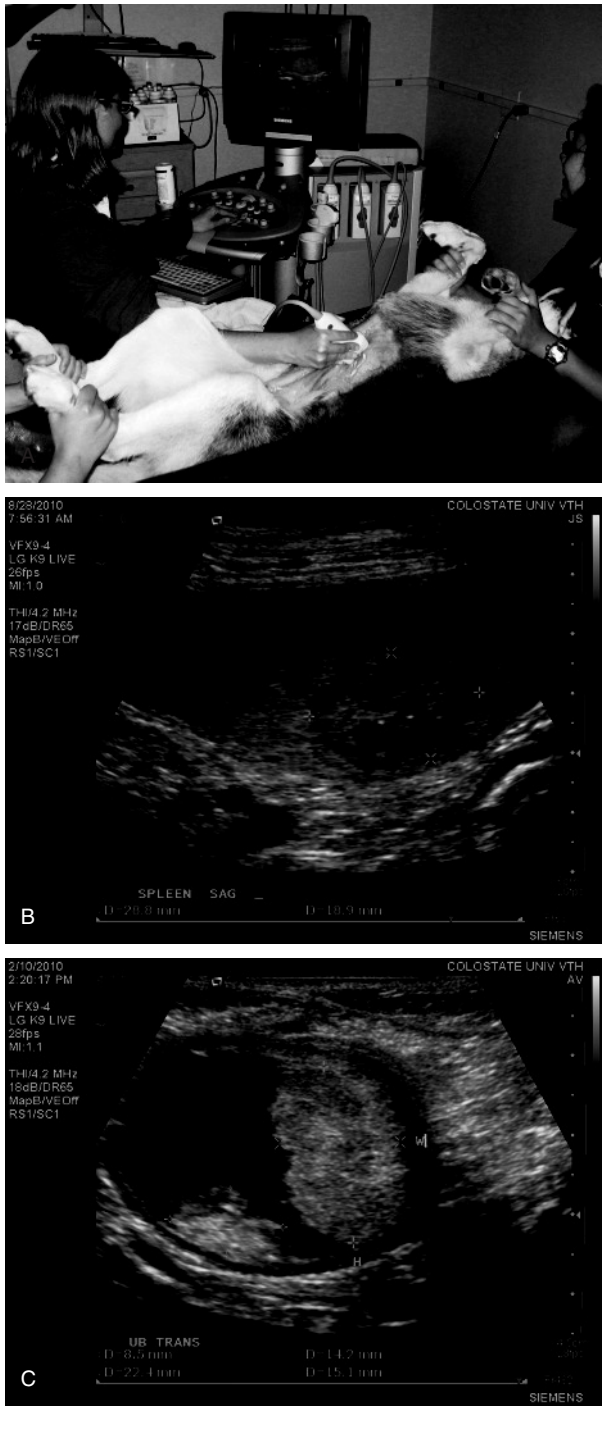


Figure 4.6 (A) A dog in dorsal recumbency undergoing an ultrasound examination of the abdomen. (B) A splenic mass in an 8-year-old male castrated golden retriever. Measurements can be obtained digitally on the images collected. (C) A bladder mass in an 11-year-old female spayed Scottish terrier. Changes in the size of this mass can be assessed over time as an indication of how well treatment is working.

for the client what the veterinarian means by terms such as "partial response" or "stable disease." An understanding of how treatment response is assessed can help owners interpret how the treatment is working.

In general, responses to therapy are assessed by comparing the tumor measurements you or the veterinarians make over time. This can be done by comparing either the maximum tumor diameters or the tumor volumes, calculated by multiplying measurements in two or three different dimensions.

Complete response (CR)

CR means the complete disappearance of all evidence of cancer: Obviously, this is the "Holy Grail" for cancer treatment. In addition to all the measurable disease going away, all clinical signs associated with disease are expected to resolve as well. While this is great news for any client, it is important for owners to know that ***this does not necessarily mean "cure."*** There are some cancers, such as lymphoma, in which we can induce CR in 75–90% of patients; however, in all but 5% of the cases, the disease eventually comes back.

Cure is hard to define in veterinary oncology. For many types of cancer in humans, "cure" means being disease free for longer than 5 or 10 years. Our patients are typically older at the time of diagnosis and would usually have other age-related problems before reaching the 5- or 10-year mark. So, for our patients, cure may mean that the cancer stays away long enough for the patient to die of an unrelated problem.

Partial response (PR)

PR means that we see "significant" tumor shrinkage but not complete disappearance of all disease. Technically, this term means that all measurable disease decreases by more than 50% in volume or more than 30% in maximum diameter and without the development of any new lesions. This is the next best thing to seeing a CR.

Stable disease (SD)

SD means that the disease has not improved significantly but also has not worsened. In other words, tumors have shrunk by less than 50% in volume or less than 30% in maximum diameter, but have grown by less than 25% in volume or less than 20% in maximum diameter, and no new lesions have appeared. As mentioned above, we certainly strive for tumor shrinkage or even complete tumor disappearance, but there are many types of cancer for which "not growing" is a very acceptable outcome. If we can give a

treatment that is well tolerated and preserves an excellent quality of life, and if we can make tumors stop growing, then that can be a very good outcome for the pet and the client, and a very rewarding outcome for the veterinary team.

Progressive disease (PD)

PD means that the disease has gotten "significantly" worse. Technically, this means that all measurable disease has increased by more than 25% in volume or more than 20% in maximum diameter, or that new lesions that have not been previously seen, have appeared. In most cases, this is an indication to either discontinue the treatment or try something different, depending on the alternatives, the quality of life of the patient, and the owner's interest in continuing treatment.

Additional reading

Bassert JM, McCurnin DM. 2009. *McCurnin's Clinical Textbook for Veterinary Technicians* (7th Ed.). Philadelphia: Saunders.

Ogilvie GS, Moore AS. 2001. *Feline Oncology*. Yardley, PA: Veterinary Learning Systems.

Ogilvie GS, Moore AS. 2006. *Managing the Canine Cancer Patient: A Practical Guide to Compassionate Care*. Yardley, PA: Veterinary Learning Systems.

Withrow SJ, Vail DM. 2007. *Withrow and MacEwen's Small Animal Clinical Oncology* (4th Ed.). Philadelphia: Saunders.

Appendix 4.1 Oncology patient recheck history form

PLEASE ANSWER **ALL** QUESTIONS

Date: _____ Time: _____ Patient: _____
Owner: _____ Case Number: _____

When will you return to pick up your pet?
12–1 PM ☐ 1–3 PM ☐ 3–5 PM ☐ 5–8 PM ☐ 8–10 PM ☐

Telephone # where you can be reached ( ) _____ ☐ Work ☐ Home ☐ Cell

Which best describes your pet's health since last visit?
Excellent ☐ Good ☐ Fair ☐ Poor ☐

Please describe each item according to your dog's behavior since the last appointment.

Appetite	Comparison of appetite compared to the last appointment. ☐ Greatly decreased ☐ Decreased ☐ No change ☐ Increased ☐ Greatly increased
Sleeping	Amount of time that your dog spends sleeping, compared to the last appointment. ☐ Greatly decreased ☐ Decreased ☐ No change ☐ Increased ☐ Greatly increased
Activity	Current activity level compared to the last appointment. ☐ Greatly decreased ☐ Decreased ☐ No change ☐ Increased ☐ Greatly increased
Playfulness	Playfulness compared to the last appointment. ☐ Greatly decreased ☐ Decreased ☐ No change ☐ Increased ☐ Greatly increased
Accidents	Number of urinary or fecal accidents in the house compared to the last appointment. ☐ Greatly decreased ☐ Decreased ☐ No change ☐ Increased ☐ Greatly increased
Panting	Amount of panting compared to the last appointment. ☐ Greatly decreased ☐ Decreased ☐ No change ☐ Increased ☐ Greatly increased
Response	General responsiveness compared to the last appointment. ☐ Greatly decreased ☐ Decreased ☐ No change ☐ Increased ☐ Greatly increased
Health	General health compared to the last appointment. ☐ Greatly decreased ☐ Decreased ☐ No change ☐ Increased ☐ Greatly increased
Overall	General health compared to before your dog's diagnosis of cancer. ☐ Greatly decreased ☐ Decreased ☐ No change ☐ Increased ☐ Greatly increased

Describe any concerns you have about your pet since last visit (i.e., loss of appetite, vomiting, diarrhea, cough).

When did these problems occur? Have the problems resolved?

_____
_____

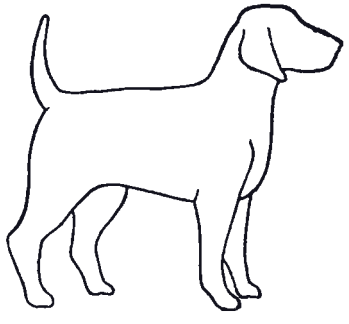
What questions or concerns you would like to discuss with your pet's doctor?

_____
_____

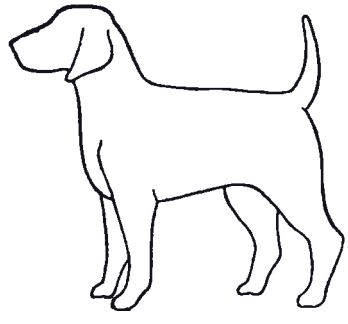
What medications have you given since your pet's last visit?

Medication	Dose—# of pills	How often (1×/day, 2×/day, etc.)	Number of days	Need refill?	
				No	Yes

Appendix 4.2 Oncology body map

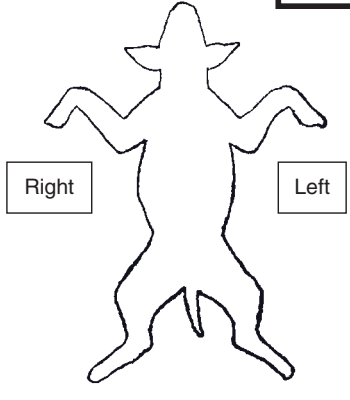


Right



Left

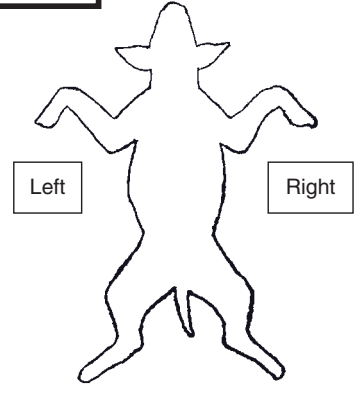
DATE _____



Right

Left

Ventrum



Left

Right

Dorsum

1. _____
2. _____
3. _____
4. _____
5. _____

6. _____
7. _____
8. _____
9. _____
10. _____

5 Chemotherapy Handling, Safety, and Disposal

Richard Allen and Kenneth Crump

Key points

- Chemotherapy drug preparation standard operating procedures (SOPs)
  - *A generic SOP is suggested.*
- Storage of cytotoxic drugs
  - *Separate chemotherapy drugs from other medications.*
  - *Helpful websites for governmental guidelines*
- Safe drug preparation
  - *State-of-the-art protective equipment*
  - *Preparing chemotherapy drugs in a smaller clinic*
- Safe drug administration
  - *Use a dedicated catheter.*
  - *Compounding powdered chemotherapy drugs*
  - *Splitting tablets*
- Safe waste disposal
  - *Seven government agencies regulate the handling of hazardous waste.*
  - *Laws pertaining to handling hazardous waste are strictly enforced.*
- Standards for waste handling
  - *It is important to recognize the different classifications of hazardous waste.*
  - *Waste receptacles are color coded.*
  - *Hazardous waste can only be transported by licensed "hazardous waste handlers."*

Cancer Chemotherapy for the Veterinary Health Team, First Edition. Edited by Kenneth Crump and Douglas H. Thamm.

Introduction

The decision to treat patients with chemotherapy must not be taken lightly. There are many specialty clinics that prepare and administer chemotherapy on a large scale, with well-trained staff and safety equipment on-site. So, the option for your clinic to avoid handling these medications through referral is always available. However, when the decision is made to treat cancer patients in your practice, there are many considerations that must be recognized to ensure the safety of the personnel administering the agents, as well as the patients being treated. Studies have linked workplace exposure to hazardous drugs with health effects, such as skin rashes, adverse reproductive outcomes, and possibly cancer. The degree of health risk is influenced by the extent of exposure, the concentration of the agent, and the toxicity of the agent being used. This chapter reviews the proper measures to employ to assure safe handling, preparation, administration, and disposal of these agents. The goal is to assure maximum protection for all involved.

Chemotherapy treats both human and animal cancers. These drugs are toxic to both cancerous and normal healthy cells. Individuals who prepare and administer chemotherapy must be protected from contact with these medications. The veterinarian will develop a treatment plan for each patient based on the type of cancer and the stage of its development. Many factors are taken into consideration for the selection of drugs, doses, and treatment intervals. Because these drugs are cytotoxic, double or even triple check the choice and doses of medications before they are administered to the patients. To be successful, each protocol must allow the maximum therapeutic effect with minimal side effects to the animal. If, as a result of treatment, the pet is constantly lethargic, nauseated, or has severe bouts of diarrhea, the owner may perceive it as causing more suffering than the disease.

Below is a short list of common chemotherapy drugs and their uses in veterinary medicine:

- carboplatin
  - used in a variety of veterinary and human cancers, including squamous cell carcinomas, ovarian carcinomas, and adenocarcinomas;
- doxorubicin
  - used for lymphomas, carcinomas, leukemias, and sarcomas;
- vinblastine
  - used for lymphomas and mast cell tumors;
- vincristine
  - used in combination-drug protocols for lymphoid cancers and cancers of the blood.

All of these drugs require preparation before they can be administered to a patient. Some, such as vincristine, only need to be drawn into a syringe.

Others, such as doxorubicin, must be diluted with an electrolyte solution and either added to a bag of fluids or drawn into a large syringe. However, neither preparation should be made without the use of ***personal protective equipment*** (PPE).

Standard operating procedures (SOPs)

If your clinic has made the decision to prepare and administer chemotherapeutics, an SOP needs to be established and implemented. If a chemotherapy hood or an isolator (described below) is not available, drugs can be prepared in a small designated room with low airflow and minimal traffic. This room should be scrubbed down regularly. Technicians need to wear PPE and use some type of protective system such as PhaSeal® or Onguard® to minimize contamination of the surroundings and personnel. Once prepared, place the drugs in a ziplock chemo-transport bag. The sealed chemo-transport bag will contain any leakage that may occur while the drug is moved from one room to another. Used supplies are then disposed of in a yellow chemo-waste receptacle.

An example of a generic SOP for handling these agents is suggested below:

Designate a work area.

- biological safety cabinet (BSC)
- small room (minimum)
  - good ventilation (no drafts)
  - low traffic
  - allow only essential personnel in room during preparation
- well-lighted counter for preparation
  - place an adsorbent pad with nonporous backing on the work surface

Gather PPE.

- face mask with respirator
- disposable gown with elastic cuffs
- latex or nitrile exam gloves

Make sure all drugs are labeled.

- Verify patient's name, product name, and dosage.
  - *This is an extremely important step*. Make sure all preparations are labeled with the drug name, concentration, and dosage that each syringe or intravenous (IV) bag contains. Drugs like vincristine and vinblastine have similar names, yet very different doses and effects on the treatment outcome. Have at least two people calculate the dose. Remember, you cannot remove an incorrect drug once it is in the patient.

Use only Luer lock syringes.

- Luer lock syringes screw and lock onto a needle or catheter.

Use Phaseal or Onguard or other drug containment devices.

Have a chemo-spill kit available to handle any accidents.

- A chemo-spill kit contains chemotherapy protective gloves, eye protection, disposable gown, absorbent towels, and collection and disposal bags.

Procedure

(1) Prepare the product to be administered.
(2) Clearly label it with the patient's name, drug name, and drug concentration.
(3) Place in a sealed chemo-transfer bag.
(4) Dispose of all waste in proper receptacles.

Commercially prepared agents

There are some pharmacies that will prepare chemotherapeutic agents for your patients and deliver or ship them directly to your clinic. Although this eliminates the necessity of someone in your clinic having to prepare the dosage, handling of the drugs at the time of delivery and handling of waste must still be considered.

- Be sure to employ PPE and other protective precautions to assure minimal exposure to personnel.
- Keep a chemo-spill kit nearby to immediately and safely contain an accidental leak or spill. To clean a spill:
  - Wear PPE.
  - Absorb liquid in towels or absorbent pads.
  - If a dry spill, wet the towels to limit the creation of dust.
  - Place broken vials and other waste in a plastic bag.
  - Dispose of used plastic waste bag, towels, and absorbent pads in a chemo-waste container.
  - Deactivate and decontaminate the spill area with bleach solution.
  - Clean spill area with detergent solution.
- Once again, it is important to have a written SOP for handling prepared chemotherapy drugs and that all personnel are familiar with the procedures.

Storage

Whether stored at room temperature or refrigerated, segregate chemotherapy drugs from other medications. A separate refrigerator to store these agents is ideal, or at least prepare a designated container within a drug refrigerator. Apply a warning sign to the door of the refrigerator to

indicate that hazardous drugs are stored there. Also, identify chemotherapy drugs stored on shelving units with warning signs. Chemotherapy drugs are usually shipped in a ziplock bag or a sealed container. Wear gloves when carrying these sealed containers to their storage area to prevent contamination. When removing a bottle or vial from the sealed container, wipe it down with alcohol or diluted bleach, not for disinfection but for deactivation and decontamination. Bottles and vials may be exposed to broken bottles during shipment, or may have overfilled and backsplashed at the time of manufacture.

Notify every employee in your practice that chemotherapy preparation and administration will be performed and educate them on the risk factors. Pregnant personnel or those trying to become pregnant should avoid handling, preparing, or administering these drugs. Post the written SOP you have established, and verbally present them to the staff to avoid any misunderstanding as to how the drugs are handled. Also, review what to do in case of a spill or an adverse reaction. Since health risks are influenced by the extent of exposure and potency of a drug, limiting exposure to the cytotoxic drugs is a priority. A few of the many governmental agencies regulating the distribution, protection of personnel, and disposal of these hazardous products are listed below. Each has helpful websites that can guide you to prepare and implement an SOP for your clinic:

- Occupational Safety Health and Safety Administration (OSHA),
- National Institute for Occupational Safety and Health (NIOSH), and
- Department of Transportation (DOT).

Limiting exposure

Minimizing exposure is a major concern when dealing with cytotoxic drugs. There have been many devices developed to attempt to accomplish this. Unless your clinic is a large oncology treatment center, it is unlikely that you will have access to what most agencies consider an optimal piece of equipment necessary for protection: a Class IIA vertical laminar flow BSC or a negative pressure isolator. The BSC hoods establish sterile airflow from the top of the hood to the bottom, with the air splitting near the bottom of the unit, flowing into the front and rear intakes (Figure 5.1). The air is then vented through high efficiency particulate air (HEPA) filters into a dedicated venting system to the outdoors. This process not only establishes a sterile environment but, when used properly, also allows the operator to prepare hazardous compounds safely. The BSC allows minimal exposure to the individual preparing the drug. However, the hood alone may not provide all the protection needed to safely prepare cytotoxic drugs.

Figure 5.1 Class IIA, vertical laminar flow biological safety cabinet. Although this cabinet is very long, much shorter cabinets are made, which can easily fit into smaller spaces.

The operator should also wear PPE including a lint-free, long-sleeved gown; gloves (special heavy long-sleeved chemotherapy gloves, latex gloves, or nitrile gloves); and eye protection. In addition to all of these safety equipment, it is suggested you use a device to safely vent vials when mixing. These devices allow compressed air escaping from the vial to be either filtered or vented into a containment envelope.

Equipment more recent than the older vertical laminar flow hood is called a "negative pressure total exhaust compounding aseptic containment isolator" (Figure 5.2). They are also costly and not intended for a clinic that seldom administers chemotherapy. These units are basically glove boxes with external venting through HEPA filters. Isolators are made up of two chambers. Items are placed in the antechamber after being sprayed with sterile alcohol. After entry, it takes about a minute for the air in the antechamber to become sterile again. Then items are transported into the *working chamber*. The operator inserts his or her gloved hands into the sleeved portion of the working chamber to prepare the chemotherapy drugs. It is still necessary to use devices to limit aerosolization so the interior of the chamber is not contaminated, but the only PPE required are latex or nitrile gloves. The totally contained chamber system allows zero

Figure 5.2 Negative pressure isolator.

exposure to the operator and the environment. Because of the waste ports at the floor of the chamber that open into chemo-waste containers stored under the unit, the operator is never exposed to empty vials, syringes, or other wastes. These waste ports are sealed with plastic covers. When full, another plastic plug is locked in place before the waste container is removed. Strict guidelines are set for pharmacies in the "USP 797" protocol.

Because of the low volume of chemotherapy preparations, these guidelines are not yet imposed on smaller veterinary clinics. However, as you will see in the *Safe waste disposal* section of this chapter, government agencies are taking a closer look at the safe handling of these agents during preparation, storage, handling of waste, and disposal for all veterinary practices.

Safe drug preparation

Never attempt to mix a chemotherapy agent without some type of protective device to vent the vial during reconstitution or dilution. Additional safety equipment is available for the veterinary setting whether you have an isolator, a BSC, or just a small room for preparation. One of the first

types of safety devices was called a ***chemo-safety pen***. The pen allowed air expelled from a vial by liquid displacement to exit through a 0.22-µm filter. This was thought to be a safe device until tests showed that particles escaped through the filter and contaminated the immediate area.

Many studies have been published connecting the potential toxicity of chemotherapeutics to the workers who handle them. Several papers demonstrate compromised reproductive effects, as well as cancer in healthcare workers handling these agents. When mixed in a BSC, the hood removes the atomized particles with its HEPA filters. However, without a BSC, you may contaminate the work area and create the opportunity for personal exposure. Studies demonstrated that even while using the chemo-safety pen, chemotherapy agents show up on work surfaces, surrounding areas, and the operator's gloves. Since most chemotherapy drugs are manufactured in vials at sea level, there is positive pressure inside the vials at higher elevations. When a needle, chemo-safety pen, or other device penetrates the vial, it will expel air and particulates from the vial into the surrounding area. Caution should be used, and all precautions should be in place to prevent exposure when penetrating a chemotherapy vial.

Two new systems for mixing chemotherapeutics are now available. One system (PhaSeal) is considered a "closed-system drug transfer device." The other system (Onguard) is a "contained medication system." Both are superior to the early chemo-safety pens. Yet, as good as they are, OSHA considers them to be even safer when used inside a BSC or an isolator.

The Onguard system uses a locking cap that attaches to the drug vial, with a spike that penetrates the vial's rubber closure. This cap contains a 0.22-µm filter and a secondary filter made up of activated charcoal. The activated charcoal absorbs toxins that might escape through the membrane filter. A special syringe adaptor screw-locks onto the vial cap to prevent leakage. A diluent is introduced into the vial, and the displaced air escapes through the filters. So air still leaves the vial, but it is double filtered. The system allows a positive-lock needleless connection to an IV set for administration to the patient. The needleless aspect of this system is attractive because it eliminates the potential for accidental injury or contamination by needlesticks.

Unlike the Onguard system, the PhaSeal system totally prevents air and particulates from escaping into the surrounding area. The PhaSeal device has a spike connected to a protector cap that penetrates the rubber membrane of the vial. When pressed through the membrane, a balloon chamber on the side of the spike inflates, capturing air and particles that are displaced from the vial. Then, a needle is pushed out of its protective barrel and down through double membranes, into the vial. The needle portion of this Luer lock injector is designed so the needle is never exposed, preventing accidental needlestick injuries. It is contained in a plastic chamber that telescopes into the barrel (Figures 5.3 and 5.4). The injector and the protector cap are locked together, with the rubber membrane of the injector

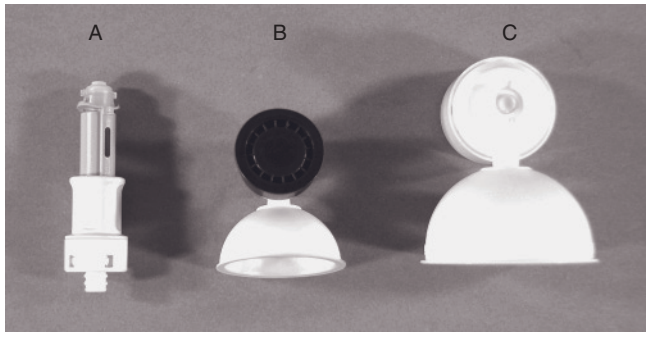


Figure 5.3 PhaSeal components necessary for chemotherapy preparation. (A) Injector: attaches to a syringe to allow safe extraction of chemotherapy drug from a vial. (B,C) Two sizes of protectors. These absorb positive pressure and aerosols from a vial and allow drug extraction without aerosol exposure risk.

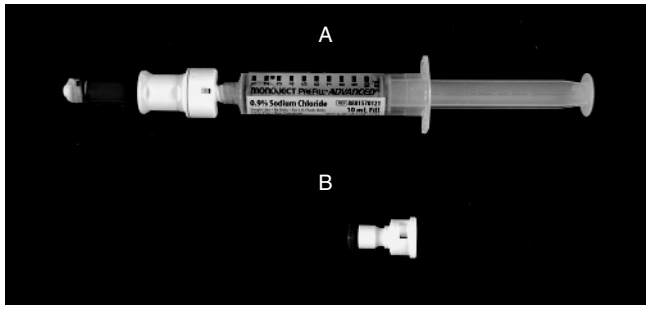


Figure 5.4 PhaSeal components necessary for chemotherapy administration. (A) Flush syringe with the injector attached. (B) Luer lock connector. This attaches to the catheter attachment on the patient with a locking mechanism that prevents drug exposure.

in contact with the rubber membrane of the vial, creating a *dry* connection. When the needle is withdrawn from the vial, it retracts into its plastic barrel chamber. Because the rubber membranes are locked together in a dry connection, there is no chance of drug particles escaping the vial during preparation. If the drug is diluted into a larger volume, such as a 150-mL bag of electrolyte solution, a different infusion adaptor connects to the IV administration set and allows the drug to be added to the bag, using the same locking closed system. A similar docking device is used for the administration of the medication. An adapter is Luer-locked onto the catheter, and a needle again penetrates the double membrane of the dry connection. The four-part PhaSeal system provides maximum protection for the technician or pharmacist preparing and administering a dose of chemotherapy. The cost of these closed or contained systems is reasonable for

the practice that occasionally administers chemotherapy and can be passed directly on to the client.

Safe drug administration

Always place a new, dedicated catheter for the administration of chemotherapy. Administering IV chemotherapy through only a needle with syringe leaves your patient (and yourself) vulnerable to accidental exposure. The patient may pull away from the holder and cause the needle to come out of the vein, risking a needlestick injury or topical exposure to you as well as the holder, and topical or perivascular exposure to the patient. Many chemotherapy drugs are very toxic to normal tissues when administered perivascularly. ***Flush*** the catheter immediately before administration to confirm its patency and immediately after administration to assure that the catheter is clear of any drugs before removal. That way, the patient receives its entire intended dose and no drug remains in the catheter when it is removed.

Many cancer drugs can be administered orally by the owners on an outpatient basis. These drugs can be dispensed by your clinic or prescribed to a pharmacy. Instruct owners to wear gloves when handling these medications, and caution them that their pet's saliva, urine, and feces may be contaminated with chemotherapy drugs or their metabolites for a period of time. There may be times when splitting a tablet to achieve the proper dose of chemotherapy for an animal patient seems unavoidable. Having tablets compounded is one way to avoid the risks associated with splitting them. Compounding powdered chemotherapy drugs into capsules should not be attempted by a veterinary clinic without a ***powder containment glove box***. It is similar to the isolator chambered system, except that a powder containment glove box has prefilters to prevent its HEPA filters from becoming clogged with powder. To compound a human cancer drug, which veterinary patients require in very small doses, the drug is pulverized and mixed with other powder fillers and then placed in capsules for administration. The powder containment glove box confines the toxic dust created by this compounding process, protecting the surroundings and personnel.

Although unadvisable, if a patient's chemotherapy tablet must be split, and the owner is willing to do it at home, instruct the owner to wear a mask and gloves, and to carefully cut the tablets with a tablet cutter. If a technician, veterinarian, or pharmacist routinely divided tablets for their cancer patients, they would take unacceptably high risks of being exposed to much higher levels of toxicity. The pet's owner will also be exposed by cutting his or her pet's tablets, but his or her exposure will be nominal. Supply the owners with protective latex or nitrile gloves, and teach them how to minimize their risk of contamination as they split and administer chemotherapy tablets to their pets.

Safe waste disposal

Proper disposal of hazardous waste is important to all of us and is the mission of the Environmental Protection Agency (EPA) and other government agencies. Recent studies demonstrate that our drinking water contains measurable levels of drugs that have not been filtered out by current water treatment systems. The highest levels of drugs are hormonal-type steroids classified as "endocrine disruptors." They are, in large part, from prescriptions for birth control products and hormones for menopause. These drugs, or their metabolites, work their way through the body and end up in our wastewater. Antibiotics, pain medications, tranquilizers, antidepressants, and chemotherapeutics are also detected. It has long been common practice to dispose of excess or expired drugs like these by flushing them down the drain.

When administered to humans, chemotherapy drugs are also excreted in their urine or feces over time and, ultimately, end up in the wastewater system. Chemotherapy drugs containing platinum, like cisplatin or carboplatin, can be detected in a patient's urine for up to 5 days. The veterinary cancer patient presents additional concerns about waste. Since pets rarely use toilets, there is increased potential for direct exposure to humans and other animals. Inform owners that waste from their pets may be hazardous and to avoid contact with urine, feces, or vomit. Instruct them to protect small children and pets by picking up and disposing of their cancer patients' feces in plastic bags, and washing urine spots with water. Hazardous waste in your clinic is governed by no less than seven government agencies, and all are concerned with how your veterinary clinic disposes of hazardous waste. They are

- EPA,
- OSHA,
- Drug Enforcement Agency (DEA),
- US Nuclear Regulatory Commission (USNRC),
- State Department of Public Health and Environment,
- NIOSH, and
- DOT.

These organizations are most interested in waste generated by human medicine. However, it has come to their attention that veterinary clinics also have the potential to contaminate drinking water and accidentally expose people to infectious, nuclear, and cytotoxic waste products. And they impose the same guidelines on veterinary clinics for the disposal of these agents. Inspections by any of these governmental agencies can take place unannounced to determine your compliance with laws pertaining to waste handling.

Standards for waste handling

Standards have been set for handling hazardous waste, and they apply to veterinary clinics as well as human clinics. Special color-coded containers are manufactured to collect hazardous waste. The colors indicate the type of waste that they store. Yellow designates chemotherapy waste, red is for infectious waste, and black containers are specific for Resource Conservation and Recovery Act (RCRA) waste. These standards were initially set to control hazardous waste produced by large manufacturers. However, they have now trickled down to end users like medical and veterinary clinics. For instance, the practice of clinics working together to gather their chemotherapy waste and dispose of it from a central location violates both state and federal laws governing the transport of hazardous materials. Now, only licensed "hazardous waste handlers" can transport these wastes. If you were to carry chemotherapy waste from your clinic to the local human hospital for proper disposal, and it was discovered in your car, you could face imprisonment and a fine for illegally transporting hazardous waste without a license.

The RCRA classifies hazardous waste using letter designations. Hazardous drugs are designated by the letters "P" and "U." Products that fit into these two categories are chemicals commonly found in healthcare facilities. Examples of drugs that are designated with a "P" that might be found in your clinic are

- heartworm medication,
- epinephrine,
- nitroglycerine, and
- warfarin.

Most chemotherapeutic agents are designated in the "U" listing of RCRA.

It is important for veterinarians and technicians to recognize the classifications of hazardous waste and to know how to handle them in the clinic. There are specific guidelines for the disposal of these agents, as well as specific types of containers that must be used. The RCRA containers are black and are available in 1-, 2-, and, 5-gal sizes. Drugs classified as letter "P" and "U" must be disposed of in these containers.

The waste generated by chemotherapy preparation and administration is designated as either *concentrated* waste or *contaminated* waste. ***Concentrated waste*** includes the original drug vial, or a syringe and needle that came in contact with the concentrated drug during preparation. These should be disposed of in a black RCRA container. ***Contaminated waste***, such as gloves, gowns, administration sets, and IV bags, is disposed of in yellow chemo-waste containers. Yellow is the designated color for incidental chemotherapy waste.

Veterinary clinics that handle any of the RCRA drugs or chemotherapeutics must contract with a ***licensed hazardous waste handler***. Waste containers can be purchased from the same suppliers who offer sharps containers. They have a sealable lid and are to be accessed only when adding more waste. Nothing should ever be removed once it is placed in a container. The RCRA and yellow containers may be stored on-site for 30 days or more until arrangements can be made for pickup. Licensed waste handlers will pick up your containers, replace them with empty ones, and transport the waste to their collection sites. Contracting with a waste-handling service is the only way for a veterinary clinic to comply with state and federal regulations and is an expense to be considered. Laws are very strict regarding this process.

The EPA has designated state governments to enforce the proper handling of medical waste. State agencies are always looking for sources of hazardous waste contamination. They already inspect human hospitals, pharmacies, and medical clinics. They are beginning to look at veterinary clinics as possible contaminators. They have the authority to come into your clinic and observe how you handle hazardous waste. If you have the proper color-coded containers and a contract with a licensed waste handler, your clinic is in compliance and should have no problems with an inspection. All of these protective measures add up and are expensive, but we must all be good custodians of our environment.

Additional reading

Department of Transportation (DOT). More information on hazardous material transportation violations can be found at the DOT, Office of Inspector General (OIG) web site. [http://www.oig.dot.gov/oversight-areas/criminal-investigations/hazardous-materials-pipelines].

Harrison BR. 1989. Exposure to hazardous drugs: Time to reevaluate your program? *Am J Health Syst Pharm* 56(14):1403.

National Institute of Safety and Health (NIOSH). Safe Handling of Hazardous Drugs for Veterinary Healthcare Workers, 2010. [http://www.cdc.gov/niosh/docs/wp-solutions/2010-150/pdfs/2010-150.pdf].

Occupational Safety Health and Safety Administration (OSHA). Prevention of Employee Exposure, 1999. [http://www.osha.gov/dts/osta/otm/otm_vi/otm_vi_2.html#5].

Skov T, Maarup B, Olsen J, Rørth M, Winthereik H, Lynge E. 1992. Leukaemia and reproductive outcome among nurses handling antineoplastic drugs. *Br J Ind Med* 49(12):855–61.

U.S. Pharmacopeia (USP). USP797, Guidebook to Pharmaceutical Compounding: Sterile Preparations, 2008. [http://www.usp.org/products/797Guidebook/].

6 Workflow for Chemotherapy Administration

Kenneth Crump

Key points

- Anxiety about cancer and visits to the clinic can create a cycle of unpleasant expectations for the pet and the client.
- A behavioral history is important at initial presentation.
  - Mark the front of an unpredictable patient's record, cautioning others of the pet's questionable behavior.
- Blood samples are drawn from the jugular vein of chemotherapy patients.
  - It is important to protect the integrity of peripheral veins.
- A busy treatment room is not a suitable place for chemotherapy administration.
- The decision to use sedation is made by the veterinarian, with the informed consent of the owner.
- Proper restraint technique during chemotherapy administration is imperative to maintain control of the patient.
- Practice *soft skills* to ensure a successful chemotherapy experience for the pet.
- There are basic recommendations to follow when dispensing or administering chemotherapy tablets or capsules.
- Off-the-needle administration of any chemotherapy drug is strongly discouraged.
- Placement of a catheter for chemotherapy must be perfect on the first attempt.
- Available chemo-administration systems offer increased safety and decreased accidental exposure.
- A flow sheet is an effective way to track a patient's individual progress.
- Providing clients with a one-page written overview of each treatment removes a layer of anxiety.

Cancer Chemotherapy for the Veterinary Health Team, First Edition. Edited by Kenneth Crump and Douglas H. Thamm.

Introduction

The proportion of owners willing to pursue advanced diagnostics and treatment for their pets with cancer has grown significantly in recent years, making it increasingly important that veterinary practices gain expertise in the administration of chemotherapy. With the advanced safety devices available today, many chemotherapy protocols can be performed easily in a private practice setting with minimal specialized equipment. Veterinary technicians play a central role in the treatment of pets diagnosed with cancer. It is essential to take all necessary precautions to minimize the risks to the animal, as well as to the veterinary healthcare team. However, a successful chemotherapy experience for the pet, the owner, and the hospital staff requires more than careful attention to technical expertise. It also requires employing the *soft skills* of customer service.

The greeting

One of the ways clients judge the quality of a veterinary hospital, its staff, and the services it provides is by how their animals respond to being treated. In other words, how much their pet enjoys its visits to the hospital can be as important to the client's feeling of success as the efficacy of the treatment itself.

Visiting a veterinary clinic is stressful for some pets and therefore for their owners. Couple that with the anxiety that often accompanies a diagnosis of cancer in a loved one and a cycle of unpleasant expectations can begin to form. The owner may anticipate a chemotherapy visit with apprehension. Their pet will likely respond to its perception of the owner's anxiety and "act out" behaviors of apprehension. Each visit that results in stress and unpleasantness for the pet ensures that future visits will become more difficult. Considering that most chemotherapy protocols require multiple visits to the clinic, it is to everyone's benefit to help the owners and the patients feel relaxed at your veterinary clinic. One place to begin is during the initial patient history, when the pet first presents for cancer treatment. Getting to know a pet's personality and behaviors in the beginning can go a long way toward preventing stress from mounting from one visit to the next. A ***behavior assessment*** should be a routine part of every pet's history upon initial presentation.

Studies show that only 25% of veterinary practices routinely discuss behavior issues with clients. It is important to realize that an owner may never think to discuss his or her pet's behaviors with you because he or she may not see how behaviors relate to cancer. Therefore, it is vital that you ask questions about his or her pet's personality as part of your patient history. A behavior assessment can detect situations and can identify potential problems before they impact the quality of future visits. Consider questions similar to the following:

- Is there anything you are reluctant to do with (or to) your pet?
- What sorts of things frighten your pet?
- How does he or she react when he or she is afraid?
- How does he or she react to new people or situations?

Obtain behavioral *descriptions*, not interpretations. Owners often describe their pets' behavior in vague subjective terms like, "He goes crazy when the doorbell rings." Encourage a more specific description by asking, "What does that look like?"

Also, take note of the pet's demeanor in the clinic. Record any observed occurrences of fearful, threatening, or aggressive behavior in the patient's record, and share that information with other team members. It is a good idea to mark the front of an unpredictable patient's record, cautioning others of the pet's questionable behavior. Discuss behavior concerns with the doctor, so the doctor can discuss the pet's behavior with the owner. Avoid taking it on yourself to develop a course of action for the client to follow, or making recommendations or referrals for appropriate treatment of behavior problems without approval from the veterinarian. In some cases, a script can be written for a difficult conversation with an owner, so as to discuss only the pet's behavior and to avoid giving the impression that the pet is "bad."

A veterinary technician can do a lot to calm a tense "first experience" for a pet receiving chemotherapy. Technicians know to avoid the behaviors most people use to greet dogs, which could be misunderstood by dogs as threats. A dog in a strange, emotionally charged environment might be "offended" by postures such as direct eye contact, direct frontal approach, reaching toward or over them, and leaning forward. Cats may find them equally threatening. Instead, when approaching a dog, turn your side toward the animal and try to approach at a slight angle rather than head-on. Look at the floor or off to the side, keeping the pet in your peripheral vision, but without looking him straight in the eyes. These and other simple techniques may be employed to ease a patient's stress by keeping your behavior less threatening. When clients see their pets are calm and accepting of the new situation, they also relax. The cycle of unpleasant expectations then begins to unwind. Throughout your interactions with a chemotherapy patient, assume the role of the pet's favorite "aunt" or "uncle," doting on them and liberally rewarding the slightest positive behavior. Your goal is for the pet to *drag* its owner from the car to the front door of the clinic at every chemotherapy appointment.

Pretreatment examination

Initial friendliness is not always predictive of how an animal will react to restraint and handling. Do not assume an animal will be tolerant of being handled for examination and other procedures. Careful observation of an animal's posture is the best way to assess its emotional state and its

intentions. Cancer patients are quite often older animals and may tolerate handling better if they are examined on the floor, rather than lifted onto a table. See Chapter 4 for details on the importance of a quality temperature, pulse, and respiration (TPR) and physical examination.

Many chemotherapy drugs affect the bone marrow's ability to make cells, so blood is drawn from chemotherapy patients at nearly every visit to evaluate their white blood cell count. White blood cells called neutrophils form an integral part of the immune system. A low number of neutrophils could be a cause to postpone a chemotherapy treatment. Your clinic will establish a minimum acceptable number of neutrophils for treatment. Be sure you know that number.

Since many intravenous (IV) chemotherapy drugs are ***vesicants*** and damage tissues if they leak out of the vein, it is important to protect the integrity of peripheral veins as much as possible. Therefore, draw all blood samples for routine blood tests from the ***jugular vein***.

Drawing blood from the jugular vein is an acquired skill and takes practice to perfect. One simple way to gain confidence in finding the jugular vein on a variety of sizes and shapes of animals is to raise the jugular vein of every patient you see. A successful blood draw from the jugular is rarely a matter of hitting the vein; it is usually a matter of *finding* the vein. Once it can be located, palpated, and visualized, you discover that it is larger than any other vein you can access. Sliding a needle into it is relatively easy.

Positioning the pet on the floor or on a table largely depends on the size of the animal. Have the handler restrain the patient in a manner that exposes its neck, yet still prevents the pet from backing up or trying to scratch you with its front or rear claws (Figure 6.1). If you are apprehensive

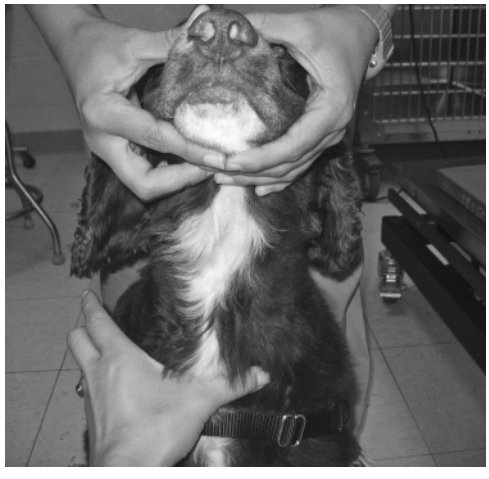


Figure 6.1 To expose the jugular vein, hold the animal's head in a near normal position.

about the pet's behavior at all, use a muzzle to keep from having to divide your attention between the pet's neck and its teeth.

With the animal's head in a near normal position, no more than slightly above a 90° angle from the neck, the jugular vein generally runs along a line from the base of the ear to the thoracic inlet. A quick visualization and palpation of the jugular vein of every patient you see, regardless of whether or not you draw blood from it, will increase your confidence remarkably when you need to use it.

Restraint for chemotherapy

One of the first decisions to be made when preparing to administer chemotherapy is whether or not chemical restraint is indicated and appropriate. Sedatives and tranquilizers depress the central nervous system and reduce anxiety and struggling. They can help minimize stress during the administration of chemotherapy and reduce the need for physical restraint. The decision to use sedation is made by the veterinarian, with the informed consent of the owner. Although your patient's disease usually does not merit any particular consideration when selecting the drugs to use for sedation, cancer patients are generally older animals and may have other age-related issues. When necessary, the ideal sedative for a chemotherapy patient has a rapid onset and short duration. The drug or drug combination should have minimal negative side effects and be reversible if possible. The rationale for using combination drug therapy for sedation is similar to the rationale for using combination drug therapy to fight cancer. Multidrug protocols are generally more effective than single-drug treatment regimens. When drugs are used in combination, several important points should be kept in mind:

- Each drug in the combination should be effective when used alone.
- Drugs with overlapping toxicities should be avoided.
- The drugs should be dosed in combination to produce the maximal effect, with the least side effects.
- Combined sedative drug regimens are most effective when they have different mechanisms of action and act at different receptor sites.

As mentioned earlier, we are all creatures of habit. And although our habits usually serve us well, it is important that you avoid just reaching for your usual sedation protocol and take that extra moment to make conscious decisions regarding sedatives for patients receiving chemotherapy. Whether or not to sedate and the choice of drugs to use are ultimately the veterinarian's decisions to make. However, your awareness of the need to possibly divert from your usual sedation practice will go a long way toward enhancing the cancer patient's chemotherapy experience.

A busy treatment room is the least suitable place for a chemotherapy treatment. Select a room that is out of the flow of traffic and is easy to regulate personnel moving in and out of the room. Clients often wish to "help" or watch a chemotherapy treatment. For the safety of the client, the patient, and the staff, this should not be allowed. See Chapter 3 for more details on preparing an appropriate place to administer chemotherapy.

Older, larger cancer patients may better tolerate receiving chemotherapy on the floor rather than being lifted onto a table. But lifting a pet onto the examination table is usually the first step in the administration procedure. Lifting smaller animals is usually fairly routine; however, larger animals present challenges. Their weight may be prohibitive, their bulk makes them awkward, and they are not used to being lifted. Also, their joints may be stiff from age-related changes, and any struggle they offer will likely hurt them, you, or both. For these reasons, it is better to have two people lift and position a larger pet onto the examination table for chemotherapy administration.

With two people, a larger patient can safely be lifted and positioned in one smooth motion. The two-step process of lifting the dog onto the table and then positioning it offers another opportunity for the patient to feel insecure and unstable standing on a slippery steel table. So the preferred method for a larger dog is to lift and position into lateral recumbency (lying on their side), all in one motion. Many large breeds of dogs are too deep-chested to adequately restrain for a chemotherapy infusion while positioned in sternal recumbency (lying on their chest). But lateral recumbency affords even the smallest handler the ability to safely and securely restrain the patient.

Before lifting the patient, decide which lateral recumbency is preferred for infusion: right or left. Then both handlers stand side-by-side, facing the side of the pet to be infused. Bending at the knees, both handlers then squat facing the dog. The handler near the pet's head places an arm in front of the forelimbs across the sternum and the other arm in a forklift position about halfway down the abdomen. The other handler places an arm behind the hind legs and the other arm in a forklift position about halfway up the abdomen. Both handlers hold the dog securely against their own bodies and then lift and roll the pet onto the table into lateral recumbency, in one motion (Figure 6.2). The handler near the head remains in position over the dog, holding it in place on the table, while the second handler circles to the other side of the table and establishes the proper position to restrain the patient for an infusion.

To properly restrain a dog in ***lateral recumbency***, the holder stands at the dog's back with one forearm pressed across the animal's neck while that hand holds the "down" foreleg, which lies against the table. The other forearm presses across the dog's flank, and the "down" hind leg, which lies against the table, is held in a similar manner (Figure 6.3). As mentioned before, if you are at all apprehensive about the pet's behavior, use a muzzle.

Figure 6.2 Two handlers hold the dog securely against their own bodies and then lift and roll the pet onto the table into lateral recumbency.

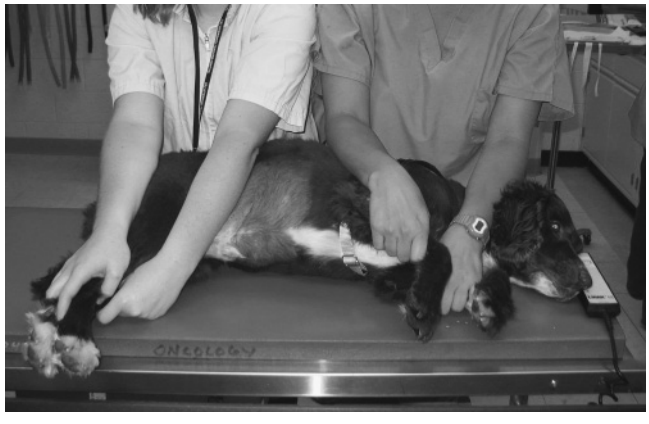


Figure 6.3 The proper technique to restrain a dog in lateral recumbency.

With a muzzle on the animal, you will be less concerned with the need for rigid restraint, and your hold will be more relaxed. It is finesse over force; animals respond better to being held securely rather than forcefully. Also, dogs who are not accustomed to being muzzled are often distracted by having a muzzle placed.

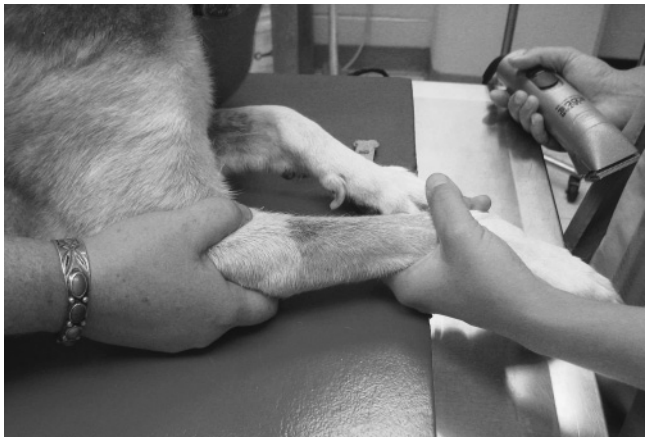


Figure 6.4 Proper restraint to expose a cephalic vein. Note that the elbow is cupped by the holder's palm to prevent withdrawal of the limb and that the dorsum of the forelimb is rotated laterally by the thumb so that the vein runs directly over the top of the limb.

Held in ***sternal recumbency*** to use a cephalic (forelimb) vein for the infusion, the holder stands (or kneels) beside the dog facing the venipuncturist. Place one arm under the dog's neck, and using the hand of that arm, hold the dog's head against your shoulder, with the muzzle pointed away from your face. At the same time, wrap the other arm over the back of the dog and use that hand to encircle the patient's foreleg. Cup the patient's elbow in the palm of that hand and cover the cephalic vein with your thumb. Push slightly with your palm so the pet cannot withdraw its leg from the venipuncturist, and rotate your hand while pressing with your thumb to present the engorged cephalic vein to the most anterior (top) aspect of the foreleg (Figure 6.4). Once the catheter is seated in the vein, stop holding the vein with your thumb but continue to cup the elbow in your palm to maintain control of the patient's leg.

Whether in sternal or lateral recumbency, using proper restraint techniques during chemotherapy administration is imperative to maintain control of the patient. Many of the cytotoxic drugs used to treat cancer are ***vesicants***. Vesicants are highly reactive chemicals that combine with proteins, DNA, and other cellular components, resulting to destructive cellular changes. When vesicant medications leak out of a vein and make contact with the surrounding tissue, the damage begins. Tissue damage can range from mild skin irritation to gaping necrotic wounds, requiring multiple surgical repairs. See Chapter 3 for more information about managing vesicant drugs.

As a team, the venipuncturist and the holder work together to safely and effectively administer chemotherapy to the animal cancer patients. Neither job is more or less important than the other. Each person relies on the other

to be focused and attentive to his or her responsibilities. Each is the star of the show. When the team is confident and relaxed, the patient will also be. But a successful chemotherapy experience for the pet does not end with expertly executed technical skills. For the pet to leave the experience feeling comfortable and wanting to do it again, the medical team must practice *soft skills* as well.

Soft skills refer to the intangibles that contribute to a positive experience. In a veterinary clinical setting, these intangibles include the sights, sounds, and smells of the environment. Avoid wearing strong-scented cologne or perfume. Create a quiet atmosphere away from slamming doors, barking dogs, and stressed cats. Also, remember that pets, especially dogs, are companion animals. They interact with all people, not just their owners. That means your demeanor can affect their comfort. While administering chemotherapy, keep in mind that your patient is responding to your actions and emotions. Avoid emotionally charged conversations with one another while holding a patient and administering chemotherapy. Monitor your surroundings for how things ***look*** (Are there bright lights? Fast, frantic motions?), ***sound*** (Are people shouting over the sound of a centrifuge?), and ***feel*** (Is someone recounting an angry conversation?). Assuming the perspective of a pet while administering chemotherapy is one way you can further unwind the cycle of unpleasant expectations for your patients' visits.

Drug administration

Oral chemotherapy

Oral administration of chemotherapy drugs can be convenient, noninvasive, and, sometimes, economical. However, there are situations when drug delivery by this route is not possible. Follow these basic recommendations when dispensing or administering tablets or capsules:

- Never crush or break tablets and never open capsules.
  - Although ill-advised, if a patient's chemotherapy tablet must be split, and if the owner is willing to do it at home, instruct the owner to wear a mask and gloves, and to carefully cut the tablets with a tablet cutter.
  - Provide owners with mask and gloves.
  - Inform owners of the potential hazards associated with splitting and administering chemotherapy tablets.
  - Have owners return unused medications to your practice for proper disposal.
- Wear appropriate personal protective equipment (PPE) when handling any tablet or capsule.

- When a capsule or tablet is administered in a food bolus, make sure the food bolus is completely consumed.
  - It is a good practice to follow the drug-containing food bolus with a second "empty" food bolus to ensure ingestion of the first.
- When a capsule or tablet is administered directly *per os* (PO, in the mouth), take care to avoid dissolution of the outer protective coating of the tablet, and make sure the tablet or capsule is swallowed.
  - It is a good practice to follow with a tidbit of food to ensure ingestion.
- Always wash hands after handling drugs.
- See Chapter 5 for more details on handling chemotherapy tablets and capsules.

Intravenous chemotherapy

It should go without saying that eating, drinking, smoking, chewing gum, and applying lip balm are all prohibited in chemotherapy administration areas. Before administering injectable chemotherapy to any patient, review these simple steps to increase your awareness and protect your patients from being harmed by a chemotherapy-related error (see Chapter 3):

(1) Review the patient's record.
(2) Recheck the patient's blood test results.
(3) Recheck the drug name and dose.
(4) Recheck the dose calculation.
(5) Ask questions.
(6) Keep accurate records.

IV drugs can be administered through a traditional dedicated over-the-needle catheter or a butterfly-style catheter. Off-the-needle administration of any chemotherapy drug, no matter how small the volume, is strongly discouraged. The sites most frequently used are the cephalic and lateral saphenous veins in the dog, and the cephalic and medial saphenous veins in cats. The larger veins of the forelimb (cephalic veins) are often chosen, as many find them easier to catheterize. Saphenous veins have advantages also. Over-the-needle style catheters are used to infuse volumes of greater than a couple of milliliters. See Chapter 3 for criteria for selection of an appropriate style of catheter and for supplies to have ready in your "chemotherapy setup" prior to starting.

Placing a catheter for chemotherapy requires a level of skill greater than "novice." Although a novice can likely place a catheter successfully, a seasoned veteran should stand at the ready to make any necessary second attempts. Always place a new, dedicated catheter for the administration of chemotherapy. Shave the area of the insertion site generously, as you would for a surgical incision. Perform a surgical prep with antiseptic scrub and

solution. A full surgical prep (rather than a swipe with alcohol) and aseptic technique are both important because chemotherapy may lower a patient's resistance to catheter-related infections. Repeated catheterization of an immunocompromised cancer patient courts disaster. Local anesthetic block is rarely indicated because the injection of anesthetic is likely as painful as the insertion of the catheter.

Ignore the general catheterization rule that suggests you start your first attempt distally and proceed proximally. The placement of a catheter for chemotherapy must be perfect on the first attempt. So, rather than beginning distally and working your way up the leg, *begin where you have the best view of the vessel and the best chance of success*. Should you fail an attempt, move to a different leg entirely. In this manner, you best protect your patient from being injured by vesicant drugs leaking from a vessel. You also minimize damage to any one vessel that might occur during multiple unsuccessful attempts to catheterize it.

Flush the catheter immediately before administration to confirm its patency and immediately after administration to assure the catheter is clear of any drugs before removal. Check patency with ***0.9% sodium chloride*** solution. Avoid heparin–saline solution for flushing because it can precipitate some drugs, especially doxorubicin. Tape an over-the-needle catheter firmly in place. Do not tape a butterfly catheter in place (see Chapter 3). Leave the catheter uncovered to better visualize it during administration. Wear PPE during drug administration and check the catheter site often. If at any point you feel resistance to flow through the catheter, or see swelling or other reactions, stop until you have confirmed the catheter is displaced or until you are confident that the catheter is flowing as it should. After the infusion is complete, flush the catheter with at least 10 mL of 0.9% saline solution immediately upon completing the administration of chemotherapy to assure the catheter is clear of any drugs before removal. That way, the patient receives its entire intended dose and no drug remains in the catheter when it is removed. Then, remove the catheter immediately, place all materials into a sealed plastic bag, and discard as cytotoxic waste. Figures 6.5–6.17 demonstrate the step-by-step chemotherapy administration in a dog with lymphoma.

Two systems for administering chemotherapeutics are now available. The PhaSeal® system is considered a "closed-system drug transfer device." The other system, Onguard®, is a "contained medication system." Both systems offer increased safety for the hospital staff and decreased accidental chemo-exposure. Both systems have four primary components designed for nearly intuitive use. Because these systems can be easily integrated into your current practice, training can be completed easily and in a timely manner (see Chapter 5).

The ***rate of administration*** for chemotherapy is determined by the type and volume of drug to be administered, as well as the protocol designed by the veterinarian. Vincristine, for instance, is usually in small volumes

Figure 6.5 Review the record and check the drug to be administered. Do you have the right patient? Do you have the right drug? Do you have the right dose?

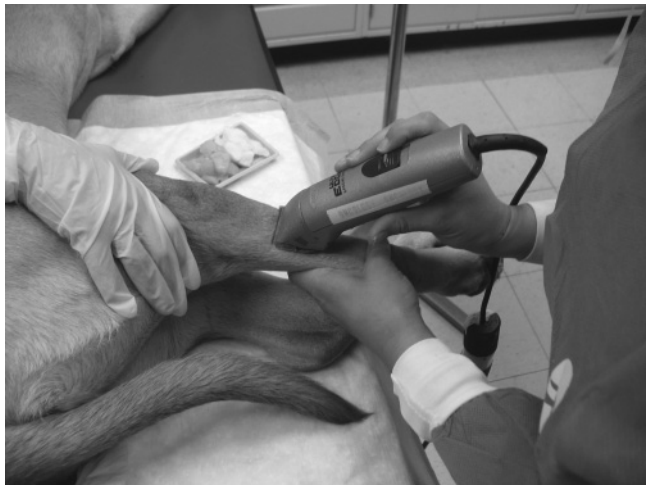


Figure 6.6 Shave the catheter site. A small shaved area is acceptable.

and can be delivered in seconds by slow push through a butterfly catheter. Drugs, such as doxorubicin, that have higher extravasation risk and take longer to administer should be given through a securely placed over-the-needle catheter. The administration of cisplatin, however, involves a prescribed IV prehydration, followed by a long infusion of the drug, which is then followed by a prescribed IV posthydration. The entire chemotherapy administration session can take 6–8 hours. See Chapter 7 for general guidelines on chemotherapy routes and rates of administration.

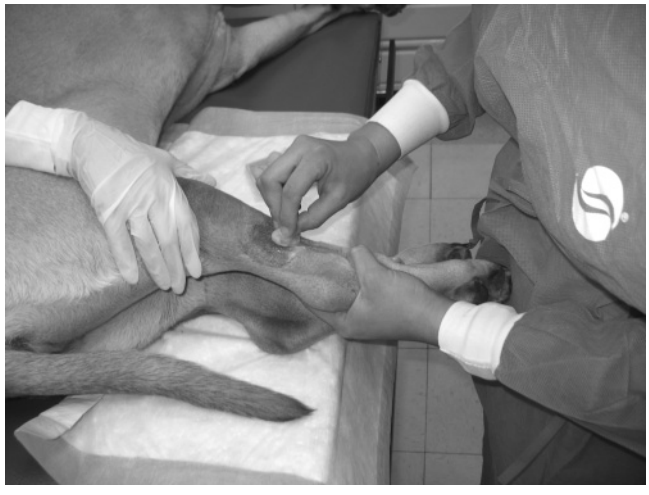


Figure 6.7 Prep the catheter site. A full surgical prep and aseptic technique are both important to prevent catheter-related infections.

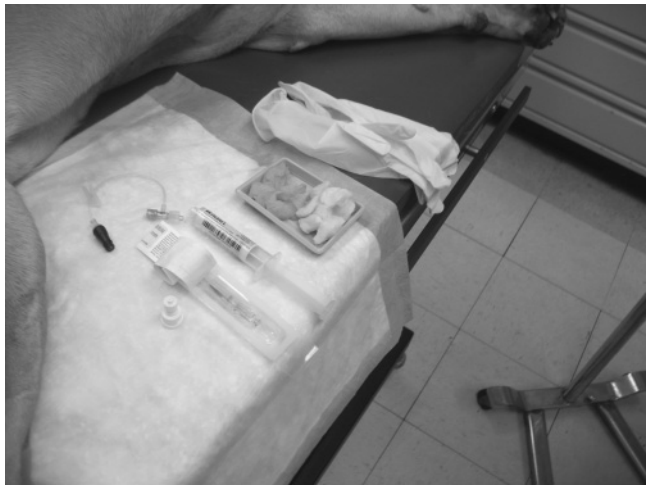


Figure 6.8 Ensure that all necessary supplies are close by and ready to go. This includes tearing strips of tape, opening catheters, T-ports, and protective supplies, and preloading the catheter and T-port with saline. Note the absorbent pad in place under the limb into which chemotherapy is going to be administered.

Subcutaneous/intramuscular chemotherapy

Some chemotherapy drugs, such as cytarabine and asparaginase (see Chapter 7), are administered either subcutaneously (SQ) or intramuscularly (IM). They present additional contamination concerns to you because, although they can be reconstituted and the doses drawn into

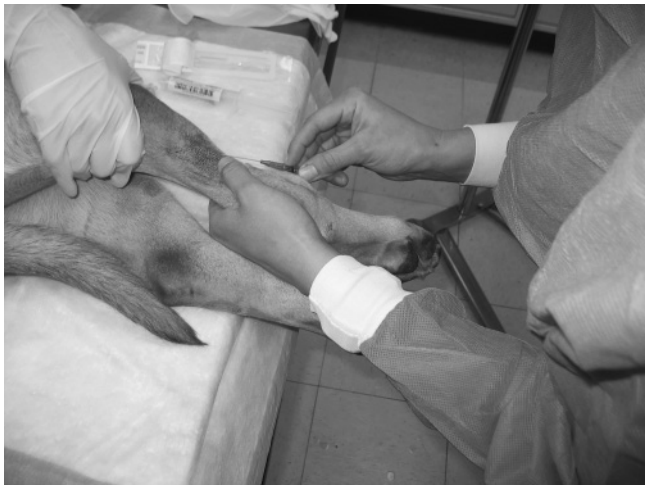


Figure 6.9 Insert the catheter. Remember the "one-and-done" rule for catheter attempts for chemotherapy administration!

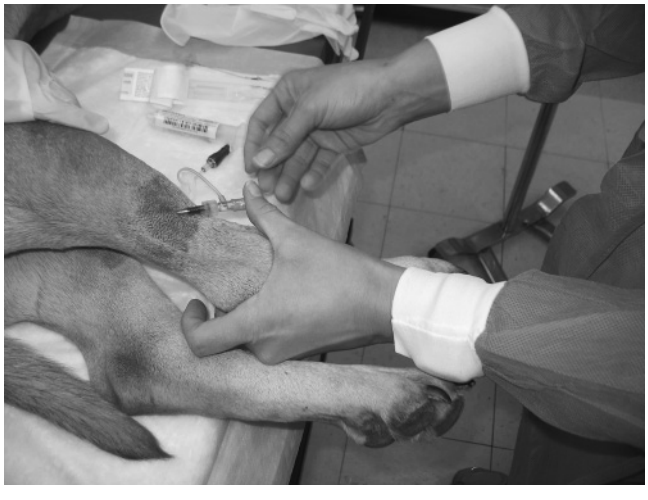


Figure 6.10 Attach the T-port. This allows the limb freedom to move without risk of the catheter being pulled out.

syringes using the PhaSeal or Onguard protective devices, a bare needle is required for subcutaneous or intramuscular injections. An unprotected, bare needle offers the opportunity for accidental drug spill, errant injection, and needlestick injuries. Be aware that you, your colleagues, and your facility are at their most vulnerable for contamination. It is imperative you wear PPE when administering chemotherapy drugs either SQ or IM.

When a subcutaneous injection is administered, tent a fold of skin and insert the needle at its base, parallel to the long axis of the fold. If the needle

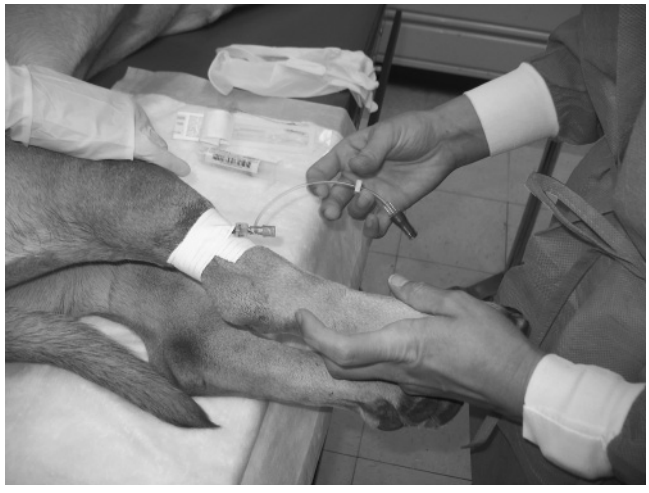


Figure 6.11 Tape the catheter securely in place.

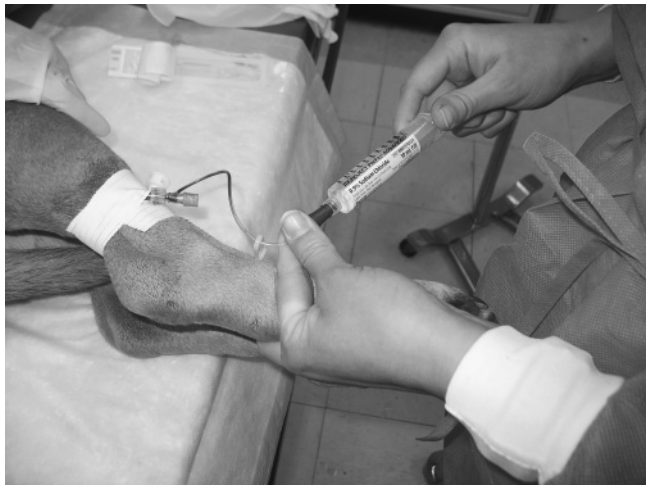


Figure 6.12 Flush the catheter to ensure patency. Watch carefully for blebs or swelling under the skin and note resistance to flushing, which could indicate that the catheter is improperly placed or is outside a vein. Check for a flashback of blood to ensure proper catheter placement.

is inserted perpendicular to the fold, the needle may penetrate both sides, and you may empty the contents of the syringe into the pet's hair. Aspirate slightly and check the needle hub for blood or air bubbles. Blood in the needle hub indicates that you have penetrated a vessel. Air in the hub is an indication that you have penetrated both sides of the "tent." Either indicates you must reposition the needle.

Chemotherapy drugs are most often administered IM into the lumbar muscles, lateral to the dorsal spinous processes. Wearing PPE, uncap the

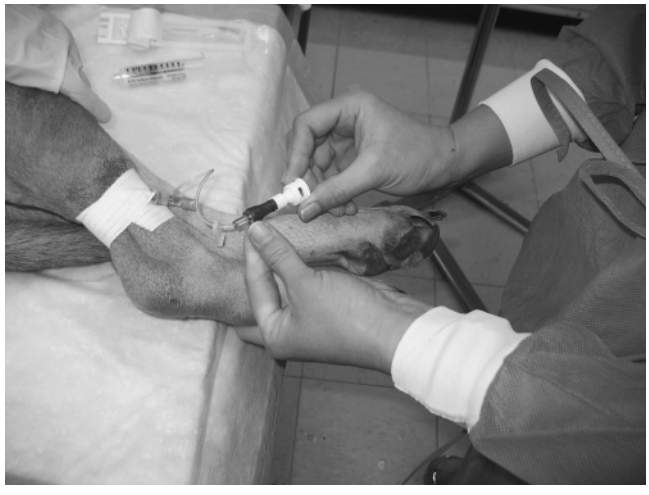


Figure 6.13 Attach the PhaSeal adapter or similar protective device to the tip of the extension set.

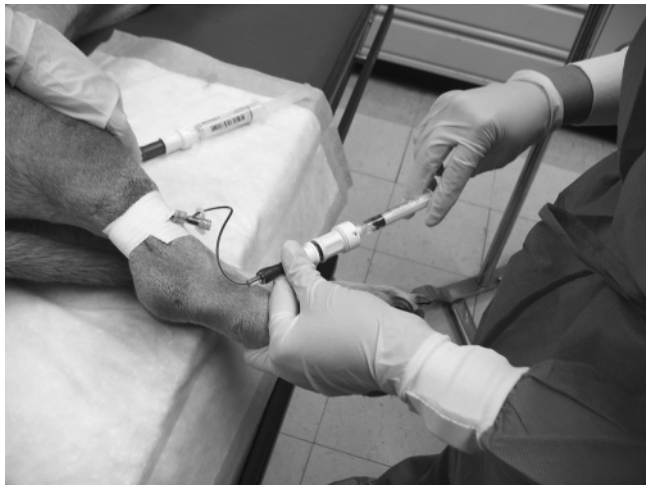


Figure 6.14 Administer chemotherapy. Speed of administration will vary depending on the agent.

20- to 22-gauge needle attached to the syringe and isolate the muscle between your fingers and thumb. Slide the needle into the muscle and aspirate, checking the needle hub for blood. If blood is observed, withdraw the needle and insert into another spot. Once the proper needle placement into the muscle or under the skin is verified (no blood or air in the hub upon aspiration), slowly inject the drug. Then withdraw the needle.

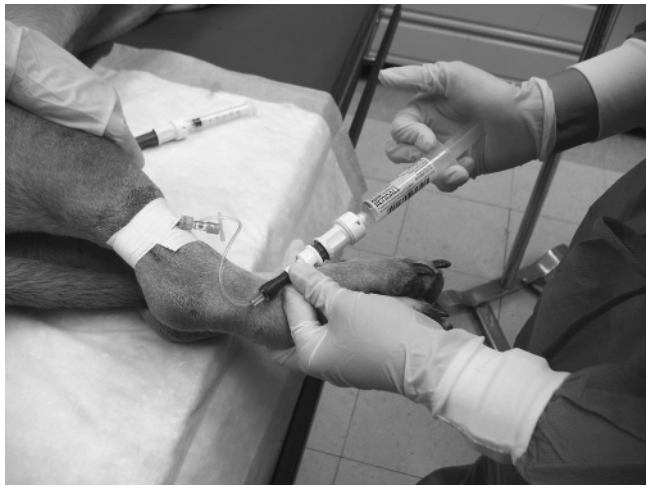


Figure 6.15 Flush thoroughly with saline after chemotherapy administration. This ensures that no chemotherapy drugs remain in the catheter, which could damage the skin or subcutaneous tissues upon catheter removal.

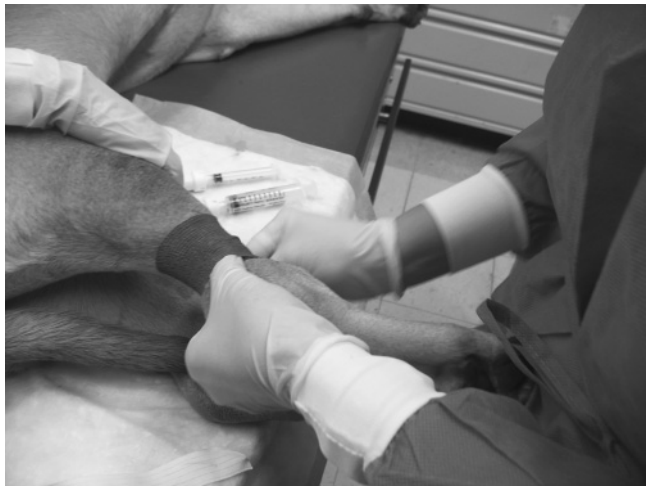


Figure 6.16 Remove the catheter and place the bandage. This usually consists of a small piece of flexible veterinary wrap or adhesive tape, and a cotton ball or folded gauze sponge.

A word of caution about needlestick injuries. The National Institute for Occupational Safety and Health (NIOSH) estimates that 62% of all reported needlestick injuries happen with hypodermic needles, and 42% of those injuries occur after the needle has been used and before its disposal. This means that the risk of a needlestick injury, and the consequential

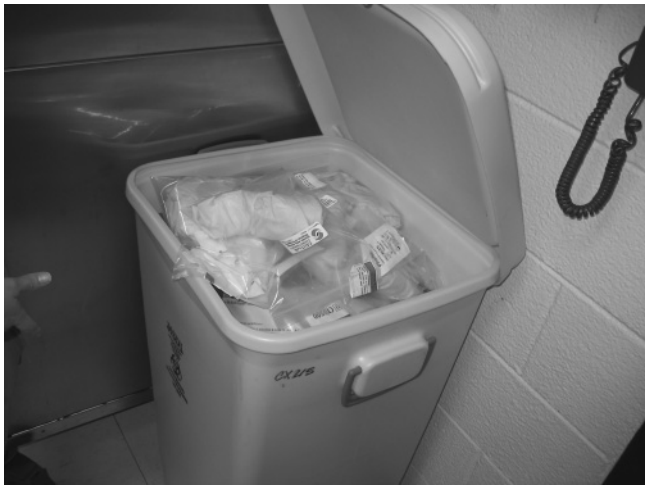


Figure 6.17 Dispose of all waste that came in contact with chemotherapy (catheters, syringes, T-ports, absorbent pad, etc.) in an appropriate cytotoxic waste container.

self-contamination with a cytotoxic drug, is very high as you withdraw the needle from the patient and move it toward disposal. Studies have shown that nearly 25% of needlestick injuries occur when recapping a used needle. ***The Occupational Safety and Health Administration (OSHA) prohibits recapping needles by hand***, unless no other alternative exists. So, if you must recap a used chemotherapy needle before disposal, do it with extreme care and attention.

Chemotherapy flow sheet

A ***flow sheet*** is an effective way to track a patient's individual progress through the course of chemotherapy. It consolidates the pertinent information from each visit into a single chart for easy reference. An example of an effective chemotherapy flow sheet is in Appendix 6.1. It contains

- the date,
- doctor's name,
- patient's weight,
- drug name,
- dose,
- route of administration,
- leg used,
- adverse reactions,
- name of the person who administered the drug, and
- drugs and doses of sedation if used.

Afterward

People don't care how much you know until they know how much you care.

This often quoted statement by author John C. Maxwell holds an elemental truth with regard to medicine. A follow-up telephone call several days after each chemotherapy treatment goes a long way toward showing your clients how much you care for their pets and for them. It can also give you an early indication of how your patient tolerates chemotherapy and give you an opportunity to address complications before they become serious.

Providing clients with a one-page written overview of each treatment for them to take home also removes a layer of anxiety that many people feel about cancer therapy. An example of a posttreatment client information sheet can be found in Appendix 6.2. Such an overview includes

- an indication that a staff member will call in a few days for an update,
- the name of the drug the pet received during that visit,
- a list of the side effects that may be seen and how to manage them, and
- reminders on chemo-safety-related issues of concern at home.

Appendix 6.1 Sample chemotherapy flow sheet

Chemotherapy flow sheet								
Client, patient _____			**Case # _____**			**Diagnosis _____**		
Date								
Clinician								
Weight (in pounds)								
Parenteral agent								
Dose (calculation)								
Route								
Leg used								
Adverse reaction								
Administered by								
Drugs for home use								
Sedation required	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Drugs used for sedation								

COMMENTS:

_____

_____

_____

Appendix 6.2 Sample client discharge instructions

In the next few days, a member of our staff will call for an update on your pet and to address any questions or concerns you may have. Below is information about the chemotherapy your pet received, in addition to chemotherapy safety guidelines.

Vincristine (Oncovin®)

Vincristine (Oncovin) is an active chemotherapy drug used to fight many forms of cancer. The IV administration of vincristine usually takes only a few minutes. The procedure is painless, so the patient lies quietly on a padded table during administration and rarely needs any form of sedation.

Although serious adverse effects can occur with any chemotherapy, there is less than 5% chance that your pet will be hospitalized with side effects and less than 1% chance of fatality. As the owner, you play an important role in recognizing side effects, managing them at home whenever possible, and alerting the doctor if side effects persist. Listed below are some potential side effects of vincristine. Please consult your pet's doctor with any questions you may have about this chemotherapy.

Potential side effects of vincristine

- Hair loss (alopecia)
  - Hair loss in pets is rare.
- Reduction in the number of white blood cells (neutropenia)
  - Your pet's ability to fight off infection is impaired by neutropenia.
- Stomach or intestinal (gastrointestinal) discomfort
  - Many patients experience some form of stomach or intestinal discomfort 2–7 days after a chemotherapy treatment.
  - If your pet shows signs of upset stomach (drooling, "smacking" lips, vomiting) or loss of appetite, administer the medicine your doctor prescribed for nausea.
  - If your pet shows signs of diarrhea, administer the medicine your doctor prescribed for diarrhea.
  - Keep water available at all times.
  - Call your veterinarian if you have concerns, or if the condition persists for more than 24 hours.
- Tissue injury
  - If irritation of the chemotherapy administration site appears in the form of pain or redness that persists for more than 24 hours, call your veterinarian.

Safety

The chemotherapy your pet received requires that you take special safety precautions after each visit. For 72 hours after each chemotherapy visit,

your pet's urine and feces should be considered contaminated. For your safety, please follow these guidelines:

- If you are pregnant or nursing, avoid cleaning the litter box or handling any other materials that may be contaminated.
- Wear gloves when cleaning urine or feces from the litter box, cage, and so on.
- Flush solid waste material or place it in a Ziploc® type bag for disposal.
- If your pet has an "accident," remove the solid waste and rinse the area with water. Then wash the area with detergent, followed by a second rinsing with water.
- Soiled linens should be washed once separately prior to routine laundering.
- If accidental skin exposure occurs, wash with soap and water immediately.

7 Chemotherapy Agents

Douglas H. Thamm

Key points

- Chemotherapy is the only form of cancer therapy that treats the entire body.
- Chemotherapy drugs are classified according to their mechanism of action, and if they interfere with cellular reproduction.
  - Cell-cycle phase specific
  - Cell-cycle phase nonspecific
- Combining cytotoxic drugs is an effective strategy.
  - Reduces drug resistance
- Knowing the route of administration ("routes"), rate of administration ("duration"), and specific contraindications ("special precautions") are key factors for success.

Cancer Chemotherapy for the Veterinary Health Team, First Edition. Edited by Kenneth Crump and Douglas H. Thamm.

Introduction

Unlike surgery and radiation therapy, chemotherapy is the only form of cancer treatment that can work throughout the body, rather than in a local area. Although chemotherapy in animals is designed to have a lower risk of side effects than chemotherapy in humans, side effects can be seen in some patients. Educating owners about the risks of side effects is an important part of chemotherapy in pets (see Chapters 1 and 8 for additional information).

Although other chapters in this book cover owner education, pretreatment assessment, administration techniques, and strategies for managing side effects, the purpose of this chapter is to provide a quick reference regarding individual chemotherapy drugs—their uses, toxicities, and routes and techniques for administration. For detailed information about doses and schedules of administration, additional references are provided at the end of this chapter.

Chemotherapy drugs are classified according to their mechanism of action and the point in the cell's life cycle at which they interfere with cellular reproduction. Drugs that are active only during a specific phase of the cell's life cycle are called *cell-cycle phase specific*. Drugs that are active regardless of the cell's life cycle phase are called *cell-cycle phase nonspecific*. The use of cell-cycle phase-nonspecific drugs appears to result in the death of both resting and cycling cells. Following cell death, resting cells are "awakened" into the reproduction cycle and are then more susceptible to future chemotherapy treatments. The awakened cell will then die as it attempts to reproduce itself. The cell kill rate of various drugs is related to the concentration of the drug in the body and to the degree of tumor cell exposure over time.

Combining cytotoxic drugs is an important, effective strategy in chemotherapy. When drugs are used in combination, they often enhance the activities of each other. Drugs are also combined to minimize their dose-limiting toxicities. Combination drug chemotherapy also helps reduce the development of drug resistance in the tumor cells, since cells resistant to one drug in a combination may be sensitive to another drug within that combination.

Treatment dose and schedule depend on the type of cancer and chemotherapy method. In many cases, periodic chemotherapy is necessary to control the cancer for the rest of the pet's life. For maximum therapeutic effect, a dose of a drug or a drug combination should be used, which causes minimal toxicity with maximal effectiveness. Many chemotherapy drugs have a very narrow ***therapeutic index***. This means that the most effective dose of chemotherapeutic agents is often very close to the toxic dose.

For the information below, the risk for neutropenia and gastrointestinal (GI) toxicity are graded on a 3-point scale (0, +, ++), where "0" is rare and

"++" is more common. It is important to note that even for those drugs where the risk is "++," less than one third of animals become sick.

Actinomycin D

Other names: dactinomycin, Cosmegen
Uses: Canine (rarely feline) lymphoma
Routes: intravenous (IV) only!
Duration: 2- to 5-minute slow push. Can be diluted with sodium chloride before administration.
Toxicities: Neutropenia: +/++ GI toxicity: +
Special precautions:

- Can cause severe tissue damage if even a slight amount is administered outside the vein.

Asparaginase

Other names: Elspar, L-spar
Uses: Used with other drugs for the treatment of canine and feline lymphomas and leukemias.
Routes: subcutaneous (SQ) or intramuscular (IM). **Should never be given intravenously!**
Duration: Bolus
Toxicities: Neutropenia: 0 GI toxicity: 0
Special precautions:

- Hypersensitivity reactions can occur following administration. These can be fatal if the asparaginase is given intravenously. Patient should be monitored in the clinic for 60 minutes after injection.

Carboplatin

Other names: Paraplatin
Uses: Canine and feline carcinomas and melanomas, canine osteosarcoma, feline vaccine-associated sarcoma
Routes: IV; occasionally given intralesionally (directly into a tumor) or into a body cavity
Duration: 5- to 10-minute slow push
Toxicities: Neutropenia: ++ GI toxicity: 0/+
Special precautions:

- Use with caution in patients with reduced kidney function.
- Smaller dogs may be at increased risk for diarrhea.

Chlorambucil

Other names: Leukeran
Uses: Chronic lymphocytic leukemia and low-grade lymphomas in dogs and cats. Occasionally used for lymphomas in place of cyclophosphamide.
Routes: *per os* (PO) only
Toxicities: Neutropenia: + GI toxicity: 0/+
Special precautions:

- Thrombocytopenia (low platelet count) can sometimes be observed with long-term use.

Cisplatin

Other names: Platinol, CDDP
Uses: Canine osteosarcoma and various carcinomas
Routes: IV; occasionally given intralesionally (directly into a tumor) or into a body cavity.
Duration: 20-minute infusion. Must be given along with high rates of IV fluid diuresis before and after administration.
Toxicities: Neutropenia: + GI toxicity: ++
Special precautions:

- Can cause severe kidney damage if not given with high rates of IV fluid diuresis before and after administration. Check kidney function before each dose.
- Vomiting or severe nausea is common immediately after administration. Patients need to receive antinausea drugs before cisplatin is given to prevent this.
- ***Fatal to cats!*** Do not use in this species!

Cyclophosphamide

Other names: Cytoxan
Uses: Used with other drugs (doxorubicin, vincristine, asparaginase) for the treatment of canine and feline lymphomas. Sometimes used for the treatment of sarcomas in combination with doxorubicin. Can also be used as an immunosuppressive drug in dogs and cats.
Routes: IV and PO
Duration: 3- to 5-minute slow push (IV)
Toxicities: Neutropenia: + GI toxicity: +
Special precautions:

- ***Sterile hemorrhagic cystitis*** (an irritation of the bladder causing signs similar to a urinary tract infection) can occur rarely. Cyclophosphamide

is often given along with the diuretic drug *furosemide* (Lasix) to dilute the urine and encourage excretion of the by-product that irritates the bladder.

Cytarabine

Other names: cytosine arabinoside, Cytosar, AraC
Uses: Canine and feline lymphomas: Occasionally used for the treatment of granulomatous meningoencephalitis in dogs.
Routes: IV and SQ
Duration: 30-minute to 24-hour infusion (IV)
Toxicities: Neutropenia: + GI toxicity: +
Special precautions:

- A poorly placed SQ injection creates the opportunity for accidental drug spill, errant injection, and needlestick injury.

Doxorubicin

Other names: Adriamycin
Uses: Canine and feline lymphomas, leukemias, carcinomas, and sarcomas including osteosarcomas and hemangiosarcomas.
Routes: IV only!
Duration: 10- to 20-minute IV infusion or slow push. Often diluted in sodium chloride before administration.
Toxicities: Neutropenia: ++ GI toxicity: ++
Special precautions:

- Can cause severe tissue damage if even a slight amount is administered outside the vein.
- Hypersensitivity reactions can occur during administration. Monitor patients for reddening of mucous membranes/skin, head shaking, facial swelling, or hives during administration.
- Damage to the heart can occur in dogs if more than six doses are administered.
- Damage to the kidneys can occur in cats if with multiple doses. Check kidney function in cats prior to each treatment.

Lomustine

Other names: CCNU, CeeNu
Uses: Canine and feline lymphomas, mast cell tumor, histiocytic sarcomas, occasionally brain tumors
Routes: PO only

Toxicities: Neutropenia: +/++ GI toxicity: 0/+
Special precautions:

- Thrombocytopenia (low platelet count) can sometimes be observed with long-term use.
- Elevations in liver enzymes can be observed with long-term use. Liver values should be checked before each treatment.

Melphalan

Other names: Alkeran
Uses: Canine and feline multiple myelomas. Occasionally used for lymphomas.
Routes: PO only in veterinary medicine
Toxicities: Neutropenia: + GI toxicity: 0/+
Special precautions:

- Thrombocytopenia (low platelet count) can sometimes be observed with long-term use.

Mitoxantrone

Other names: Novantrone
Uses: Canine and feline lymphomas, bladder tumors, anal sac tumors
Routes: IV; occasionally given into a body cavity
Duration: 10- to 20-minute infusion or slow push. Dilute with sodium chloride before administration.
Toxicities: Neutropenia: +/++ GI toxicity: 0/+
Special precautions:

- Mild tissue damage can occur if given outside a vein

Vinblastine

Other names: Velban
Uses: Canine and feline mast cell tumors; occasionally used for lymphomas.
Routes: IV only!
Duration: 1- to 2-minute push
Toxicities: Neutropenia: +/++ GI toxicity: 0/+
Special precautions:

- Moderate tissue damage can occur if given outside a vein

Vincristine

Other names: Oncovin
Uses: Canine and feline lymphomas, transmissible venereal tumor. Sometimes used in combination with cyclophosphamide and doxorubicin for the treatment of canine sarcomas. Can also be used to help increase platelet count in dogs with immune-mediated thrombocytopenia.
Routes: IV only!
Duration: 20-second to 1-minute push
Toxicities: Neutropenia: + GI toxicity: 0/+
Special precautions:

- Moderate tissue damage can occur if given outside a vein

Additional reading

Chun R, Garrett LD, Vail DM. 2007. Cancer chemotherapy. In: Withrow SJ, Vail DM (eds.), *Small Animal Clinical Oncology* (4th Ed.). St. Louis, MO: Saunders Elsevier, pp. 163–92.

Moore AS, Frimberger AE. 2009. Anticancer drugs and protocols: Traditional drugs. In: Bonagura JA, Twedt DC (eds.), *Kirk's Current Veterinary Therapy XIV*. St. Louis, MO: Saunders Elsevier, pp. 305–10.

Plumb DC. 2008. *Plumb's Veterinary Drug Handbook*. Hoboken, NJ: Wiley-Blackwell.

8 Management of Chemotherapy Side Effects

Douglas H. Thamm

Key points

- Client education handouts explaining side effects, how to manage them at home, and when to become concerned are useful.
- Identify and treat immediate side effects:
  - hypersensitivity (allergic responses) and
  - tissue damage from extravasation (drugs administered outside a vein).
- Identify and treat delayed side effects:
  - questions to ask clients when handling phone calls about side effects,
  - nausea/vomiting/diarrhea,
  - neutropenia (low white blood cell count), and
  - acute tumor lysis syndrome.

Cancer Chemotherapy for the Veterinary Health Team, First Edition. Edited by Kenneth Crump and Douglas H. Thamm.

Introduction

Studies that have looked at clients' opinions of medical treatment for cancer generally report a positive experience; most owners felt that the treatment was worthwhile, that it resulted in improvement in the well-being of their pet, and that quality of life during treatment was good.

Although uncommon, some side effects can have serious consequences for the pet and the owner. These include

- decreased quality of life,
- increased cost (hospitalization and treatment),
- delay or changes to future treatments, and
- reduced enthusiasm for continuing treatment.

It is the veterinary team's job to make sure that clients understand the goals of therapy and the risks of side effects before treatment is started. The use of client education handouts explaining the potential side effects, how to manage them at home, and when to become concerned is encouraged. An example of such a handout is included at the end of this chapter (Appendix 8.1).

Even in practices where chemotherapy is not used, general and emergency/critical care practices may be called upon to deal with side effects from chemotherapy that has been given at another practice. Thus, a general familiarity with the identification and treatment of chemotherapy side effects is useful for most general practices.

Client education

Owners may be very frightened by the idea of giving chemotherapy to their pet, based on experiences they may have had with a friend or family member. It is important to point out how cancer chemotherapy in animals differs from cancer chemotherapy in people (see Chapter 1 for more information). Most common veterinary chemotherapy protocols are made to have a low risk of side effects. In general, less than one in three animals will have an unpleasant side effect and only about 1 in 20 will have a significant side effect, one that requires hospitalization. Most pets will spend less than 72 hours in the hospital for the treatment of a serious side effect.

With effective treatment, the risk of a chemotherapy-associated death is less than 1 in 200. Should a serious side effect occur, doses can be reduced, drugs can be substituted, or other medications can be given to reduce the chance of further side effects. These changes are effective 90% of the time.

Why side effects from chemotherapy happen

Most cancer drugs work by damaging rapidly dividing cells. The most commonly encountered side effects, neutropenia (low white blood cell count) and digestive tract upset, generally occur as a result of "collateral damage" to rapidly dividing normal cells. The hope with chemotherapy treatment is to attack the tumor cells, which are among the most rapidly dividing and are also the cells that are least able to repair themselves. However, both bone marrow stem cells, which make new white blood cells, and gastrointestinal crypt cells, which provide the lining for the intestines, are rapidly dividing and thus are sensitive to the effects of chemotherapy. Additional acute effects that can happen and may require treatment, include allergic reactions and accidental drug extravasation (administration of drug outside a vein).

Hypersensitivity (allergic reactions)

Several cancer drugs are capable of causing immediate anaphylaxis or hypersensitivity reactions in patients. The most common drugs that can cause these reactions are asparaginase and doxorubicin. The shock organs of the dog are the intestinal tract and the skin, and these two organs are most severely affected during and immediately after administration. The lung is the shock organ in the cat.

Asparaginase can result in severe anaphylaxis, usually within 60 minutes of injection. Milder reactions can occur up to 24 hours following treatment. Therefore, animals should be monitored in the hospital for signs of anaphylaxis for 60 minutes following drug administration. The likelihood of these reactions increases with multiple asparaginase injections. If a hypersensitivity reaction to asparaginase does occur, it most commonly shows as facial swelling or development of hives. Occasionally, severe, acute collapse can occur.

Hypersensitivity reactions to ***doxorubicin*** can include itchiness, facial swelling, hives, reddening of the skin and the mucous membranes, head shaking, vomiting, restlessness, or difficulty breathing. These typically occur while the drug is being given. For this reason, it is helpful to note the color of the skin (the inside of the ear is a good spot to look) and mucous membranes before the treatment is started, and then check for increased redness several times during the doxorubicin administration.

If a mild or moderate hypersensitivity reaction occurs, stop drug administration and give ***diphenhydramine*** and ***dexamethasone sodium phosphate (SP)***. For very severe or life-threatening hypersensitivity reactions, ***epinephrine*** may need to be given. See Table 8.1 for dosages and routes of administration for these medications. When the reaction improves, administration can be restarted at a slower rate. For animals that have previously

Table 8.1 Hypersensitivity drugs, routes, and dosages

Drug	Dosage (mg/kg)	Route
Diphenhydramine	3–4	Intramuscular
Dexamethasone SP	0.5–1	Intravenous
Epinephrine	0.001–0.01	Intravenous

had a hypersensitivity reaction, it usually can be prevented during subsequent treatments by pretreating with diphenhydramine and dexamethasone SP, 15–20 minutes before the chemotherapy drug is given.

Extravasation

Several cancer drugs (doxorubicin, vincristine, vinblastine, actinomycin D) can cause tissue damage if accidentally given outside of a vein (extravasated). Administration of these drugs needs to be through a dedicated, perfectly placed ("first stick") intravenous catheter (see Chapter 5 for additional information). Patients undergoing infusions of these tissue-irritant drugs should be constantly observed until completion of the infusion to ensure that the catheter remains functional and in place.

Most catheter leaks are noticed right away. A bleb or swelling appears immediately next to the catheter site. Some animals experience immediate discomfort and will squirm, cry out, or struggle. If an irritant drug is known to have been extravasated, ***stop the delivery***. As much drug as possible should be aspirated back through the catheter, as well as through a series of 25-gauge needlesticks into the surrounding tissue, then withdraw the catheter. Following that, cold-packing 15–20 minutes four times per day is recommended for 48–72 hours. Prevent licking and chewing at all costs, through the use of an Elizabethan collar. Additionally, the application of 99% dimethyl sulfoxide (DMSO) topically every 8 hours for 2 weeks may forestall some of the effects.

While most catheter leaks are noticed right away, the skin ulceration may not appear for several days or even weeks. It has been demonstrated that doxorubicin can persist in the tissue for at least a month. If allowed, the pet will start licking at the catheter site. Then pain, swelling, inflammation, desquamation, and limping may occur and may continue to worsen for months.

Doxorubicin is a very commonly used cancer drug and is also an extremely potent tissue irritant (Figure 8.1). It is disheartening to realize that no currently applied procedures adequately prevent the devastating tissue damage that arises from doxorubicin extravasations. Surgical treatment, including immediate surgical removal of the affected tissues and,

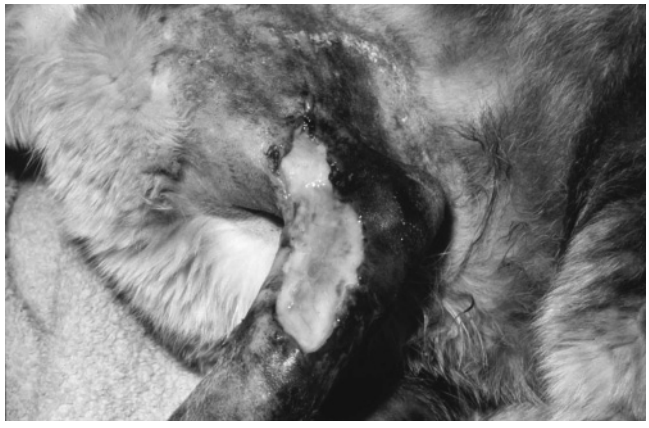


Figure 8.1 Severe skin damage following accidental extravasation of doxorubicin in a dog. Months of nursing care, skin grafts, and, sometimes, amputation can be necessary to manage these types of injury.

potentially, amputation may be required. The free-radical-scavenging drug ***dexrazoxane*** (Zinecard®; Pfizer, New York, NY), marketed for the prevention of doxorubicin-associated heart damage, may help minimize doxorubicin tissue damage. Intravenous administration of dexrazoxane at 10 times the dose of doxorubicin within 3 hours, and again at 24 and 48 hours after extravasation, may significantly reduce local tissue injury. Most veterinary clinics do not keep this drug in stock. If doxorubicin is used in your practice, it is recommended that a source of dexrazoxane (local human hospital or oncology clinic) be identified, so that it can be obtained quickly if needed.

More effective treatments for extravasation of drugs like doxorubicin continue to be explored. Interestingly, due to obvious similarities to some types of snakebite, a simple approach with a snakebite extractor kit has been applied to humans with extravasation injuries. In one study of human patients, three doxorubicin extravasations were encountered in a clinical setting between 1985 and 2002 (one every 6 or 7 years). Chemotherapy was immediately discontinued, and the catheter was removed. Then the specific area of extravasation was marked and surgically prepped, and X-shaped incisions, approximately 1 cm in length, were made through the full thickness of the skin. A clear snakebite extractor suction cup with a syringe was then applied directly over the incision. As the cup filled with serosanguinous fluid, it was emptied and reapplied until the drainage stopped. The area was dressed with sterile gauze and examined periodically. All three cases treated in this manner showed prompt and complete resolution within a week. A similar technique called the "modified Villalobos snakebite slit technique" is also reported to be a highly effective treatment in animal cancer patients.

Gastrointestinal effects

While many pets receiving chemotherapy may experience 1–2 days of mildly decreased appetite, a few pets receiving chemotherapy (one in three or less) may have more unpleasant digestive side effects such as more prolonged loss of appetite, nausea/vomiting, or diarrhea. Most are mild and self-limiting; however, more severe episodes are sometimes seen.

Presenting complaints

Most commonly, gastrointestinal effects are ***delayed***, often 2–5 days following chemotherapy administration. Clinical signs can range from mild loss of appetite and slightly soft stools to severe vomiting or large amounts of watery or bloody diarrhea.

History

Careful medical and medication history helps to determine if the signs are likely to be associated with chemotherapy administration and to determine their severity. This information is often communicated over the phone and can be useful to determine whether a patient needs to be seen or can be managed at home (Table 8.2). Questions to ask include the following:

- What type of cancer does the pet have?
  - Could the signs be related to the cancer rather than the treatment?
- What drug was given most recently and how long ago?
  - Intestinal signs would be rare in a dog that received chemotherapy 2 weeks ago, but would be much more likely in a dog that received chemotherapy 2–5 days ago.
- How many times has the patient vomited?
  - A single episode of vomiting in a bright, eating patient is probably OK. Animals that have vomited more than three times in 24 hours, are vomiting every time they eat or drink (cannot keep anything down), or vomiting without eating or drinking (retching, dry heaving) should be evaluated by a veterinarian.
- Is he or she willing to eat and drink?
  - Not wanting to eat for a day or two is often OK, but not drinking for any period of time can be very serious, as dehydration can result

Table 8.2 When should an animal with gastrointestinal signs be seen?

Vomiting more than three times in a 24-hour period
Vomiting every time they eat or drink (cannot keep anything down)
Retching or dry heaving
Unwilling to eat for more than 2 days: unwilling to drink for more than 18 hours
Severe watery or bloody diarrhea
Severe weakness, lethargy, or depression

quickly. Animals that are not drinking should be evaluated in the hospital and might need fluid therapy.

- How severe is the diarrhea (if any)?
  - Mild loose stool is probably OK. Dogs with severe watery or bloody diarrhea should be evaluated by a veterinarian.
- How are they acting?
  - Bright, happy animals with mild signs can often be managed at home. Animals that are very weak, lethargic, or depressed should be evaluated in the hospital.

Treatment

Many animals with mild signs may respond to conservative therapy, for example, brief withholding of food and water followed by a bland, high-fiber diet over a short period of time. Oral antinausea medications like metoclopramide (Reglan®; UCB, Brussels, Belgium), prochlorperazine (Compazine®; GlaxoSmithKline, Research Triangle Park, NC), or maropitant (Cerenia®; Pfizer) can be prescribed for home use if vomiting is rare and the patient is bright and alert. Oral medications for diarrhea, such as loperamide (Imodium®; McNeil Consumer and Specialty Pharmaceuticals, Fort Washington, PA), metronidazole (Flagyl®; Pfizer), and/or tylosin (Tylan®; Elancon, Greenfield, IN), may be prescribed as well.

Animals that are weak, lethargic, dehydrated, or with severe signs should be hospitalized so that fluid, acid–base, and electrolyte disturbances can be addressed. These animals should be kept without food and water until vomiting resolves, and injectable antinausea drugs can be administered. Then, carefully rebuild the patient's digestive tract with bland food and transfer to oral antinausea drugs after a patient has not vomited for 12–24 hours.

If hospitalization is necessary, most animals will need support for 24–72 hours. After this period of time, the intestinal cells have usually had sufficient time to regenerate, and the pet's clinical signs should improve. Vomiting that persists longer than 72 hours indicates a reason to look for other causes, such as pancreatitis, foreign body, or tumor spread to the digestive tract.

Neutropenia and sepsis

Neutropenia (decreased number of neutrophils, one of the white blood cells) is a relatively common side effect of chemotherapy in both pets and humans. Neutropenia and associated infections can be extremely variable, from clinically insignificant to overwhelming and occasionally fatal.

Presenting complaints

Many animals may have mild to moderate neutropenia, yet show no outward signs of illness. Most pets have a low risk of infection if their neutrophil count remains greater than ***1000/μL***. It is important to remember that the likelihood of infection and treatment decisions should be made based on the *absolute neutrophil count, not the percentage of neutrophils nor the total white blood cell count*.

Septic animals typically present with vague, nonspecific signs such as lethargy, weakness, and poor appetite. They often have a fever, but a normal or decreased temperature does not rule out the presence of a serious or even life-threatening infection.

History

An accurate medication history is very important, as the timing of the last chemotherapy treatment can help to determine if neutropenia is likely. Neutropenia is most commonly seen 7–10 days after the administration of most chemotherapy drugs.

Diagnostics

As mentioned, septic patients usually, but not always, have a fever. Other physical abnormalities could include increased heart rate, injected mucous membranes, slow or prolonged capillary refill, or weak pulses. Initial minimum database should include a complete blood count (CBC) and platelet count with a manual differential, serum biochemistry profile, and urinalysis. The results of these tests will direct the veterinarian toward other necessary diagnostic tests and treatment.

Treatment

Bright patients without a fever and with less than 1000 neutrophils/μL can usually be managed as ***outpatients***. In these patients, the risk of a hospital-acquired infection probably outweighs the benefit of hospitalization. Treatment may be a 5- to 7-day course of a broad-spectrum oral antibiotic such as trimethoprim-sulfa or enrofloxacin. Instruct the owner to monitor the patient's temperature once or twice daily at home. If the patient becomes clinically ill or the temperature exceeds 103.5°F, hospitalization may be required. Clinically normal animals with mild neutropenia (>1000/μL) generally require no treatment.

Febrile or systemically ill patients should be hospitalized for 24-hour observation and care. Intravenous fluid therapy is the first line of treatment for these patients. It is common for fever and clinical signs to improve significantly after several hours of fluid therapy.

The second line of defense is antibiotic treatment. Most bacteria that cause illnesses in septic veterinary cancer patients are sensitive to com-

monly used antibiotics. Intravenous coverage for both gram-positive and gram-negative bacteria should be used. Medications to reduce fever are rarely necessary, and may make the interpretation of response to treatment difficult.

Most patients respond rapidly to therapy, and neutrophil counts may also rise very rapidly. The fever breaks in most patients within 12–24 hours, and they can be sent home on oral antibiotics when they no longer have a fever and have neutrophil counts that are climbing.

Acute tumor lysis syndrome

Acute tumor lysis syndrome is a life-threatening metabolic emergency associated with certain types of cancer. In acute tumor lysis syndrome, tumor cells break apart, releasing their contents into the bloodstream. The result is a dangerous alteration in the normal balance of serum electrolytes. The changes occur so quickly and can be so dramatic that rapid death can result.

Many factors contribute to the development of acute tumor lysis syndrome. Tumors that carry the highest risk of the development of acute tumor lysis syndrome are large and bulky, and are comprised of rapidly dividing cells. In addition, tumors that respond well to treatment are associated with acute tumor lysis syndrome because successful treatment may result in the death of a large number of cells all at once. Most often, the syndrome is associated with blood-based diseases, such as lymphoma and acute leukemia. Usually, acute tumor lysis syndrome develops after the administration of combination chemotherapy regimens, but it may also occur spontaneously or as a result of radiation or prednisone therapy. Patients with underlying kidney diseases are at a higher risk of developing acute tumor lysis syndrome. For example, a patient undergoing chemotherapy may experience nausea and vomiting, and may become dehydrated. Without optimal hydration, waste products build up and cannot be excreted in the urine fast enough. As a result, significant serum electrolyte imbalances can occur.

Treatment is aimed at prevention and supportive care. The main goal of treatment is to prevent renal failure and severe electrolyte imbalances. High-risk patients should receive chemotherapy or radiation therapy treatment on an inpatient basis to allow for close monitoring after therapy. Prior to initiating cancer therapy, a high-risk patient's hydration status and electrolyte levels are to be carefully evaluated. If there are abnormalities, a treatment delay may be considered, although this may not always be an option. The effects of acute tumor lysis syndrome can be devastating, but sometimes the life of a patient with a high tumor burden is more at risk without cancer therapy. The risk assessment makes acute tumor lysis syndrome the more attractive outcome when compared with the likelihood of death, if the cancer remains untreated.

Appendix 8.1 Sample chemotherapy owner handout

All of the chemotherapy protocols in common use for veterinary patients are designed to have a fairly low risk of causing unpleasant side effects. With most treatments, *70% of patients will have very little in terms of side effects*, except for perhaps some slight tiredness or decreased appetite for 1–2 days following treatment. However, there are approximately 25% of patients that may experience some type of mild side effect and 5% that can experience a side effect severe enough to require hospitalization. We cannot usually predict which patients are likely to experience a serious side effect.

Most chemotherapy drugs work by targeting rapidly dividing cells. Although cancer cells are typically the most rapidly dividing and this is why they are preferentially killed, other rapidly dividing cells can be damaged as well. Cells lining the intestinal tract, cells in the bone marrow, and hair follicle cells are rapidly dividing cells, and damage to these cells is responsible for most of the side effects we encounter.

Digestive tract

One of the side effects that can be seen with certain medications is digestive tract upset, in the form of unwillingness to eat/drink, nausea/vomiting, or diarrhea. In most cases, these signs are mild and will go away by themselves within a short period of time. These side effects are most commonly seen 2–5 days following a chemotherapy treatment.

Decreased appetite can occasionally be seen and is not worrisome if it persists for less than 48 hours. It is important, however, that your pet continues to drink. ***Unwillingness to drink water for more than 24 hours and prolonged, complete unwillingness to eat are problems that should be reported to your veterinarian.***

Some animals can develop nausea, which can lead to vomiting. Vomiting is not a cause for undue concern if it occurs less than three times. Should your pet vomit, withhold food and water for approximately 12 hours, to give the digestive tract a "rest." Then slowly reintroduce water first. If no vomiting occurs several hours after water is given, then a bland food can be offered in small amounts. This may consist of boiled chicken or lean ground beef mixed with starch like rice, pasta, or potatoes. We may sometimes prescribe oral antinausea medications that can be given to relieve mild nausea, inappetance, or vomiting. ***Repeated vomiting, vomiting after every meal ("can't keep anything down"), or repeated nonproductive retching (dry heaving) should be reported to your veterinarian. Animals that experience these effects will need to be evaluated for dehydration, and may need hospitalization for intravenous fluids and antinausea medications.***

You may also see diarrhea as a side effect of certain chemotherapy drugs. This can range from mild soft stools or increased frequency of defecation, to profuse, watery diarrhea that may contain blood. Mild diarrhea in a

bright, eating pet can be treated with the bland diet described above. Some oral medications can also help to resolve diarrhea. ***Severe, watery diarrhea, blood in the stool, or diarrhea associated with lethargy, weakness, depression, or unwillingness to drink should be brought to the attention of your veterinarian.***

White blood cells

If the rapidly dividing cells in the bone marrow have been affected by the chemotherapy, a *low white blood cell count* can develop. This side effect is most commonly seen 7–10 days after chemotherapy is given. We check the white blood cell count prior to each and every chemotherapy treatment, to insure that it is not too low for another treatment to be safely given. Occasionally, the white blood cell count may dip low enough that we need to delay a treatment for a few days. Such a brief delay will not affect the overall success of your pet's chemotherapy protocol.

It is uncommon for the white blood cell count to drop low enough that an increased susceptibility to infection is a concern. However, if your pet has a very low white blood cell count and is eating and drinking normally, does not have a fever, and is otherwise acting normally, we will often prescribe a broad-spectrum antibiotic for you to give at home. We would then recommend that your pet's temperature be taken once or twice per day to ensure that they are not developing a fever. Taking a pet's temperature is easy. A standard glass or digital thermometer that you buy at the store is used. If a glass thermometer is used, make sure to shake it down well first. Lubricate the thermometer with a small amount of Vaseline or K-Y jelly, and insert it approximately one half inch into the rectum. For a glass thermometer, it should be left in place for approximately 2 minutes. Most digital thermometers will beep when the temperature is recorded. A normal dog or cat's temperature at home should be between 100 and 102°F. If your pet's temperature is higher than 103°F or they show signs of weakness, lethargy, depression, or unwillingness to eat, please call. Hospitalization may be necessary.

If your pet has a low white blood cell count and has a fever, or is depressed, lethargic, or not eating, hospitalization for intravenous fluids, antibiotics, and very careful monitoring is recommended. Most animals will improve rapidly with this treatment, and hospitalization is rarely necessary for more than 72 hours. They are ready to go home when their temperature has become normal and their white blood cell count is no longer in a dangerously low range.

If serious side effects are seen after a treatment, we always try to make changes to the treatment protocol, so that they are much less likely to happen again. Some of the changes may include decreasing the dose of chemotherapy given for subsequent treatments, adding some medications to help prevent adverse effects, or switching to an entirely different drug. It is always our goal to make it so that serious side effects are not encountered more than once.

Additional reading

Bronden LB, Rutteman GR, Flagstad A, Teske E. 2003. Study of dog and cat owners' perceptions of medical treatment for cancer. *Vet Rec* 152:77–80.

Laing EC, Carter RF. 1988. Acute tumor lysis syndrome following treatment of canine lymphoma. *J Am Anim Hosp Assoc* 24:691–6.

Mahoney JA, Bergman PJ, Camps-Palau MA, Hull TL. 2007. Treatment of doxorubicin extravasation with intravenous dexrazoxane in a cat. *J Vet Intern Med* 21:872–3.

Mellanby RJ, Herrtage ME, Dobson JM. 2003. Owners' assessments of their dog's quality of life during palliative chemotherapy for lymphoma. *J Small Anim Pract* 44:100–3.

Thamm DH, Vail DM. 2007. Aftershocks of cancer chemotherapy: Managing adverse effects. *J Am Anim Hosp Assoc* 43:1–7.

Vickery KR, Thamm DH. 2007. Successful treatment of acute tumor lysis syndrome in a dog with multicentric lymphoma. *J Vet Intern Med* 21:1401–4.

Villalobos A. 2006. Dealing with chemotherapy extravasations: A new technique. *J Am Anim Hosp Assoc* 42:321–5.

9 Compassionate Client Communication

Erin Allen and Gail Bishop

Key points

Supporting the grieving client
- Clients experience grief before, during, and after a loss.
- Grief occurs on physical, intellectual, social, and spiritual levels.

Children grieve too.
- Children express grief differently from adults due to shortened attention spans and varying intellectual levels of understanding of death and loss.
- The death of a pet is often a child's first experience with loss.

Supportive communication skills
- Clients rely on the veterinary healthcare team for support during the time of their pet's illness or death.
- Employing simple communication techniques will greatly enhance relationships with clients and staff: nonverbal communication, empathy, reflection, and self-disclosure are vital skills to master.

Quality of life discussions
- Objective tools to help clients define quality of life for their pet
- Pain versus suffering

End-of-life decision making
- Guidelines in helping clients make an end-of-life decision
- Euthanasia versus natural death
- Helping clients create a plan

Self-care and team care
- Compassion fatigue, how to identify it, and how to avoid it
- Six strategies to utilize in taking care of yourself
- Debriefing cases and promoting closure reduce the chance of compassion fatigue.

Cancer Chemotherapy for the Veterinary Health Team, First Edition. Edited by Kenneth Crump and Douglas H. Thamm.

Introduction

More than three quarters of pet owners report a strong relationship between their ability to cope with grief for a pet and the support they received from their veterinary team. People develop very strong attachments to the animals in their lives. These days, pets are more often than not considered as family members. This generates greater client expectations for compassionate veterinary care and respectful communication from the veterinary team. The majority of clients are deeply affected by a terminal diagnosis of their pet, and many will experience severe grief, beginning well before their pet dies.

The focus of this chapter is to provide you with some insight to what the client may be experiencing, some helpful tools you can utilize to ensure supportive communication, and an examination of how this type of work can personally affect you, emphasizing the importance of caring for yourself. Remaining aware that every client, patient, and situation is unique, this chapter takes a general approach to creating and maintaining compassionate relationships with clients during difficult times.

> Ms. Sandra Brown came into the hospital today with her 8-year-old bassett hound, Barkley, for the first of many chemo treatments for Barkley's lymphoma, diagnosed last week. Usually a chatty person, Sandra is very quiet after she checks in for her appointment.

The grieving client

As a technician, you spend a great deal of time with your clients. During a cancer treatment process, you will witness a broad spectrum of emotions with each client. These emotions are likely related to the impending loss of the animal and the client's grief. Grief is not only experienced after a loss. ***Anticipatory grief*** begins when someone realizes there will soon be a loss, resulting in a drastic change of day-to-day life. It is often during this period of anticipation that people begin to experience the various feelings and manifestations commonly associated with grief (Figure 9.1).

Receiving a diagnosis of cancer has been compared with watching a fireworks show: numbing, deafening, and overwhelming. One of the most common feelings during this period is an increase in anxiety, which can intensify as the time of death draws closer. This strong feeling can be quite overwhelming for people, especially those who have little experience with how to manage it. The grief process is unique for each individual, and intense emotions often ebb and flow as a client works through his or her grief and begins to adjust to the idea of his or her impending loss.

This can set in motion a roller coaster of very painful and confusing feelings, most of which are very difficult to cope with. The intensity of this

Figure 9.1 Anticipatory grief, which is often experienced at the time of a terminal diagnosis, can also occur as a pet grows old.

experience depends greatly on the strength of the bond between the client and his or her pet. Many pets are viewed as sources of emotional and social support, eliciting feelings of strong attachment from the client. Clients who have an unusually strong bond with their pets are more likely to experience intense grief emotions. This tremendous attachment can occur for several reasons, such as when clients believe their pets "got them through" a difficult period of life, have relied on their pets as their most significant social support, or have anthropomorphized the animal. Some may view the pet as a symbolic link to significant people no longer part of their lives (i.e., children, parents, and friends who have died or moved away) or significant times in their lives (i.e., childhood, ended marriage). In such cases, losing this pet may be symbolic of other previous losses. Knowing this may help you appreciate your client's experience.

Sandra hugs Barkley and begins to sob. She asks, "Are you sure it's cancer? Couldn't it be just an infection?" You offer her some tissue and after a moment, she says, "Why did this have to happen? He is too young for this. Was it something I did? I just don't know what to do."

You respond softly, "I'm sorry to say that he does have lymphoma, not just an infection. I wish I knew why dogs get cancer. I can assure

you it isn't anything that you did. This is a difficult time, and it's natural to feel overwhelmed and scared."

Through each encounter with a grieving client, you may witness many different grief expressions. Remember that these commonly occur well before the death of a pet. These manifestations occur on physical, intellectual, emotional, social, and spiritual levels. Before, during, and after loss, grief may appear as, but not limited to, the following forms:

Physical: crying, sobbing, wailing, shock and numbness, dry mouth, a lump in the throat, shortness of breath, stomachache or nausea, tightness in the chest, restlessness, fatigue, exhaustion, sleep disturbance, appetite disturbance, body aches, stiffness of joints or muscles, and dizziness or fainting.

Intellectual: denial, confusion, inability to concentrate, feeling preoccupied by the impending loss, a need to reminisce about the loved one and to talk about the circumstances of the loss, a desire to rationalize or intellectualize feelings about the loss, and thoughts or fantasies about suicide (not accompanied by concrete plans or behaviors).

Emotional: sadness, anger, guilt, depression, anxiety, relief, loneliness, irritability, a desire to blame others for the loss, resentment, embarrassment, self-doubt, feelings of being overwhelmed or out of control, feelings of hopelessness and helplessness, and behaviors and emotions that seem inappropriate for the situation (nervous smiles and laughter).

Social: feelings of withdrawal, isolation, a greater dependency on others, a rejection of others, a reluctance to ask others for help, change in support system, a desire to relocate or move, and a need to find distractions from the intensity of grief (to stay busy or to overcommit to activities).

Spiritual: bargaining with God in an attempt to prevent loss, feeling angry at God, renewed or shaken religious beliefs, feelings of being either blessed or punished, searching for a meaningful interpretation of a loved one's death, visions or dreams concerning a dead loved one, wondering what happens to loved ones after death, and the need for a purposeful ending or closure to the relationship (a funeral, memorial service, last rites ceremony, or good-bye ritual).

Moving through grief

Individuals move through their grief at different rates, and the course of grief varies greatly. Some people have extreme difficulty accepting the impending death of a loved one. Clients who are having difficulty coping with an impending loss may not know how to handle their emotions. They may attempt to intellectualize or rationalize the experience in some way or use questionable humor to deflect others' support and concern. Others

Figure 9.2 People can exhibit grief in many ways, including anger, frustration, and blame, as they adapt to the news of a cancer diagnosis. This can make a client come across as "difficult" when, in reality, they are simply grieving.

sometimes move too close to the patient in attempts to overmanage the patient's medical care. It is very important to recognize that the person's grief is most likely compelling these emotions.

Having an awareness of what your client may be experiencing can help you alleviate any reactions you may have to their behaviors and emotions by validating that their actions are brought about by their grief. This can play a key role in redefining a "difficult client" as truly a "grieving client" (Figure 9.2).

> Sandra rushes in the door with Barkley, an hour late for the appointment. "No one told me that he had to be here early. I expected a call to remind me of the appointment and didn't get that either."
>
> You respond softly, "Yes, I realize how complicated Barkley's treatment schedule is. Having him here early helps us get him back home with you sooner. Let's work together to make this as smooth as possible. How can I help?"

While leading grief theorists may describe the process of grieving a bit differently, they all involve an initial period of shock or denial, a middle period of emotional pain and finally acceptance and recovery. In 1969, Kubler-Ross pioneered these studies and described ***five stages through which one processes grief***: denial, anger, bargaining, depression, and acceptance. Since her work, Kubler-Ross' stages have been explained as not sequential, but dynamic in nature, with a person often moving between different phases as they grieve. Theorists agree that even when death follows a progressive illness and is expected, the moment of death can still be shocking. When working with your clients, William Worden's four tasks

of mourning, described as a path to processing one's grief, may be helpful to understanding what your clients are experiencing:

- The first task involves *accepting the reality of the loss*. The acceptance takes time, considering it is not only an intellectual acceptance but also an emotional one. This reality is tested quite often following the death of a pet, with established habits such as calling the pet's name at dinnertime, as one begins to create new routines to replace old ones.
- The second task is *to work through the emotional pain of grief*. Many clients may believe that their grief pain is wrong or "crazy" in some way, especially since their emotions are induced by the loss of an animal, not a person. In general, society does not encourage grief for pet loss as it does for human loss, making the process difficult or even embarrassing for some.
- Worden's third task is *to adjust to an environment in which the deceased is missing*. It involves coming to terms with changes resulting from the pet's death. This adjustment is unique to each client and the role the animal played in his or her life. Depending on how active a role this was and how responsible the client was for the pet's health care and well-being, the client may also adjust to a change in his or her own sense of self and purpose.
- The final task of mourning is *to emotionally relocate the deceased*. This can be the most difficult part of the grieving process. This involves developing a relationship with the thoughts and memories of the deceased versus a physical relationship, allowing the person to continue on with life after the loss.

Pain of the loss can resurface during certain events, such as birthdays and anniversaries. Although there is no certain time line for grief, when a person can think of the deceased pet in fond memories, with less disruption in his or her daily life and feel hopeful for the future, the person is moving in a healing direction.

Children and grief

The death of a family pet is often a child's first experience with loss. Children experience grief also, though their age and development levels influence their grief reactions. They express grief differently than adults do, due to shortened attention spans and varying intellectual levels of understanding death and loss. Each child is unique, and overlap occurs across levels of development, so the following overview should be used only as a guide. Please see the *Preparing children for pet illness and loss* section for recommendations in helping families with children.

Children ages 1–2

Their world is experienced through their senses. At this age, they do not understand death. Instead, they respond to their caregiver's emotions and behaviors. They may express grief as irritability, changes in sleep and eating patterns, and quietness. For caregivers, supportive actions include continuing nurturing interactions and maintaining routines.

Children 2–6

For children at these ages, death is like sleeping. Death is temporary and perhaps reversible, not final. The deceased pet can come back to life. Children may ask and repeat many questions, such as "When will he be back?", "Where did he go?", or "What will he eat in the ground?" They may also believe that their own magical thinking can have realistic results. At this stage, children can be very focused on the concrete details, often very curious of the physical aspects of the dead body. Still, they are very sensitive to their caregiver's emotions and behaviors. They may express their grief as irritability, change in regular patterns, regression, and acting out behaviors. The maintenance of schedules is important. Children often process their emotions through play, so themes of death, dying, and funerals may be displayed with toys. Parents and caregivers are encouraged to answer questions truthfully, using simple and appropriate language.

"Barkley is sick and suffering with cancer."

"We will have the doctor give Barkley medicine that only animals can have to help him to die."

"When Barkley dies, his body will still be here but he will not be alive anymore."

This is also an opportunity for adults to model appropriate expression of feelings. This not only helps the child identify what they are feeling themselves, but also creates a sense of safety about experiencing emotions and expressing them appropriately.

Children 6–12

Children in this age range begin to understand death as final. They may be curious of the physical and biological aspects of the deceased. In the earlier years of this developmental phase, children may believe that death is something that occurs only to the old and only to others. Soon an understanding will occur that death can happen to anyone, as well as themselves. Fear of death may occur. Acting out behaviors at home and at school may be exhibited. Social development is occurring so children may imitate how others around them respond to death. It is important for parents to continue to model appropriate behaviors and to be honest and factual with children.

Teenage children

These young adults are able to think abstractly about death. They understand it is the end of a physical life. At this age, teenagers are searching for identity and are attempting to find a balance between independence and dependence on their caregiver. They may struggle with needing support and not wanting it. It is important to help them find personal ways to express their grief, such as writing, drawing, and talking.

In all areas of development, the ways in which parents process and display their grief will greatly impact their children's ability to grieve. It is an important time for parents and other adults to teach children how to express grief in emotionally healthy ways free of shame or embarrassment—lessons carried into adulthood.

Supporting clients

Comfort with one's own grief comes from a variety of sources and can be greatly increased by the support from those close to the situation, such as you and your medical team. Research shows that almost all clients believe that the veterinary team should provide some sort of emotional support at the time of the pet's illness and death. It is not suggested that you become a grief counselor, but rather, learn how to respond appropriately to your client's grief. Grief is an experience best handled in cooperation with others, where support and understanding is available.

In providing support to clients, it is essential to employ compassionate support skills to emphasize your care and enhance the client's experience with you. You and your team can pick up cues from your client to read what the client is experiencing and tailor your efforts to his or her needs. Effective support begins with effective communication.

There are several simple communication techniques that you can keep in mind as you seek to support your clients. To master these skills, you must simply be compassionate and respectful. Using the word "we" when talking about treatment and decision making will help your client feel a sense of partnership from you. It will create rapport with your client and will create teamwork as you progress through the situation. This rapport and relationship can be emphasized in other ways also. Experts believe that *only 7% of communication happens verbally*, so at times, no words are needed.

Nonverbal communication

There are several forms of nonverbal communication that you can employ while communicating with clients. Facial expressions, vocal tone and inflections, and the use of touch and personal space all exhibit communication messages. Think of ***facial expressions*** as the famous quote "a picture

is worth a thousand words." It is important to maintain an awareness of what message you are sending through the expressions you display. The way you wrinkle your forehead, smile, frown, and tilt or nod your head can translate into many different messages, some of which may not be what you want to portray. ***Eye contact*** is essential in displaying support and understanding. It also invites trust from your client. ***Silence*** is helpful to support your client while they contemplate without interruption. It is important to not try and fill the empty space when silence occurs, but rather, be comfortable and sit, wordlessly, for a while. When you speak, do so softly and slowly so you convey empathy and compassion while remaining appropriate to your client's needs and responses. Speaking loudly and fast-paced can be perceived as rushed and uncaring, creating a separation between you and your client.

The ***use of touch*** is a communication tool that demonstrates care and concern (Figure 9.3). Touch can soothe an emotional client. Neutral areas to touch are the arms and shoulders. Placing a hand on someone's shoulder can demonstrate a great deal of empathy. If you use touch to comfort clients, remain aware of the client's nonverbal reactions. If you sense that he or she is uncomfortable, or if you are uncomfortable, you can support the client verbally instead or focus your caring touch on the pet. Personal space and body position also send a message to your client. If you are sitting with your client, face and lean a bit toward him or her to show your engagement in the conversation. Some men may be more comfortable having conversations sitting side by side, while women may prefer facing one another. If you lean away or stand at a different level from your client, you give the impression of someone uncomfortable, unconcerned, or uncaring with the situation. It also becomes difficult to use touch as a

Figure 9.3 A compassionate touch is a supportive gesture to show your concern for your client.

supportive gesture. Any compassion or empathy you try to convey may be lost.

Empathy

Empathy can be shown silently through your nonverbal communication or through your words. Empathy is not sympathy. Being empathetic is to stand in your client's shoes and to have an emotional and intellectual comprehension of what they are experiencing without taking on the actual feelings yourself.

You tell Sandra, "I can imagine how sad you must feel to have received such bad news about Barkley. What a heartbreaking diagnosis this is. I know what a sweet boy he is and it must be hard to see him feeling badly."

Reflection

Another skill to use in creating support for your client is ***reflection***. When reflecting, you are focusing not only on the content of the conversation but also on the feelings your client expresses. Your client is assured that his or her message was heard when you paraphrase or reflect what he or she has said, creating a mutual understanding. There are many ways to begin a reflective statement, many of which you use in day-to-day conversations. Examples are, "It sounds like . . . ," "It seems as though . . . ," and "What I'm hearing is. . . ." Using your own words, you can simply repeat what you have heard the client express. This tells the client that you comprehend his or her feelings and care about what he or she is going through.

Sandra tells you, "I just don't know what I'm going to do when the chemo isn't working for Barkley anymore."

You say, "I can tell that you are worried about how to handle Barkley's disease progression and how to prepare yourself."

Self-disclosure

Self-disclosure is another communication tool that can help you relate to your clients. Sharing a similar experience you have faced can help your client feel less isolated and can normalize his or her emotions. It is important to keep in mind that sharing this information is for the benefit of your client, not for your own therapeutic purpose. This helps create rapport, builds trust, and enhances your relationship.

You tell Sandra, "My dog had the same kind of cancer last year. It was really hard on me too."

She asks, "What did you do when he was gone?"

You tell her, "I cried for a long time, which is normal. It took me a while to get used to not having him with me."

While supporting a client during the highly emotional period of cancer treatment for his or her pet, remember to consider the client's privacy. If the information that the client shares would be helpful to understand his or her perspective, it is respectful to ask permission to share it with the medical team.

Quality of life decisions

When you have been working with your client for so long to manage his or her pet's illness, it can be very difficult for your client to switch gears from striving for quality of life to preparing for quality of death.

Sandra says, "I don't want Barkley to suffer. How will I know when it's time to say goodbye?"

This question can come up when the client begins to prepare for the end of his or her pet's life. This is something that you will be asked many times throughout your career in the veterinary field. Clients will turn to you for support and assistance in determining their pets' quality of life and making a heartbreaking decision on their pets' behalf for euthanasia (Figure 9.4). *Quality of life* is the degree of well-being felt by the animal. It consists of two components: ***pain*** and ***suffering***. In helping your client make this important assessment for his or her pet, it can be helpful to provide some ideas to distinguish the two and to evaluate them objectively. The veterinary team can also provide input and perspective.

Pain is a physical and emotional sensation that can be complicated to assess. Keep in mind that a pet's reaction to pain is dependent on the animal's personality and the degree of pain experienced. It is important to educate your client that his or her pet may display these signs to indicate pain:

- trembling or shaking,
- panting,
- slow to rise,
- whining or lack of vocalization,
- decreased or absent appetite,
- acting out of character,
- being restless or unable to get comfortable,
- sitting or laying abnormally,
- bearing little or no weight on affected limb,
- hesitant to be touched in painful areas, and
- changes in energy level.

Figure 9.4 Difficult conversations around end-of-life topics can go more comfortably when you utilize your supportive communication skills, such as compassionate nonverbal cues, reflection, and empathy.

Suffering is more than solely physical attributes and involves the ability to enjoy living life. When your client says he or she wants to prevent suffering, it is important to help the client define and understand what suffering would look like in his or her pet. To start this conversation, encourage the client to define quality in terms of basic functions:

- Does he eat and drink normally?
- Can he relieve himself on his own?
- Can she move around on her own?
- Is she interested in the activities around her?
- Is he withdrawn much of the time?

As the client assesses these areas, you may then encourage them to gain a deeper understanding from the pet's point of view. Some objective tools you can share are the following:

- *Suggest that your client create a list of the pet's unique qualities*:
  - chasing a ball,
  - playing with other pets,
  - scratching on a post,
  - rubbing on your legs,
  - barking at a neighbor, and
  - enjoying daily walks.

As the disease progresses and these qualities fade, have the client mark them off the list. Decide which and how many traits can go before too much quality diminishes from the animal's day to day life.

- *Suggest that your client keep a good day/bad day calendar*.
  - Evaluate what a good day would be for the pet, and also what a bad day looks like. Each evening, recall the day and decide if it was a good or bad day, marking a calendar with a ☺ or ☹. Decide how many bad days in a row occur before quality is compromised.
- *Suggest that your client keep a journal or daily record of events in the pet's life.*
  - This can be helpful in looking back to reflect on changes that occur and how the animal's and client's life are affected.

These tools can help your client decide if important qualities are diminishing or are no longer present in the pet's life. This may help the client to define what suffering would be for his or her pet. It is important to empower your client to also rely on his or her special relationship with the pet and trust that the decision will become clear with time.

End-of-life decision making

> Sandra tells you, "I think we're getting close, but not there yet. I am so scared of when that day comes because I don't think I'll know what to do."
>
> You reply, "Yes, this can be a scary time. Let's talk about what will help to prepare you and your family so that you know what to expect."

When a pet's death is impending, some individuals have a religious or spiritual belief system that does not support euthanasia. For others, it is a thoughtful decision and is considered a humane option. It is important to determine your client's perspective as you discuss end-of-life issues. When a natural death is the client's choice, some issues to discuss are

- the client's expectations of the natural dying process,
- physiological effects of the dying process (disease specific),

- pain management, and
- available hospice care.

The decision to euthanize a beloved pet is probably the hardest decision your client will have to make regarding the pet's care. Uncertainty surrounding the euthanasia can be extremely frightening. One way you can provide support and help alleviate fear is to encourage the clients to plan what is important for them on that day. Planning ahead is in no way equivalent to giving up, but rather, it is a means of taking care of one's self and one's pet during a very emotional and exhausting time. It is also a way to have some control where there has been little thus far by planning their pets' last day. Knowing that cancers can be unpredictable, it can be beneficial to encourage your clients to develop two plans: one for how they would wish the day to go and another for crisis situations.

In an emergency, some concerns you want your clients to be aware of are as follows:

- Will they have assistance to manage the pet physically? (i.e., a 120-lb dog with pathological bone fracture, unable to stand)
- What veterinary hospitals are available? (location, hours)
- Who can the client call for help? (child care, other pets, transportation)

In determining a plan for a day that goes as the client hopes, encourage your client to consider these issues:

- Where would the client prefer the euthanasia to occur? (at home, in the hospital, outdoors)
- Will the client be present? Who else in the pet's life should be present? (family, friends, other pets)
- Which doctor would the client prefer?

Important details to be considered regardless of an emergency or planned euthanasia, or natural death include the following:

- body care (cremation, burial, other options available) and
- memorializing object (paw print or hair clipping).

As you help the client identify the answers to these questions, you can also gain an understanding of what circumstances need to be in place for this to occur. You may need to determine specific details, such as the doctor's schedule and choices available for euthanasia location, body care, and memorializing objects. You can help facilitate financial issues prior to the euthanasia if billing is not preferred nor even an option. It is appropriate and important to inquire if your client has experienced euthanasia of a pet previously. If no such experience has occurred, a client may be very fearful

of the unknown. Regardless of a client's experience, it is very important to explain what your hospital's euthanasia protocol is and educate the client about what to expect. Use layman's terms during these conversations. Words such as *reflexes*, *muscle twitches*, and *sighing* can be less scary than *reactions*, *muscle spasms*, and *agonal breathing*. While the responsibility of these conversations often falls on the doctor, the client may ask you to discuss end-of-life concerns.

Preparing children for pet illness and loss

"What do I tell my kids about Barkley?" Sandra asks you.

Parents may see you and your team as experts to help explain cancer to their children. They may also ask your help in preparing their children for the loss of a beloved family pet (Figure 9.5). Remember to use simple, age-appropriate terminology. It is helpful to know what the parents have already shared so you can use similar language. Along with educating them about how children grieve (please see the *Children and grief* section), you can prepare them for how to approach their child's involvement in the pet's illness.

Some helpful ideas you can share are the following:

- Be as honest as possible. Encourage parents to be open and honest with their children about a pet's illness and death. Even when done out of

Figure 9.5 Involving children in the dying process of their pets can help them gain an understanding of and alleviate some fear about death.

a desire to protect children, fabrication can result in a loss of trust and anger when the truth is uncovered. Young children can believe the death resulted from their own thoughts or actions. Falsehoods such as "he ran away" or "we had to find him another home" can leave children wondering what they did wrong or blaming themselves for the animal leaving and provides no resolution.

- Avoid euphemisms like "put to sleep." These can be frightening and confusing especially to young children.
- Understand that the loss of a pet is a significant loss for children and is not to be trivialized or minimized.
- Be prepared to answer many questions, often repeatedly, depending on the child's age.
- Include children as much as possible in decisions and discussions about the pet's illness and death. Allow children to have a choice if they want to be present for the euthanasia or see the body afterward, preparing them for what to expect. This can help a child gain an understanding of the death.
- Do not encourage replacement of pets.
- Encourage parents to involve their children in a good-bye ceremony and in memorializing the pet.
- Help children find ways to express their grief. This can include talking, drawing, sharing memories, writing poems or stories, or creating shadow boxes.

Your practice may want to consider having some books on children's pet loss to offer parents facing this challenging time. There are many that are available for various age groups. These books can be used as a starting point for discussions regarding illness, death, and euthanasia.

Follow-up communication

Follow-up contact after a death, such as a phone call, a condolence card, or a memorial acknowledgment, is a meaningful gesture to support clients. This shows your continued care and compassion for your client as well as offers you an opportunity to process your relationship with the pet and family. When writing on a condolence card, everyone who cared for the pet is encouraged to sign. Personalized messages convey your empathy much stronger than a simple "Sorry for your loss" sentence. An example is as follows:

Dear Mr. and Mrs. Brown,

You are in my thoughts since you said goodbye to your beloved boy, Barkley. He was such a brave boy through his treatments, always

jumping up to say hello to everyone in the clinic. I will always remember him with a stuffed toy in his mouth, like he carried around here so often. You took such wonderful care of him, throughout his entire life and especially as he battled the cancer. I know it will be very hard to be without him, though I hope you can take some comfort from knowing you did all that you could, and made a heartbreaking decision to spare him any pain or suffering. He was lucky to have you love him so much.

Sincerely,

Even when speaking from a heartfelt place, there are some phrases to avoid when supporting a client:

- Avoid clichés, such as "Time will heal," as well as responses that promote avoidance such as "Be strong now," "Try and stay busy," or "Don't cry." These can stall a person's grief by promoting unhealthy coping methods.
- Do not encourage immediate replacement of the deceased pet or removal of the pet's belongings. Each individual will come to these decisions in his or her own time and for his or her own reasons.
- Do not try and cheer up a grieving client by giving advice or pep talks such as "He lived a long life" and "You still have other pets." Validating and normalizing the person's grief is the best approach, as well as suggesting grief resources if appropriate.

Your client may ask for pet loss support or resources, so it is helpful to be familiar with resources, such as professional pet loss support groups, counselors, and pet loss websites.

Cost of caring

Through all of your actions and caring support, you help your clients in a variety of important ways. You acknowledge their grief and often grieve with them. You help them adjust to the changes that losing a pet brings. You impart compassion and care through difficult and sad times. Providing such support takes effort and great strength. In this field, veterinary professionals experience death of patients five times more often than physicians for humans. Even with this statistic, you are in this field because of your desire to care, not only for the animals but also for the clients that you build relationships with. The compassion it takes to care for terminally ill patients and their families can come at a price. Depletion of your emotional resources can leave you with no way to continue caring for your patients, your clients, or yourself.

Compassion fatigue is often mistaken for burnout. The easiest way to distinguish the two is to recognize that compassion fatigue is caused by the work you do, while burnout is caused by where you do it. While each may seem similar, they are actually very different and have different paths to recovery. Burnout is driven by organizational concerns, policies, procedures, and bureaucracy. It often involves feelings of hopelessness and helplessness in doing your job effectively. Such negative feelings usually have a gradual onset. They can reflect the feelings that your work makes no difference and are often associated with a very high workload or unsupportive work environment. Burnout is felt to be a contributing factor in compassion fatigue by intensifying the sense of emotional exhaustion that one experiences.

Compassion fatigue results when you have no more empathy to give. Each interaction with someone in an emotional event, such as cancer treatment, compels you to "stand in their shoes," compassionately wishing to ease their pain somehow. As stated before, the key to empathy is to not take on the other person's feelings. When you experience someone else's emotions repeatedly, it can become hard not to suffer the feelings yourself. The chain reaction that begins to take place means the more you care, the less you are able to care.

You may not experience complete compassion fatigue after working with just a few cases, but you can begin to feel the pull at your compassion "strings." Be aware of these pulls and identify when you feel them getting stronger. If unattended, you run the risk of fatiguing yourself completely and developing a list of problems, such as

- dissociation or "checking out" mentally,
- numbness in emotional situations,
- isolation,
- hypervigilance and heightened alertness,
- sleep problems,
- tearfulness, and
- avoidance and/or obsession.

Other signs are a loss in sense of humor, loss of fulfillment from previously enjoyable activities, overreacting, ongoing feelings of sadness, and self-medication with drugs, food, or alcohol. The ability to cope with this emotional stress is unique to each member of the veterinary team, based on each person's life experiences, beliefs, and values.

Working within a veterinary healthcare team has its ups and downs. A healthy and balanced team can help every member reduce the chances of compassion fatigue, while an unsupportive team environment can foster negative emotional effects.

Members of the veterinary healthcare team often experience intense situations repeatedly, without stopping to mentally or emotionally rest. Some

may overcommit to clients and patients. Putting in late hours to care for patients when others are available, sharing personal contact information with clients to remain in touch, and allowing breeches of hospital protocol for particular clients, such as after-hour visits and discharges, all begin to wear on the team as well as the individual. Technicians often experience less control over their work situations and feelings of powerlessness, and frustration can result. You may begin to feel isolated in your devotion to your patients—another setup for compassion fatigue. You cannot avoid experiencing compassion fatigue by remaining emotionally detached from your patients. Research has shown that behaving in an empathic way with patients leads to a better level of care, whereas remaining detached leads to stress and emotional exhaustion.

It does not take much time working in the veterinary field to realize the attachment you will form with many of your clients. When you work with oncology clients and patients, you can expect to experience your own sense of grief and loss when the pet dies. You will not only have lost a relationship with that patient that you have cared for and nurtured throughout treatments, but also the client whom you have stood beside throughout the duration of the pet's illness (Figure 9.6). Research has shown that grief responses of professional caregivers are similar to those experienced by the families with whom they worked. Your grief, though it will be shorter and less intense than your client's, is of great importance and worthy of the same care that you give to your clients. When you acknowledge your grief and establish a plan to care for yourself, both in and out of the workplace, you will be at less risk for compassion fatigue.

Figure 9.6 Technicians often grieve not only the loss of the patient but also their relationship with the client. Allowing time to process one's grief is important to maintaining a healthy self-care regimen.

Team-care strategies

Employing strategies within the work environment can enhance teamwork and communication as a way to reduce the chance of compassion fatigue:

- *Debrief cases*: Meeting as a group to discuss case specifics as well as the emotional components experienced can act as a release for team members. These discussions can provide opportunities to share perspectives of the case, affirm personal contributions, and identify the needs of the team. This is especially important for ongoing and emotionally charged cases.
- *Promote closure*: Case closure is important for you to transition from work life to personal life. It can be something that the team does together or individually before leaving for the day or when a case ends. Closure can also occur when you sign a condolence card or debrief the case. Creating a purposeful ending helps you to take closure a step further and acknowledge the patient and client in your own way. Some ideas are to have a special place or journal where members of the veterinary team can write their favorite memories of the patient, allow time during debriefing or staff meetings to share heartwarming stories of clients and patients, or plan a memorial to commemorate all the animals you have worked with. The only requirement for creating a purposeful ending is that it has meaning for you and the team. This will help you to process the events and then let them go.

Self-care strategies

When you begin to care for yourself appropriately, you create a balance between life and work, and are able to enjoy each separately. Instead of treading down the path to compassion fatigue, begin to recognize the signs and put into place some self-care strategies to prevent it.

Prioritizing your self-care techniques can help you to maintain them (Figure 9.7). It can be difficult to start many new practices at once. Try out different ones to see which fit best in your lifestyle. It can be good to ask your support system (family and friends) to help you continue these practices.

- *Boundaries*: The best way to start caring for yourself is to set boundaries. This helps you protect your time. Boundaries include the following:
  - Work a full day and then go home.
  - Avoid going into work on your days off or checking work e-mails.
  - Refrain from sharing personal phone numbers with clients.
  - When you are home, turn off your "work" thinking.

Figure 9.7 To maintain a healthy work–life balance, it is good to identify what hobbies and activities are helpful.

  - Trust your coworkers to take care of patients in your absence so you can keep your mind away from work when you are not there.
- *Reconnect with yourself*: Remember the things that you loved to do before your life became entangled with your work. Treat yourself to a massage, get your hair done, plant a garden, read a book, exercise, watch the sunset, and so on. Each person has specific activities that fulfill them. It is important to identify what they are for you and commit to nurturing yourself.
- *Reconnect with others*: Schedule fun social events or outings with your family, friends, or pets. Make a point to interact in events not related to work.
- *Care for your body*: Maintaining a healthy diet is important for keeping your immune system strong and helps your body respond to stress. This allows more energy for the things you enjoy. Exercise is a natural way to relieve stress by raising endorphins, the feel-good chemicals in your brain. Exercise also reduces anxiety and promotes good sleep. Research shows that it is a proven mood enhancer. Eating healthy and creating a daily exercise routine can help maintain balance in your life and mood.
- *Take a break*: When you begin to feel that emotional pull of compassion at work, check that your patient is being cared for and allow yourself to step away for a short break from the situation. Walk outside or go to a break room. Wherever you go, breathe deeply and use positive self-talk and imagery as a way to rebalance yourself emotionally.

- *Talk to a professional*: Sometimes, caring deeply can be too much to handle on your own. Seeking out the help of a professional therapist or counselor is nothing to be ashamed of. It can even set an example for others in need of help. Talking with someone can help you see outside the box and gain an appreciation of yourself.

Your work is meaningful to many, including yourself and your clients. You have the skills and compassion to create lasting memories even in the face of diseases. As long as you remember to care for yourself as you do for your patients and clients, you will continue to enjoy a fulfilling career.

Additional reading

Adams CL, Bonnett BN, Meek AH. 2000. Predictors of owner response to companion animal death in 177 clients from 14 practices in Ontario. *J Am Vet Med Assoc* 217:1303–9.

Arnetz BB. 1997. Physicians' view of their work environment and organization. *Psychother Psychosom* 66:155–62.

Bartholomew J, Morrison D, Ciccolo JT. 2005. Effects of acute exercise on mood and well-being on patients with major depressive disorder. *Med Sci Sports Exerc* 37(12):2032–7.

Cohen S. 2002. Can pets function as family members? *West J Nurs Res* 24(6):621–38.

Cohen S. 2007. Compassion fatigue and the veterinary health team. *Vet Clin North Am Small Anim Pract* 37:123–34.

Figley CR, Roop RG. 2006. *Compassion Fatigue in the Animal-Care Community*. Washington, DC: Humane Society Press.

Kubler-Ross E. 1969. *On Death and Dying*. New York: Collier Books/Macmillan.

Lagoni L, Hetts S. 1990. Bereavement. In: McCurnin D (ed.), *Clinical Textbook for Veterinary Technicians* (2nd Ed.). Philadelphia: Saunders.

Lagoni L, Butler C, Hetts S. 1994. *The Human-Animal Bond and Grief*. Philadelphia: Saunders.

Mehrabian A. 1972. *Nonverbal Communication*. Chicago, IL: Aldine-Atherton.

Mitchener K, Ogilvie GS. 2002. Understanding compassion fatigue: Keys for the caring veterinary healthcare team. *J Am Anim Hosp Assoc* 38:307–10.

Swanson TR, Swanson MJ. 1977. Acute uncertainty: The intensive care unit. In: Pattison EM (ed.), *The Experience of Dying*. Englewood Cliffs, NJ: Prentice Hall, pp. 245–51.

Worden, JW. 1991. *Grief Counseling and Grief Therapy* (2nd Ed.). New York: Springer.

Glossary

Acronym: An abbreviation formed using the initial components in a phrase or name.

Acute tumor lysis syndrome: A condition brought on when tumor cells break apart, releasing their contents into the bloodstream. The result is a dangerous, sometimes fatal, alteration in the normal balance of serum electrolytes.

Adenoma: A benign tumor derived from the skin, the linings of the digestive or urinary tract, or glands.

Anaphylaxis: An acute, multisystem severe allergic reaction.

Anemia: A decrease in the normal number of red blood cells or less than the normal quantity of hemoglobin in the blood.

Anthropomorphize: To attribute human characteristics to animals.

Anticipatory grief: The realization that there will soon be a loss, resulting in a drastic change of day-to-day life.

Apoptosis: Active cell death.

Auscultate: To listen, specifically to the sounds produced by the body.

Benign: A tumor which is self-limited in its growth, is not capable of invading into adjacent tissues, and is not capable of spreading to distant tissues (metastasizing).

Biological safety cabinet (BSC): An enclosed, ventilated workspace for safely working with materials contaminated with dangerous substances or disease-causing organisms.

Body surface area: Equivalent to the surface area of the skin. It is difficult to measure, so it is commonly estimated on the basis of formulas that use body weight as part of the equation.

Butterfly catheter: A steel needle attached to flexible plastic wings and a short piece of extension tubing.

Cancer: A class of diseases in which a cell or a group of cells display uncontrolled growth, invasion of local tissues, and sometimes metastasis.

Carcinoma: A malignant tumor derived from cells of the skin, the linings of the digestive or urinary tract, or glands.

Cephalic vein: A large superficial vein of the anterior lower forelimb.

Coarsely fractionated radiation therapy: A total dose of radiation broken into large fractions, allowing fewer treatment sessions.

Cancer Chemotherapy for the Veterinary Health Team, First Edition. Edited by Kenneth Crump and Douglas H. Thamm.

Compassion fatigue: A gradual lessening of compassion over time. Sufferers can exhibit several symptoms including hopelessness, a decrease in experiences of pleasure, constant stress and anxiety, and a pervasive negative attitude.

Complete blood count (CBC): A blood test that looks at numbers, size, shape, and appearance of red blood cells, white blood cells, and platelets.

Complete response (**CR):** The disappearance of all evidence of cancer.

Concentrated waste: Waste generated by chemotherapy preparation and administration including the original drug vial, or a syringe and needle that came in contact with the concentrated drug during preparation.

Contaminated waste: Incidental waste generated by chemotherapy preparation and administration such as gloves, gowns, administration sets, and intravenous bags.

Contraindication: A factor that increases the risks involved in using a particular drug, carrying out a medical procedure, or engaging in a particular activity.

Cystitis: Inflammation of the bladder.

Cystocentesis: A urine collection procedure whereby a needle is placed into the urinary bladder through the abdominal wall of an animal and a sample of urine is removed.

Cytotoxic: Toxic to cells.

Department of Transportation (DOT): A government agency in North America devoted to transportation. The largest is the United States Department of Transportation, which oversees interstate travel. All US states, Canadian provinces, and many local agencies also have similar organizations.

Desquamation: The shedding of the outermost membrane or layer of a tissue, such as the skin.

Diluent: A diluting agent, often water, saline solution, or dextrose solution.

Dorsal spinous process: The bony protuberance of the spine that sticks up in animals.

Drug Enforcement Agency (DEA): A law enforcement agency under the United States Department of Justice, tasked with combating drug smuggling and use within the United States.

Electrolyte solution: A solution containing any of various ions, such as sodium, potassium, or chloride, required by cells to regulate the flow of water molecules across a cell membrane.

Empathy: The ability to stand in someone else's shoes and have an emotional and intellectual comprehension of what they are experiencing without taking on the actual feelings yourself.

Environmental Protection Agency (EPA): An agency of the federal government of the United States charged with protecting human health and the environment.

Extravasation: The flow of blood or the administration of a drug outside of a blood vessel.

Febrile: Having a fever.

Fine needle aspiration: A technique to draw a sample of cells from a tumor using only a thin, small needle.

Grade: Tumor grade is a system used to classify cancer cells in terms of how abnormal they look under a microscope and can be predictive how quickly the tumor is likely to grow and spread.

Gram-positive/gram-negative: Referring to a stain technique to differentiate bacteria. Gram-stain-positive bacteria absorb the stain; gram-stain-negative bacteria do not.

Hemangiosarcoma: A malignant tumor derived from the blood vessels.

Hemorrhagic: Characterized by the presence of blood.

High efficiency particulate air (HEPA) filter: A type of high efficiency air filter designed to filter out airborne microorganisms and particles.

Histamine release: Histamine is involved in local and systemic immune responses. As part of an immune response to foreign pathogens (allergic response), histamine is released and triggers the inflammatory response.

Hypercalcemia: Abnormally high blood calcium levels.

Intralesional: Into a lesion, usually refers to the injection of a drug directly into a tumor.

Intramuscular (IM): Into a muscle, usually referring to a drug injection.

Intravenous (IV): Into a vein, usually referring to a drug injection or infusion.

Keratoconjunctivitis sicca: Dry eyes—its literal Latin translation is "dryness of the cornea and conjunctiva."

Lateral recumbency: The patient is lying on its side.

Lateral saphenous vein: A large superficial vein on the lateral (outer) aspect of the lower hind limb.

Leukemia: Cancer of the blood cells affecting the bone marrow or blood.

Luer lock: A standardized system of fluid fittings used for making leak-free connections between medical and laboratory instruments, including hypodermic syringes, stopcocks, and needles. Luer-Lok is a registered trademark of Becton Dickinson.

Lymphoma: A malignant cancer of lymphocytes; one of the white blood cells.

Malignant: A malignant tumor is not self-limited in its growth, is capable of invading into adjacent tissues, and may be capable of spreading to distant tissues (metastasizing).

Mast cell tumor: A malignant tumor, usually of the skin or subcutaneous tissues, derived from white blood cells called mast cells.

Medial saphenous vein: A large superficial vein on the medial (inner) aspect midway along the hind limb.

Melanoma: A malignant or benign tumor derived from melanocytes; pigment-containing cells in the skin and mucous membranes.

Mesothelioma: A malignant cancer of the cells lining the abdominal and thoracic organs.

Metabolite: Any substance produced by a metabolic reaction in the body, including chemicals formed by the metabolic transformations of a drug.

Metastasis: The spread of cancer from one part of the body to another.

National Institute for Occupational Safety and Health (NIOSH): The US federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness.

Neutropenia: An abnormally low number of neutrophils.

Neutrophils: Also called "segs" (short for "segmented neutrophil," alluding to the segmented nature of the nucleus); the most abundant of the white blood cells and form an integral part of the immune system. They are especially important in protecting against bacteria.

Nonsteroidal anti-inflammatory drug: A drug with pain-controlling, fever-reducing, and anti-inflammatory effects, which is neither a steroid nor a narcotic.

Normal saline: The commonly used term for a solution of 0.9% sodium chloride.

Nuclear Regulatory Commission (NRC): A US government agency that oversees nuclear reactor safety and security, reactor licensing and renewal, radioactive material safety, security and licensing, and spent fuel management.

Occupational Safety and Health Administration (OSHA): An agency of the United States Department of Labor whose mission is to prevent work-related injuries, illnesses, and occupational fatalities by issuing and enforcing standards for workplace safety and health.

Osteosarcoma: A malignant tumor arising from bone cells.

Over-the-needle catheter: Used for longer infusions into peripheral veins. After the stylet needle of an over-the-needle catheter is inserted into a vein, the catheter is then slid over the needle into the vein and the needle is withdrawn.

Palliative treatment: Treatment given to relieve the clinical signs and reduce the suffering caused by cancer and other life-threatening diseases.

Paraneoplastic syndrome: A disease or clinical sign that is the consequence of the presence of cancer in the body, but it is not due to the local presence of cancer cells.

Partial response (PR): Significant tumor shrinkage but not complete tumor disappearance.

Patency: The state of being open and unblocked.

***Per os* (PO):** By mouth.

Perivascular: Around a blood vessel.

Personal protective equipment (PPE): Equipment used to protect the user from health risks associated with the handling of potentially dangerous substances..

Platelets: Blood cells involved in the clotting cascade.

Polydipsia: Increased thirst.

Polyuria: Increased urination, usually as a result of excessively diluted urine.

Progressive disease (PD): A significant worsening of cancer.

Pulse deficit: The absence of a palpable pulse (or significant change in pulse quality) in conjunction with an audible heartbeat. Pulse deficits usually indicate a cardiac abnormality and should be brought to the attention of a veterinarian.

Quality of life: The degree of well-being felt. It consists of two components: pain and suffering. Pain is a physical and emotional sensation. Suffering involves the ability to enjoy living life.

Recheck history form: A history intake form, more focused than an initial intake history form, used to gather information from one appointment to the next.

Red blood cell: The cell in the blood responsible for carrying oxygen to tissues.

Reflection: To paraphrase back to the clients what they have said, focusing not only on the content of the conversation but also on the feelings the clients express.

Resource Conservation and Recovery Act (RCRA): The principal federal law in the United States governing the disposal of solid waste and hazardous waste.

Sarcoma: A malignant tumor derived from connective tissues. Such tissues include bone, cartilage, fibrous connective tissue, fat, muscle, and the linings around the nerves and blood vessels.

Self-disclosure: Sharing with your client a similar experience you have faced, which can help clients feel less isolated and normalize their emotions.

Septic: Experiencing a whole-body inflammatory state with the presence of infection.

Serosanguinous fluid: A fluid containing both blood and serum.

Soft skills: The cluster of personality traits, social graces, communication, language, personal habits, friendliness, and optimism that characterize relationships with other people; the ability to deal with people effectively and politely.

Stable disease (SD): A situation in which a cancer has not improved but has also not worsened significantly.

Stage: A description (usually numbers I to IV) of how much the cancer has spread through the body.

Standard operating procedure (SOP): Detailed, written instructions to achieve uniform performance of a specific function.

Sternal recumbency: The patient is lying on its chest.

Sternum: The long flat bone or set of bones located at the center of the chest.

Subcutaneous (SQ): Under the skin.

Surgical margin: When a tumor is biopsied or surgically removed, the surgeon also takes out some normal tissue around the tumor. This border of tissue between the outer edge of the normal tissue and the tumor itself is called the surgical margin.

Tachycardia: An abnormally high heart rate.

Therapeutic index: The amount of a drug that causes a therapeutic effect compared with the amount that causes drug toxicity.

Thrombocytopenia: An abnormally low platelet count.

Tumor: A swelling caused by an abnormal growth of cells, which can be benign or malignant.

White blood cell count: The number of white blood cells in the blood.

Venipuncture: The process of obtaining intravenous access for the purpose of intravenous therapy or obtaining a sample of venous blood.

Vesicant: A substance that causes tissue blistering. Vesicants are highly reactive chemicals that combine with proteins, DNA, and other cellular components resulting in destructive cellular changes.

Index

Page numbers in *italics* refer to Figures; those in **bold** to Tables.

acute tumor lysis syndrome, 109
administration of chemotherapy, 24–26, 28, 31–33, 42, 46, 49, 58, 61, 64, 66–68, 72, 75–76, 78–87, 94, 104, 106, 108–109
actinomycin D, 95, 104
Adriamycin. *See* doxorubicin
adverse effects, 8–9, 90, 94, 101–112
age, chemotherapy and, 11
alanine aminotransferase, 48
Alkeran. *See* melphalan
alopecia, 9–10, 13, 22, 24, 90, 110
ALT. *See* alanine aminotransferase
anal sac carcinoma, 49, 98
anemia, 48
antibiotics, 9, 13, 47, 67, 108–109, 111–112
anticipatory grief, 114–115, **115**
anxiety, owner and pet, 72, 75, 89, 114, 116
apoptosis, 16, 18, 24
appetite, 9, 41, 45, 54, 90, 106, 108, 110, 116, 123
AraC. *See* cytarabine
asparaginase, 83, 95–96, 103
auscultation, 43–44

behavior assessment, 72–73
Benadryl. *See* diphenhydramine
biochemistry profile, 48–49, 108
biological safety cabinet, 25, 27, 59, 61, **62**
biopsy, 5, 6
bladder tumors, 6, 49, 51, 98
blood tests. *See* laboratory tests
body map, 45, **55**
body surface area, 29–30, *35*, 45
brain tumors, 12–13, 49, 97
butterfly catheter. *See* catheters

calcium, 48
calipers, 45–**46,** 49
capsules, 10, 66, 79–80
carboplatin, 58, 67, 95
carcinogenesis, 17–18
carcinoma, 20–21, 49, 58, 95–97
cataracts, radiation-induced, 13
catheter, 30–33, 60, 65–66, 78, 80–85, 87–88, 104–105
CCNU. *See* lomustine
CDDP. *See* cisplatin
CeeNu. *See* lomustine
cell cycle, 94
cephalic vein, 78, 80
Cerenia. *See* maropitant
cisplatin, 48, 67, 82, 96
chemo-safety pen, 64
chemotherapy administration
  intramuscular, 83–84, 95
  intravenous, 80–88
  oral, 10, 66, 79
  setup for, 32, 80
  subcutaneous, 83–86
children, 67, 115, 118–120, 127–128
chlorambucil, 96
client information sheet, 89–90, 102, 110–111
combination drug chemotherapy, 94
communication, 114
compassion fatigue, 130–131
Compazine. *See* prochlorperazine
complete blood count (CBC), 46–48, 108
complete response, 52
compounding, 25, 66
computed tomography (CT), 49–50
concentrated waste, 68
condolence card, 128–129
contaminated waste, 68
Cosmegen. *See* actinomycin D
crying, 116

Cancer Chemotherapy for the Veterinary Health Team, First Edition. Edited by Kenneth Crump and Douglas H. Thamm.

CT. *See* computed tomography
cure, 52
cyclophosphamide, 11, 96–97, 99
cystitis, sterile hemorrhagic, 96–97
cystocentesis, 6
cytarabine, 83, 97
Cytosar. *See* cytarabine
cytosine arabinoside. *See* cytarabine
Cytoxan. *See* cyclophosphamide

dactinomycin. *See* actinomycin D
death, chemotherapy-related, 9, 90, 102
dehydration, 9, 106–107, 109, 111
denial, 116
Department of Public Health, 67
Department of Transportation (DOT), 61, 67
dexamethasone, 103–104, *104*
dexrazoxane, 105
diarrhea, 9, 24, 40–41, 54, 58, 90, 95, 106–107, 110–111
diet, 11, 41, 107, 111, 133
"difficult client," 117
dimethyl sulfoxide (DMSO), 104
diphenhydramine, 103–*104*
disposal of chemotherapy drugs, 58, 60–61, 67–68, 79, 86, 88, 91
diuresis, 96
doxorubicin, 11, 44, 48, 58–59, 81–82, 96–97, 99, 103–105, **105**
Drug Enforcement Agency (DEA), 67

electrolytes, 109
Elspar. *See* asparaginase
Elizabethan collar, 104
empathy, 121, 122, 124, 128, 130
end-of-life decisions, 125–127
endocrine disruptors, 67
environment, cancer development and, 3–4
Environmental Protection Agency (EPA), 67, 69
epinephrine, 68, 103–104, *104*
euthanasia, 123, 125–128
exposure, to chemotherapy, 9, 11, 24–25, 27, 33, 58, 60–61, 63–67, 81, 91,
extravasation, 46, 82, 103–105, **105**
eye contact, 121
eyewash station, 33

facial expressions, 120–121
fever, 42–43, 108–109, 111–112
fine-needle aspiration, 5–6
Flagyl. *See* metronidazole
flow sheet, 88–*89*
flushing, of catheter, 66, 81, **85, 87**
furosemide, 97

gastrointestinal (GI) toxicity, 94, 103, 106–107. *See also* diarrhea; nausea; vomiting
gloves, 10, 24, 26–27, 32–33, 59–62, 64, 66, 68, 79, 91
good day/bad day calendar, 125
gown, 26–27, 59–60, 62, 68,
grade, 21
granulomatous meningoencephalitis, 97
grief, 114–129
  children and, 118–120, 127–128
  stages of, 117–118

hair loss. *See* alopecia
"Hallmarks of Cancer," 18
handouts. *See* client information sheet
hazardous waste, 67–68
heart, damage to, 97, 105
heart rate, *42*, 43–44, 108
hemangiosarcoma, 20, 49, 97
HEPA filter, 61–62, 64, 66
histiocytic sarcoma 97
histopathology, 7–8
history, 38–42, 53, 72, 103, 108
hospice, 126
hypercalcemia. *See* calcium
hypersensitivity reaction, 95, 97, 103–104, **104**

imaging, 49–50
Imodium. *See* loperamide
initiation, in carcinogenesis, 18
invasion, 7–8, 17–19
isolator, 25, 27, 59, 61–**63,** 64, 66,

jugular vein, 46, 48, 74–75

keratoconjunctivitis sicca, radiation-induced, 13
kidney values/function, 4, 11, 48–49, 95–97, 109
Kubler-Ross, Elizabeth, 117

L-asparaginase. *See* asparaginase
laboratory tests, 29, 45–49
Lasix. *See* furosemide
lateral recumbency, 76–**77,** 78
leukemia, 20, 95–97, 109
Leukeran. *See* chlorambucil
liver values, 49, 98
lomustine, 97–98

loperamide, 107
Luer-lock syringes, 26, 60, 64–65
lymphoma, 5, 11, 20, 52, 58, 95–99, 109, 114

magnetic resonance imaging, 49–50
mammary gland carcinoma, 49
margins, surgical, 8
maropitant, 107
mast cell tumor, 6, 7, 12, 20, 58, 97–98
Material Safety Data Sheet (MSDS), 25
measurement, of tumor size, 45
medical records, 28, 30, 40–41, 80
melanoma, 7, 12, 49, 95
melphalan, 98
metoclopramide, 107
metronidazole, 107
mesothelioma, 5
metastasis, 17–20
mitoxantrone, 98
MRI. *See* magnetic resonance imaging
muzzle, 75–77
myeloma, 98

nasal tumors, 12
National Institute for Occupational Safety and Health (NIOSH), 25, 61, 67, 87
nausea, 9, 41, 90, 106–107, 109–111
needle stick injuries, 87–88
neutropenia, 9, 29, 42, 47, 74, 94, 103, 107–109, 111–112
neutrophils, 47
nonverbal communication, 120–121
Novantrone. *See* mitoxantrone
Nuclear Regulatory Commission (NRC), 67
nursing, 91

Occupational Safety and Health Administration (OSHA), 61, 64, 67, 88
Oncovin. *See* vincristine
Onguard™, 25, 27, 32, 59–60, 64, 81, 84
open-ended questions, 39
oral chemotherapy drugs, 66, 79–80
oral tumors, 12
osteosarcoma, 7, 12, 20, 49, 95–97
over-the-needle catheter(s). *See* catheters

pain, 12–13, 17, 44, 104, 118, 123
pancreatitis, 107
Paraplatin. *See* carboplatin
partial response, 52
perianal tumors, 12
personal protective equipment (PPE), 26, 32–33, 59–60, 62, 79, 85
Phaseal™, 25, 27, 32, 59–60, 64–66, 81, 84
physical examination, 42
platelets, 47–48, 96, 98–99, 108
Platinol. *See* cisplatin
prednisone, 11
pregnancy, 61, 91
premalignancy, 17
preparation of chemotherapy, 63
prochlorperazine, 107
progression, in carcinogenesis, 18
progressive disase, 53
promotion, in carcinogenesis, 18
pulse, 43–44
pulse deficit, 44

quality of life, 10, 123–124

radiation therapy, 6, 12–13, 109
radiographs, 49–50
recapping of needles, 88
red blood cells, 48
reflection, as communication, 122
Reglan. *See* metoclopramide
Resource Conservation and Recovery Act (RCRA), 68
respirator, 26–27, 59,
respiratory rate/effort, 44
response assessment, 50–53
restraint for chemotherapy, 75–79

saphenous vein, 80
sarcoma, 20
sedation, 13, 50, 75, 88–90
self-disclosure, 122–123
sepsis, 107–109
side effect(s). *See* adverse effects
snake bite kit, 105
soft skills, 72–73, 79
soft-tissue sarcoma, 12, 20, 95–97, 99
spleen, tumors of, 6
spill kit, 27–28, 32, 60
stable disease, 52–53
stage, 21
Standard Operating Procedures (SOPs), 26, 59, 61
sternal recumbency, 76, 78
storage, of chemotherapy drugs, 60–61
suffering, 123–125
surface area. *See* body surface area
surgery, 6, 7

tachycardia, 44
temperature, 42–43, 74, 108, 111–112
therapeutic index, 94

thrombocytopenia. *See* platelets
touch, as communication, 121
TPR, 42–44, 74
transmissible venereal tumor, 99
tumors, benign versus malignant, 16
tumor suppressor genes, 17
tylosin, 107

ultrasound, 49–51
urinalysis, 48–49
urine specific gravity, 48–49
USP 797 protocol, 63

vaccine-associated sarcoma. *See* soft-tissue sarcoma
Velban. *See* vinblastine
vesicant drugs, 30–31, 74, 78, 81
Villalobos technique, 105
vinblastine, 58–59, 98, 104
vincristine, 11, 25, 58–59, 81, 90, 96, 99, 104
vomiting, 9, 41, 106–107, 109–111

waste disposal container, 27, 68–69
weight, 45
white blood cells, 46–47, 111–112
  lowering of, *see* neutropenia
Worden, William, 117
workspace, for chemotherapy administration, 32–33

X-rays. *See* radiographs

Zinecard. *See* dexrazoxane