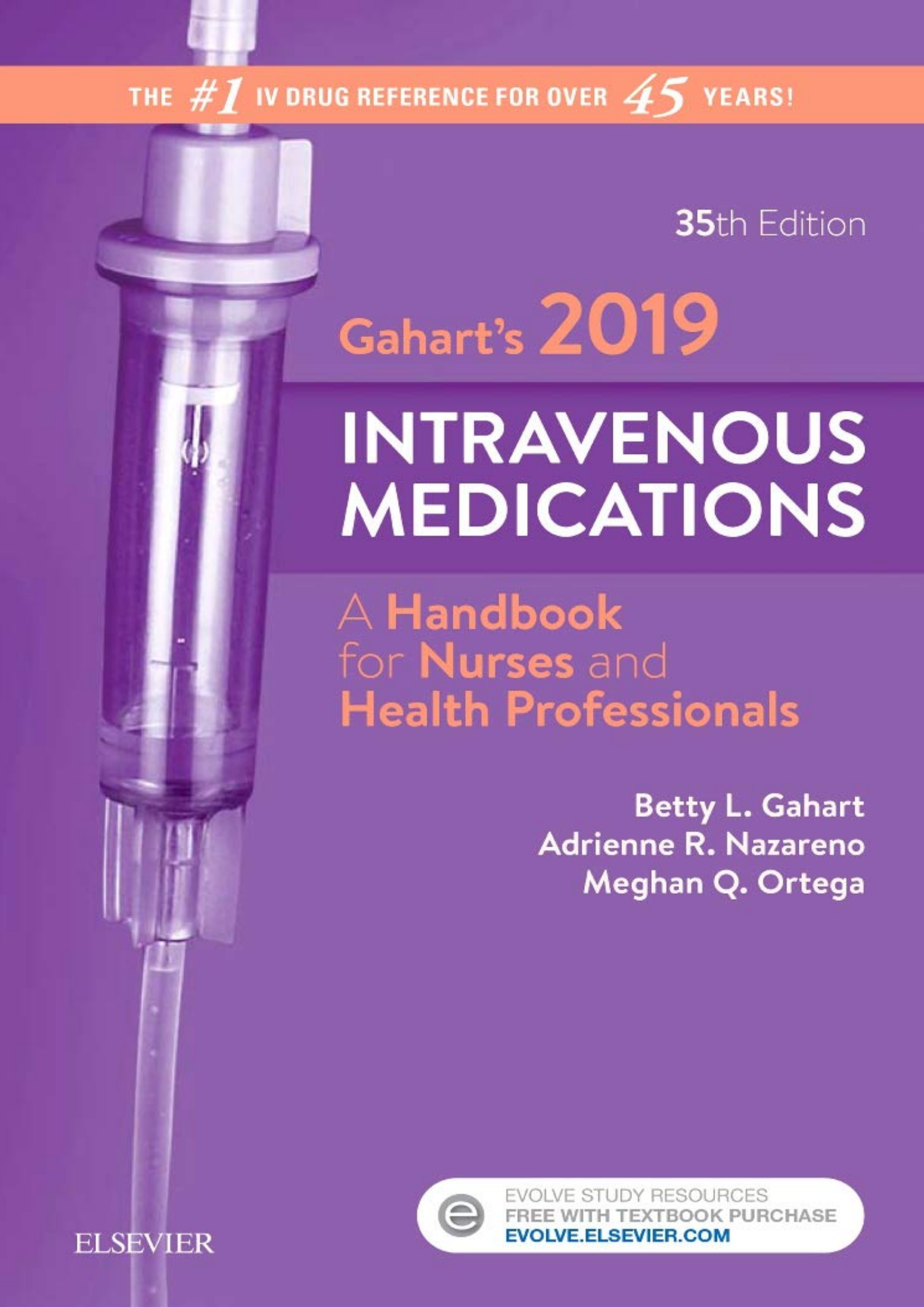
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A Handbook for Nurses and Health Professionals
Betty L. Gahart
Adrienne R. Nazareno
Meghan Q. Ortega
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2019 INTRAVENOUS MEDICATIONS

A Handbook for Nurses and Health Professionals

THIRTY-FIFTH EDITION

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General Dilution Chart (Gm to mg)							
Amount of Drug Required in Grams	Amount of Diluent						
	1,000 mL	500 mL	250 mL	125 mL	100 mL	50 mL	25 mL
	mg/mL	mg/mL	mg/mL	mg/mL	mg/mL	mg/mL	mg/mL
20 Gm	20	40	80	160	200	400	800
19 Gm	19	38	76	152	190	380	760
18 Gm	18	36	72	144	180	360	720
17 Gm	17	34	68	136	170	340	680
16 Gm	16	32	64	128	160	320	640
15 Gm	15	30	60	120	150	300	600
14 Gm	14	28	56	112	140	280	560
13 Gm	13	26	52	104	130	260	520
12 Gm	12	24	48	96	120	240	480
11 Gm	11	22	44	88	110	220	440
10 Gm	10	20	40	80	100	200	400
9 Gm	9	18	36	72	90	180	360
8 Gm	8	16	32	64	80	160	320
7 Gm	7	14	28	56	70	140	280
6 Gm	6	12	24	48	60	120	240
5 Gm	5	10	20	40	50	100	200
4.5 Gm	4.5	9	18	36	45	90	180
4 Gm	4	8	16	32	40	80	160
3.5 Gm	3.5	7	14	28	35	70	140
3 Gm	3	6	12	24	30	60	120
2.5 Gm	2.5	5	10	20	25	50	100
2 Gm	2	4	8	16	20	40	80
1.5 Gm	1.5	3	6	12	15	30	60
1 Gm	1	2	4	8	10	20	40
0.5 Gm	0.5	1	2	4	5	10	20
0.25 Gm	0.25	0.5	1	2	2.5	5	10

To use chart:

1. Find mg/mL desired, track to amount of diluent desired and amount of drug in Grams required.
2. Find amount of drug in Grams required, track to diluent desired and/or mg/mL desired.
3. Find amount of diluent required, track to amount of drug in Grams and/or mg/mL desired.

Formula: Substitute any number for X

X Grams diluted in 1,000 mL = X mg/mL (1 Gram in 1,000 mL = 1 mg/mL)
X Grams diluted in 500 mL = 2 X mg/mL (1 Gram in 500 mL = 2 mg/mL)
X Grams diluted in 250 mL = 4 X mg/mL (1 Gram in 250 mL = 4 mg/mL)
X Grams diluted in 125 mL = 8 X mg/mL (1 Gram in 125 ml = 8 mg/mL)
X Grams diluted in 100 mL = 10 X mg/mL (1 Gram in 100 mL = 10 mg/mL)
X Grams diluted in 50 mL = 20 X mg/mL (1 Gram in 50 mL = 20 mg/mL)
X Grams diluted in 25 mL = 40 X mg/mL (1 Gram in 25 mL = 40 mg/mL)

Some variation occurs from manufacturer's overfill or if the drug is in liquid form. If absolute accuracy is required, these variations can be avoided by withdrawing an amount in mL from the diluent equal to manufacturer's overfill and/or an amount equal to the amount in mL of the drug. Consult the pharmacist for specific information on manufacturer's overfill of infusion fluids used in your facility.

General dilution chart

General Dilution Chart (mg to mcg)							
Amount of Drug Required in Milligrams	Amount of Diluent						
	1,000 mL	500 mL	250 mL	125 mL	100 mL	50 mL	25 mL
	mcg/mL	mcg/mL	mcg/mL	mcg/mL	mcg/mL	mcg/mL	mcg/mL
20 mg	20	40	80	160	200	400	800
19 mg	19	38	76	152	190	380	760
18 mg	18	36	72	144	180	360	720
17 mg	17	34	68	136	170	340	680
16 mg	16	32	64	128	160	320	640
15 mg	15	30	60	120	150	300	600
14 mg	14	28	56	112	140	280	560
13 mg	13	26	52	104	130	260	520
12 mg	12	24	48	96	120	240	480
11 mg	11	22	44	88	110	220	440
10 mg	10	20	40	80	100	200	400
9 mg	9	18	36	72	90	180	360
8 mg	8	16	32	64	80	160	320
7 mg	7	14	28	56	70	140	280
6 mg	6	12	24	48	60	120	240
5 mg	5	10	20	40	50	100	200
4.5 mg	4.5	9	18	36	45	90	180
4 mg	4	8	16	32	40	80	160
3.5 mg	3.5	7	14	28	35	70	140
3 mg	3	6	12	24	30	60	120
2.5 mg	2.5	5	10	20	25	50	100
2 mg	2	4	8	16	20	40	80
1.5 mg	1.5	3	6	12	15	30	60
1 mg	1	2	4	8	10	20	40
0.5 mg	0.5	1	2	4	5	10	20
0.25 mg	0.25	0.5	1	2	2.5	5	10

To use chart:

1. Find mcg/mL desired, track to amount of diluent desired and amount of drug in mg required.
2. Find amount of drug in mg required, track to diluent desired and/or mcg/mL desired.
3. Find amount of diluent required, track to amount of drug in mg and/or mcg/mL desired.

Formula: Substitute any number for X

X mg diluted in 1,000 mL = X mcg/mL (1 mg in 1,000 mL = 1 mcg/mL)
X mg diluted in 500 mL = 2 X mcg/mL (1 mg in 500 mL = 2 mcg/mL)
X mg diluted in 250 mL = 4 X mcg/mL (1 mg in 250 mL = 4 mcg/mL)
X mg diluted in 125 mL = 8 X mcg/mL (1 mg in 125 ml = 8 mcg/mL)
X mg diluted in 100 mL = 10 X mcg/mL (1 mg in 100 mL = 10 mcg/mL)
X mg diluted in 50 mL = 20 X mcg/mL (1 mg in 50 mL = 20 mcg/mL)
X mg diluted in 25 mL = 40 X mcg/mL (1 mg in 25 mL = 40 mcg/mL)

Some variation occurs from manufacturer's overfill or if the drug is in liquid form. If absolute accuracy is required, these variations can be avoided by withdrawing an amount in mL from the

diluent equal to manufacturer's overfill and/or an amount equal to the amount in mL of the drug. Consult the pharmacist for specific information on manufacturer's overfill of infusion fluids used in your facility.

HOW TO USE THIS BOOK

STEP 1

Refer to the index at the back of the book. You can find any drug by any name in less than 5 seconds. All drugs are cross-indexed by generic and all known trade names. The index is easily distinguished by a printed blue bar at the edge of the pages. Drugs are also indexed by pharmacologic action. With one turn of the page, all drugs included in the text with similar pharmacologic actions and their page numbers are available to you. Everything is strictly alphabetized; you will never be required to refer to additional pages to locate a drug.

STEP 2

Turn to the single page number given after the name of the drug. All information about the drug is included as continuous reading. You will rarely be required to turn to another section of the book to be completely informed. Specific breakdowns of each drug (Usual Dose, Pediatric Dose, Dose Adjustments, Dilution, Compatibility, Rate of Administration, Actions, Indications and Uses, Precautions, Contraindications, Drug/Lab Interactions, Side Effects, and Antidote) are consistent in format and printed in boldface type. Subheadings under these categories are in boldface. Scan quickly for a Usual Dose check, Dose Adjustment, Drug/Lab Interaction, Side Effect, or Antidote or carefully read all included information. The choice is yours. A quick scan will take 5 to 10 seconds. Even the most complicated drugs will take less than 2 minutes to read completely. Read each monograph carefully and completely before administering a drug to a specific patient for the first time and review it any time a new drug is added to the patient's drug profile.

That's it!

A fast, complete, and accurate reference for anyone administering intravenous medications. The spiral binding is specifically designed to lie flat, leaving your hands free to secure needed supplies, prepare your medication, or even ventilate a patient while you read the needed information.

Develop the "look it up" habit.

Clear, concise language and simplicity of form contribute to quick, easy use of this handbook. Before your first use, read the preface; it contains lots of helpful information.

Check out the *Intravenous Medications* website for monographs no longer included in this text and for other useful IV medication information:

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Dedication

To my husband, ***Bill,*** *for his patience, support, and many hours of much-needed and appreciated assistance, and to our children,* ***Marty, Jeff, Debbie, Rick,*** *and* ***Teresa;*** *their spouses,* ***Sally, Terri, Jim,*** *and* ***Mary;*** *and our grandchildren,* ***Meghan, Laurie, Alex, Anne, Kathryn, Lisa, Benjamin, Matthew, Claire, Neil, Scott,*** *and* ***Alan,*** *for their encouragement and understanding.*

BLG

To my husband, ***Greg,*** *for his loving support and encouragement, and to my children,* ***Danielle, Bryan, Emily,*** *and* ***Mark,*** *for allowing me the freedom to pursue my professional practice.*

ARN

To my husband, ***Nate,*** *as well as my parents,* ***Jim*** *and* ***Debbie,*** *for their unconditional love, support, and understanding. To my grandparents* ***Bill*** *and* ***Betty*** *for their wisdom and guidance. Lastly, to* ***God,*** *for His grace and for paving my path.*

MQO

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Preface

This Year 2019 edition marks the forty-sixth year of publication of *Intravenous Medications*. All previous editions are considered out-of-date.

In this thirty-fifth edition, a total of 16 new drugs approved by the FDA for intravenous use have been incorporated. Eleven of these new drugs are presented in individual monographs alphabetically within the text. Drugs include **angiotensin II (Giapreza),** a vasopressor indicated for the treatment of hypotension in adults with septic or other distributive shock; **aprepitant (Cinvanti) and rolapitant (Varubi),** antiemetics used in combination with other antiemetic agents in adults for the prevention of acute and delayed nausea and vomiting associated with initial and repeat courses of highly and moderately emetogenic cancer chemotherapy; **copanlisib (Aliqopa),** an antineoplastic indicated for the treatment of adults with relapsed follicular lymphoma; **daunorubicin and cytarabine liposome (Vyxeos),** an antineoplastic indicated for the treatment of adults with newly diagnosed therapy-related acute myeloid leukemia (t-AML) or AML with myelodysplasia-related changes (AML-MRC); **delafloxacin (Baxdela),** an antibacterial fluoroquinolone indicated for the treatment of adults with acute bacterial skin and skin structure infections; **gemtuzumab (Mylotarg),** an antineoplastic indicated for the treatment of newly diagnosed CD33-positive acute myeloid leukemia (AML) in adults and for the treatment of relapsed or refractory CD33-positive AML in adults and pediatric patients 2 years of age and older; **inotuzumab (Besponsa),** an antineoplastic indicated for the treatment of adults with relapsed or refractory B-cell precursor acute lymphoblastic leukemia; **letermovir (Prevymis)**, an antiviral indicated for prophylaxis of cytomegalovirus (CMV) infection and disease in adult CMV-seropositive recipients [R+] of an allogeneic hematopoietic stem cell transplant (HSCT); **meropenem and vaborbactam (Vabomere),** an antibacterial indicated for the treatment of patients 18 years of age and older with complicated urinary tract infections; and **tisagenlecleucel (Kymriah),** an immunotherapy antineoplastic indicated for the treatment of patients up to 25 years of age with B-cell precursor acute lymphoblastic leukemia (ALL) that is refractory or in second relapse or later. Three additional drugs are new biosimilars—**bevacizumab-awwb (Mvasi), infliximab-qbtx (Ixifi), and trastuzumab-dkst (Ogivri)** —and have been incorporated into the existing monographs for bevacizumab, infliximab, and trastuzumab, respectively. To accommodate these new drugs and because of space limitations in this print version, 39 drugs have been moved to the Evolve website. Two new drugs—**axicabtagene ciloleucel (Yescarta),** an immunotherapy antineoplastic indicated for the treatment of adults with relapsed or refractory large B-cell lymphoma after two or more lines of systemic therapy, and **vestronidase alfa-vjbk (Mepsevii),** an enzyme replenisher indicated for the treatment of mucopolysaccharidosis VII—are going directly to the Evolve website.

Many new uses have been approved for established drugs, and numerous safety issues have been identified by the FDA. All of these changes are incorporated so our readers have the most current information available.

We continually strive to make information in this handbook informative and easier to access. **We continue to identify drugs with a Black Box Warning BBW in the main heading of the monograph.** In addition, **Black Box Warning statements are shaded** in light gray **and a different typeface is used** for instant identification wherever they appear in the text. ***Blue-screened text*** emphasizes a special circumstance not covered by a Black Box Warning. The FDA is now identifying **Limitations of Use** of drugs under Indications. Previously this information has been placed in Precautions. Drugs granted **accelerated approval** are identified.

In the past, we have incorporated the Common Toxicity Criteria (CTC) provided by the U.S. Department of Health and Human Services, the National Institutes of Health, and the National Cancer Institute. This listing has been expanded and updated by these organizations and is too expansive to be included in an appendix. Web access to this material is available at www.cancer.gov. Search for CTCAE (Common Terminology Criteria for Adverse Events Version 4.0). Printed copies are available free of charge; call 1-800-4-CANCER (1-800-422-6237).

We are all aware that **The Joint Commission** and the **Institute for Safe Medication Practices**

(ISMP) have strongly emphasized various ways to reduce errors in drug ordering and administration. One of their suggestions is to refer to a drug by both its generic and its trade name. ***Intravenous Medications*** is the only reference that has consistently used both names since its first publication. They also recommend that symbols (e.g., <, >, ≤, ≥,) be spelled out. **Although we have always spelled out most of them, they are now all spelled out. The only exception is in charts when there isn't room for the spelled-out version.** The symbols are included in the Key to Abbreviations (p. xviii) if you need a refresher. **Some of the other ways in which we assist with safe administration** is to spell out the word *units*, use Gm instead of gm so it is not confused with mg, use mcg instead of μg, and drop all trailing 0s (as in 1.0) to prevent overdoses. **The Joint Commission, the ISMP, the American Pharmaceutical Association, and several other organizations have identified "High-Alert Medications" (a list of medications with the highest risk of injury when misused).** The websites of these organizations contain considerable information and identify common risk factors and suggested strategies. From the authors' viewpoint, **all drugs given by the IV route should be considered high-alert medications.** They have an immediate effect, are irretrievable, and can cause life-threatening side effects with incorrect usage.

We join The Joint Commission in urging you to pay special attention to **how tubes and catheters are connected to patients.** The Joint Commission challenges the manufacturers of these devices to redesign them in ways that will make dangerous misconnection much less possible. Look up The Joint Commission suggestions. A preventive measure not mentioned by The Joint Commission is the **simple practice of labeling every line at the point of entry into the patient.** This should be done whenever more than a single piece of tubing (IV or other) is connected to a patient. Multiple-lumen catheters, 3-way stopcocks, chest tubes, nasogastric tubes, and any other tubing entering the patient should be labeled with its contents or use at the connection closest to the patient. In today's health care settings, patients frequently have multiple tubes inserted into their bodies. Correct labeling takes only a few seconds at the time of insertion and saves many moments of precious time every time the line needs to be accessed. Misconnection errors may be fatal; establish all of these suggestions as a standard of practice, and misconnection errors will be avoided.

IV solutions prepared in flexible plastic containers have generated Safety Alerts by the FDA. As a reminder: Do not hang IV infusions in flexible plastic containers **in series connection, do not pressurize** IV infusions in flexible plastic containers **to increase flow rates without first fully evacuating residual air from the container, and do not use vented IV administration sets** with IV infusions in flexible plastic containers. **All may result in air embolism.**

Elsevier offers electronic versions of *Intravenous Medications* for handheld devices, tablets, laptops, and desktop computers. These electronic versions are convenient and portable alternatives or supplements to the printed book. In addition, all drugs currently on the Evolve IV Meds website (http://evolve.elsevier.com/IVMeds) for *Intravenous Medications* (because of space limitations for the print version) are **now all** incorporated in these electronic versions in alphabetical order, so you have a complete package. Although the electronic versions are accessible wherever you have an electronic device, keep in mind that on some devices the entire monograph may not be visible at the same time. It is the user's responsibility to be familiar with the complete monograph and ***all*** aspects of each drug before administration.

Health care today is an intense environment. The speed of change is overwhelming, but the authors and publisher of *Intravenous Medications* have a commitment to provide all health care professionals who have the responsibility to administer IV medications with annual editions that incorporate complete, accurate, and current information in a clear, concise, accessible, and reliable tool. FDA websites are monitored throughout the year and provide many important updates, such as dose changes, new pediatric doses, additional disease-specific doses, refinements in dosing applications, new indications, new drug interactions, additional precautions, updates on post-marketing side effects, and new information on antidotes. Most drugs currently approved for intravenous use are included in the print version or are on the Evolve website: http://evolve.elsevier.com/IVMeds/. (See p. xii for a listing.) Helpful charts for dilution and/or rate of administration are incorporated in selected monographs. A General Dilution Chart to simplify calculations is found on the inside front cover. Front matter material provides a Key to Abbreviations and Important IV Therapy Facts.

Intravenous Medications is designed for use in critical care areas, at the nursing station, in the office, in public health and home care settings, and by students and the armed services. Pertinent information can be found in a few seconds. Take advantage of its availability and quickly review

every intravenous medication before administration.

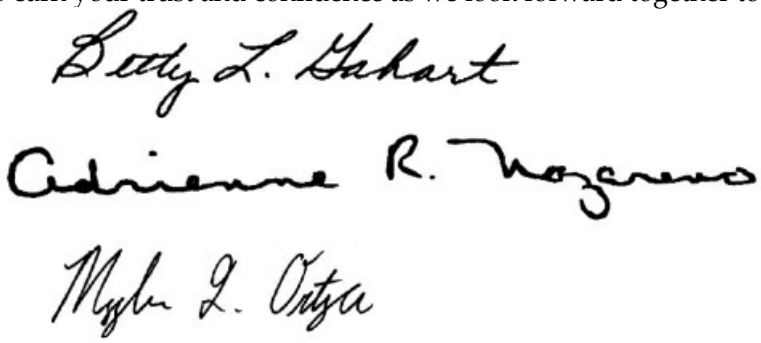
The nurse is frequently placed in a variety of difficult situations. While the physician verbally requests or writes an order, the nurse must evaluate it for appropriateness and may need to prepare it, administer it, and observe the effects. Intravenous drugs are instantly absorbed into the bloodstream, leading, it is hoped, to a prompt therapeutic action, but the risk of an inappropriate reaction is a constant threat that can easily become a frightening reality. It will be the nurse who must initiate emergency measures should adverse effects occur. This is an awesome responsibility.

If, after reviewing the information in *Intravenous Medications,* you have any questions about any order you are given, clarify it with the physician, consult the pharmacist, or consult your supervisor. The circumstances will determine whom you will approach first. If the physician thinks it is imperative to carry out an order even though you have unanswered questions, never hesitate to request that the physician administer the drug, drug combination, or dose himself or herself. In this era of constant change, the physician should be very willing to supply you, your supervisor, and/or the pharmacist with current studies documenting the validity and appropriateness of orders.

All information presented in this handbook is pertinent only to the intravenous use of the drug and not necessarily to intramuscular, subcutaneous, oral, or other means of administration.

Our sincere appreciation is extended to Gregory Nazareno, Kim Huber, and Merrilee Newton for their ongoing participation in our efforts to bring you current, accurate, and relevant information; and to Sonya Seigafuse, Charlene Ketchum, Jeff Patterson, Jodi M. Willard, and Maggie Reid at Elsevier and Joe Rekart at Graphic World, who are the editors, production staff, and design staff that make the publishing of *Intravenous Medications* happen each year.

We also wish to thank you, the users of this reference. By seeking out this information, you serve your patients' needs and contribute to the safe administration of IV meds. We will continue to strive to earn your trust and confidence as we look forward together to an exciting future for health care.



Format and content of intravenous medications

Designed to facilitate quick reference, each entry begins with the generic name of the drug in boldface type. **Drugs with a Black Box Warning are identified with a symbol BBW in the main heading.** Phonetic pronunciations appear just below the generic name. Drug categories follow. The primary category may be followed by additional ones representing the multiple uses of a drug. Associated trade names are under the generic name. Boldface type and alphabetical order enable the reader to verify correct drug names easily. The use of a Canadian maple leaf symbol ( ) after a trade name indicates availability in Canada only. The pH is listed in the lower right-hand corner of the title section. While this information is not consistently available, it is provided whenever possible. It represents the pH of the undiluted drug, the drug after reconstitution, or the drug after dilution for administration.

Headings within drug monographs are as follows:

Usual Dose:

Doses recommended are the usual range for adults unless specifically stated otherwise. This information is presented first to enable the nurse to verify that the physician order is within acceptable parameters while checking the order and before preparation. If there are any questions, much time can be saved in clarifying them. If premedication is indicated, it will be noted here.

Pediatric Dose:

Pediatric doses are specifically stated if they vary from mg/kg of body weight or M^2 dose recommended for adults. Not all drugs are recommended for use in children. See Maternal/Child for information on safety and effectiveness for use in pediatric patients. To prevent unintentional overdose, a premixed solution such as DUPLEX or Galaxy containers available in a specific dose (e.g., 1 Gm, 2 Gm) should be used in pediatric patients only when the individual dose is the entire contents of the container and not any fraction thereof.

Infant and/or Neonatal Dose:

Included if available and distinct from Pediatric Dose. See Maternal/Child for information on safety and effectiveness for use in pediatric patients, including infants and neonates.

Dose Adjustments:

Any situation that requires increasing or decreasing a dose is mentioned here. The range covers adjustments needed for elderly, debilitated, or hepatic or renal impairment patients; adjustments required by race or gender; or adjustments required in the presence of other medications or as physical conditions are monitored.

Dilution:

Specific directions for dilution are given for all drugs if dilution is necessary or permissible. Drugs, diluents, and solutions must be appropriate for IV use. Certain medications may be available in more than one form (e.g., Advantage, Duplex); follow manufacturer's directions for reconstitution and stability. The manufacturing and approval of generics seems to be accelerating. They are usually similar to the trade version but may differ slightly, so be sure to double-check the dose and dilution requirements. Appropriate diluents are listed. The Solution Compatibility Chart on the inside back cover has been expanded and updated. Diluents that are not identified in Dilution will be listed in this chart. This is the only reference that provides calculation examples to simplify dilution and accurate dose measurement. Charts are available in selected monographs. If recommendations for pediatric dilutions are available, they are listed. In some situations mcg or

mg/mL dilutions partially account for this variation. To prevent unintentional overdose, a premixed solution such as DUPLEX or Galaxy containers available in a specific dose (e.g., 1 Gm, 2 Gm) should be used in pediatric patients only when the individual dose is the entire contents of the container and not any fraction thereof. If there are any doubts, consult with the pharmacist and/or pediatric specialist. Generic dilution charts for grams to milligrams and milligrams to micrograms are featured on the inside front cover and facing page.

Filters:

A subheading. Content here includes information included in prescribing information and information we have requested from manufacturers. Many drugs are filtered during the manufacturing process. There are numerous variations in recommendations for filtration after the manufacturing process. Filters are single-use one-way streets and are most effective when used at the last stage of mixing or dilution or in-line as administered to the patient. Most manufacturers expect that a drug distributed in an ampule will be filtered to eliminate the possibility of glass being drawn into a syringe on withdrawal of the drug. This is always a two-needle process. One process uses a standard needle to withdraw from the ampule; that needle is then replaced with a needle filter to inject the drug into the diluent. If it will not be added to a diluent, use the needle filter to withdraw from the ampule and replace it with a new standard needle to administer. When questioned, many manufacturers suggest following a specific hospital's standard, which may recommend that a drug distributed as a powder be filtered either with a needle filter on withdrawal from the vial, after reconstitution as added to the diluent, or with an in-line filter on delivery to the patient. Some acknowledge that in selected situations (e.g., open heart surgery) everything is filtered at some point before delivery to the patient. Although these responses are helpful, none of them clarify specific information about a drug. For questions, the manufacturer's pharmacist is available.

Storage:

A subheading. Content here includes such items as stability, refrigeration versus room temperature, predilution versus postdilution. Newly approved generics may have slight differences; check the manufacturer's recommendations.

COMPATIBILITIES

The focus of this section is **compatibility. Any drug not listed as compatible should be considered incompatible.** ***Incompatibilities are listed only when specifically identified by the manufacturer. No third-party incompatibilities are listed.***

Some monographs include only general information because that is all that is available. It may include the manufacturer's recommendation to administer separately from other drugs or the potential for reaction with some plastic infusion bags or tubing.

Other monographs include manufacturers' statements regarding the potential inactivation or inhibition of one drug on another.

Compatibilities listed by the manufacturer are listed first, followed by **compatibilities** listed by another source, which may be divided into **additive and Y-site.** ***Any drug not listed as compatible should be considered incompatible.*** Drugs are alphabetized by generic name for ease in locating the drugs with which you are working. To make identification easier, common trade names accompany generic names, or examples are presented for drug categories. No other reference consistently provides this helpful information.

Because compatibilities may be influenced by many factors (e.g., temperature, pH, concentration, time together in solution, a specific order of mixing), **it is imperative that you verify compatibilities with your pharmacist.** Knowledge is growing daily in this field, and your pharmacist should have current information on the pharmacy computer or access to extensive references. Many compatibility studies have been done by other parties for both additive and Y-site compatibilities. Almost all are based on specific concentrations, which may or may not relate to usual doses or recommended concentrations.

Occasionally sources disagree on compatibility. If there is conflicting information about a compatibility, you will be told that this is not recommended by the manufacturer, or ***the individual drugs that may have a conflict will be underlined.***

What steps should you consider before administering any drug?

• If the drug you wish to administer is not listed in the **Compatibility** section, ***consider it to be incompatible.*** To administer, you must turn off the infusing IV (at the stopcock or with a clamp close to the Y-site), flush the line with a solution compatible to both drugs (and/or solutions), administer the required drug, and flush the line again before turning the previously infusing IV back on. If you are unable to discontinue the infusion IV, you must have another IV access (e.g., a multi-lumen catheter, a second IV line, or a heparin lock). Some drugs actually require separate tubing.

• If compatibilities are included in the package insert from the manufacturer, it will be so stated. If the manufacturer lists drugs as compatible by additive or Y-site and doesn't list concentrations, this is a good assurance of compatibility. If concentrations are listed, review the concentrations of both drugs to make sure they are within the defined parameters.

• If the drug you wish to administer is listed in the **Compatibility** section of the access you wish to use (e.g., **additive or Y-site),** ***you must consult with the pharmacist to confirm any specific conditions that may apply.*** After your consultation, write the results of your consultation regarding the specific directions for coadministering drugs on the patient's medication record or nursing care plan so others will not need to retrace your research steps when the medication is to be given again.

• When combining drugs in a solution (additives), always consider the required rate adjustments of each drug. Can each drug produce the desired effect at the suggested rate, or is continuous adjustment necessary for one drug, making the combination impractical?

• Y-site means that the specific drug in a specific monograph is compatible at its Y-site with an injection or an infusion containing one of the drugs listed under Y-site. The reverse Y-site compatibility may not be true.

• Although some drugs may be listed as compatible at the Y-site, some drugs can be administered at the Y-site only if they are further diluted in compatible solutions and given as an infusion (e.g., potassium concentrates [e.g., acetates, chlorides, phosphates], saline solution in concentrations greater than 0.9% or NS, amino acids, and dextrose solutions greater than 10% [unless in small amounts such as 50 mL dextrose 50% in insulin-induced hypoglycemia]).

• Because today's hospital units are very specialized (e.g., cancer care, emergency room, intensive coronary care, various intensive care units, transplant units, and orthopedic units to name just a

few), nursing staff in each of these areas most likely administer similar combinations of drugs to their patients. ***Take the initiative and research the drug combinations that are most frequently used on your unit. Then consult with the pharmacist and make your own compatibility chart for additives and Y-site (if applicable).*** By creating a chart specific to your unit, you will limit the number of consults required with the pharmacist to combinations that fall outside the parameters you have researched. This approach will save time for every nurse on your unit and will give each of you the necessary compatibility information to administer the IV drug combinations specific to your unit.

- The Solution Compatibility Chart on the inside back cover has been expanded and updated. Diluents that are not identified in Dilution will be listed in this chart.

Rate of Administration:

Accepted rates of administration are clearly stated. As a general rule, a slow rate is preferred. 25-gauge needles aid in giving a small amount of medication over time. Problems with rapid or slow injection rates are indicated here. Adjusted rates for infants, children, or the elderly are listed when available. Charts are available in selected monographs.

Actions:

Clear, concise statements outline the origin of each drug, how it affects body systems, its length of action, and methods of excretion. If a drug crosses the placental barrier or is secreted in breast milk, it will be mentioned here if that information is available.

Indications and Uses:

Uses recommended by the manufacturer are listed. **Limitations of Use** are now being identified by the manufacturer or FDA for some drugs. Unlabeled uses are stated as such.

Contraindications:

Contraindications are those specifically listed by the manufacturer. Consult with the physician if an ordered drug is contraindicated for the patient. The physician may have additional historical information that alters the situation or may decide that use of the drug is indicated in a critical situation.

Precautions:

The section on precautions covers many areas of information needed before injecting any drug, including Black Box warnings from the prescribing information. Most Black Box Warnings appear in this Precautions section; however, **all actual Black Box Warning statements are shaded** in light gray **and a different typeface is used** for instant identification wherever they appear in the text. The range of information in this category covers all facets not covered under specific headings. Each listing is as important as the next. To make it easier for spot checks (after reading the entire monograph), additional subdivisions are included.

Monitor:

A subheading that includes information such as required prerequisites for drug administration, parameters for evaluation, and patient assessments.

Patient Education:

A subheading that addresses only specific, important issues required for short-term IV use. It is expected that the health professional will always review the major points in the drug profile with any conscious patient, side effects to expect, how to cope with them, when to report them, special requirements such as the intake of extra fluids, and an overall review of what the drug does, why it is needed, and how long the patient can anticipate receiving it. Patient Medication Guides approved by the FDA are available for most drugs, and it is recommended that the patient review the

Medication Guide whenever possible before beginning treatment and repeat the review as indicated.

Maternal/Child:

A subheading that addresses FDA pregnancy categories (see Appendix B for a complete explanation), any known specifics affecting patients capable of conception, safety for use during lactation, safety for use in pediatric patients, and any special impact on infants and neonates.

Elderly:

A subheading that is included whenever specific information impacting this patient group is available. Always consider age-related organ impairment (e.g., cardiac, hepatic, renal, insufficient bone marrow reserve), history of previous or concomitant disease or drug therapy, and route of excretion when determining dose and evaluating side effects.

Drug/Lab Interactions:

Drug/drug or drug/lab interactions are listed here. To help identify these interactions more easily, **single drugs, drug categories when there are multiple drugs, and specific tests are in boldface type.** If a conflict with the patient's drug profile is noted, consult a pharmacist immediately. Increasing or decreasing the effectiveness of a drug can be a potentially life-threatening situation. Check with the lab first on drug/lab interactions; acceptable alternatives are usually available. After this consultation, notify the physician if appropriate. To facilitate recognition, common trade names accompany generic names or examples are presented for drug categories. No other reference consistently provides this helpful information.

Side Effects:

In some monographs, the most common side effects may be listed first, followed by the most serious side effects. In all monographs, alphabetical order simplifies confirmation that a patient's symptom could be associated with specific drug use. Specific symptoms of overdose are listed where available or distinct from usual doses.

Post-Marketing:

Post-marketing side effects reported that have not been previously recorded in the prescribing information are listed.

Antidote:

Specific antidotes are listed in this section if available. In addition, specific nursing actions to reverse undesirable side effects are clearly stated—an instant refresher course for critical situations.

Within a heading there may be references to other sections within an individual monograph (e.g., see Precautions, see Monitor, see Dose Adjustments, see Maternal/Child). These references indicate additional requirements and should be consulted before administering the drug.

Key to abbreviations

<	less than
>	more than
$^1/_4$NS	one-fourth normal saline (0.2%)
$^1/_3$NS	one-third normal saline (0.33%)
$^1/_2$NS	one-half normal saline (0.45%)
ABGs	arterial blood gases
ACE	angiotensin converting enzyme
ACT	activated coagulation time
AF	atrial fibrillation
A/G	albumin-to-globulin ratio
AIDS	acquired immunodeficiency syndrome
ALT	(SGPT) alanine aminotransferase
AMI	acute myocardial infarction
ANC	absolute neutrophil count
aPTT	activated partial thromboplastin time
ARDS	adult respiratory distress syndrome/acute respiratory distress syndrome
AST	(SGOT) aspartate aminotransferase
AUC	area under the curve
AV	atrioventricular
BMD	bone mass density
BP	blood pressure
BSA	body surface area
BUN	blood urea nitrogen
BWFI	bacteriostatic water for injection
C	Celsius
Ca	calcium
CABG	coronary artery bypass graft
CAD	coronary artery disease
CAPD	continuous ambulatory peritoneal dialysis
CBC	complete blood cell count
CDAD	*Clostridium difficile*–associated diarrhea
CHF	congestive heart failure
Cl	chloride
CMV	cytomegalovirus
CNS	central nervous system
CO_2	carbon dioxide
COPD	chronic obstructive pulmonary disease
CPK	creatine-kinase
CrCl	creatinine clearance
CRF	chronic renal failure
CRT	controlled room temperature (20° to 25° C [68° to 77° F])
CSF	cerebrospinal fluid
C/S	culture and sensitivity
CTCAE	Common Terminology Criteria for Adverse Events
CVA	cerebrovascular accident
CVP	central venous pressure
D10NS	10% dextrose in normal saline
D10W	10% dextrose in water
D5/$^1/_4$NS	5% dextrose in one-quarter normal saline (0.2%)
D5/$^1/_3$NS	5% dextrose in one-third normal saline (0.33%)
D5/$^1/_2$NS	5% dextrose in one-half normal saline (0.45%)
D5LR	5% dextrose in lactated Ringer's solution
D5NS	5% dextrose in normal saline
D5R	5% dextrose in Ringer's solution
D5W	5% dextrose in water
DC	discontinued
DEHP	diethylhexylphthalate
DIC	disseminated intravascular coagulation
dL	deciliter(s) (100 mL)
DNA	deoxyribonucleic acid
ECG	electrocardiogram
EEG	electroencephalogram
ESRD	end-stage renal disease
F	Fahrenheit
GI	gastrointestinal

GFR	glomerular filtration rate
GGT	gamma-glutamyl transferase
Gm	gram(s)
gr	grain(s)
gtt	drop(s)
GU	genitourinary
Hb	hemoglobin
Hct	hematocrit
HCV	hepatitis C virus
Hg	mercury
HIV	human immunodeficiency virus
hr	hour
HR	heart rate
HSCT	hematopoietic stem cell transplant
IBW	ideal body weight
ICU	intensive care unit
IgA	immune globulin A
IGIV	immune globulin intravenous
ÍL	microliters, µL, mm^3
IM	intramuscular
INR	International Normalized Ratio
IP	intrapleural
IU	international unit(s)
IV	intravenous
IVIG	intravenous immune globulin
K	potassium
KCl	potassium chloride
kg	kilogram(s)
L	liter(s)
lb	pound(s)
LDH	lactic dehydrogenase
LFT	liver function test
LR	lactated Ringer's injection or solution
M	molar
M^2	meter squared
MAO	monoamine oxidase
MAP	mean arterial pressure
mcg	microgram(s)
mCi	millicurie(s)
mEq	milliequivalent
Mg	magnesium
mg	milligram(s)
MI	myocardial infarction
min	minute
mL	milliliter
mmol	millimole(s)
mm^3	cubic millimeters, µL, ÍL
MDRSP	multidrug-resistant *Streptococcus pneumoniae*
MRI	magnetic resonance imaging
Na	sodium
NaCl	sodium chloride
NCI	National Cancer Institute; see CTCAE
ng	nanogram (millimicrogram)
NS	normal saline (0.9%)
NSAID	nonsteroidal anti-inflammatory drug
NSCLC	non–small-cell lung cancer
NSR	normal sinus rhythm
N/V	nausea and vomiting
OTC	over-the-counter
PAC	premature atrial contraction
PaO_2	arterial oxygen pressure
PCA	patient-controlled analgesia
PCP	*Pneumocystis jiroveci* pneumonia
pg	picogram
pH	hydrogen ion concentration
PML	progressive multifocal leukoencephalopathy
PO	by mouth/orally
PRCA	pure red cell aplasia
PRES	posterior reversible encephalopathy syndrome
PSVT	paroxysmal supraventricular tachycardia
PT	prothrombin time
PTT	partial thromboplastin time
PVC	polyvinyl chloride; premature ventricular contraction
R	Ringer's injection or solution
RBC	red blood cell
refrigerate	temperature at 2° to 8° C (36° to 46° F)
RNA	ribonucleic acid

RT	room temperature
RTS	room-temperature stable
SA	sinoatrial
SC	subcutaneous
SIADH	syndrome of inappropriate antidiuretic hormone
SOB	shortness of breath
SCr	serum creatinine
S/S	signs and symptoms
SW or SWI	sterile water for injection
TEN	toxic epidermal necrolysis
TIA	transient ischemic attacks
TLS	tumor lysis syndrome
TNA	3-in-1 combination of amino acids, glucose, and fat emulsion
TPN	2-in-1 combination of amino acids and glucose; total parenteral nutrition
TRALI	transfusion-related acute lung injury
TT	thrombin time
µL	microliters, mm3, ÍL
ULN	upper limits of normal
URI	upper respiratory infection
UTI	urinary tract infection
VF	ventricular fibrillation
VS	vital signs
VT	ventricular tachycardia
v/v	volume-to-volume ratio
WBC	white blood cell
WBCT	whole blood clotting time
w/v	weight-to-volume ratio
w/w	weight-to-weight ratio

Important IV therapy facts

- Read the Preface and Format and Contents sections at least once. They'll answer many of your questions and save time.

USUAL DOSE

- Doses calculated on body weight are usually based on pretreatment weight and not on edematous weight.
- Normal renal or hepatic function is usually required for drugs metabolized by these routes.
- Formula to calculate creatinine clearance (CrCl) from serum creatinine value (Cockcroft-Gault equation):

Males:

$$\frac{\text{Weight in kg} \times (140 - \text{Age in years})}{72 \times \text{Serum creatinine (mg/dL)}} = \text{CrCl}$$

Females: 0.85 × Male CrCl value calculated from above formula.

- Children:

$$K \times \frac{\text{Linear length or height (cm)}}{\text{SCr (mg/100 mL)}}$$

K for children >1 year of age = 0.55
K for infants = 0.45

- Lean Body Weight (LBW)

Males = 50 kg + 2.3 kg for each inch over 5 feet.
Females = 45.5 kg + 2.3 kg for each inch over 5 feet.
Children weighing 15 kg or less—Use actual body weight in kg.

- Formula to calculate body surface area (BSA):

$$\text{BSA } (M^2) = \sqrt{\frac{\text{Height (cm)} \times \text{Weight (kg)}}{3600}}$$

- To prevent unintentional overdose, a premixed solution such as DUPLEX or Galaxy containers available in a specific dose (e.g., 1 Gm, 2 Gm) should be used in pediatric patients only when the individual dose is the entire contents of the container and not any fraction thereof.

DILUTION

- Check all labels (drugs, diluents, and solutions) to confirm appropriateness for IV use.
- Sterile technique is imperative in all phases of preparation.
- Use a filter needle when withdrawing IV meds from ampules to eliminate possible pieces of glass.
- Pearls:
  1 Gm in 1 Liter yields 1 mg/mL
  1 mg in 1 Liter yields 1 mcg/mL
  % of a solution equals the number of grams/100 mL (5% = 5 Gm/100 mL)
- Pediatric dilution:
  If you dilute 6.0 mg/kg in 100 mL, 1 mL/hr equals 1.0 mcg/kg/min
  If you dilute 0.6 mg/kg in 100 mL, 1 mL/hr equals 0.1 mcg/kg/min
- To prevent unintentional overdose, a premixed solution such as DUPLEX or Galaxy containers available in a specific dose (e.g., 1 Gm, 2 Gm) should be used in pediatric patients only when the individual dose is the entire contents of the container and not any fraction thereof.
- See charts on inside front cover.
- Do not use bacteriostatic diluents containing benzyl alcohol for neonates. May cause a fatal toxic syndrome. S/S include CNS depression, hypotension, intracranial hemorrhage, metabolic acidosis, renal failure, respiratory problems, seizures.
- Ensure adequate mixing of all drugs added to a solution.
- When combining drugs in a solution (additives), always consider the required rate adjustment of each drug.
- Examine solutions for clarity and any possible leakage.
- Frozen infusion solutions should be thawed at room temperature (25° C [77° F]) or under refrigeration. Do not force by immersion in water baths or in the microwave. All ice crystals must be melted before administration. Do not refreeze.
- Syringe prepackaging for use in specific pumps is now available for many drugs. Concentrations are often the strongest permissible, but length of delivery is accurate.
- Controlled room temperature (CRT) is considered to be 25° C (77° F). Most medications tolerate variations in temperature from 15° to 30° C (59° to 86° F).

INCOMPATIBILITIES

- Some manufacturers routinely suggest discontinuing the primary IV for intermittent infusion; usually done to avoid any possibility of incompatibility. Flushing the line before and after administration may be indicated and/or appropriate for some drugs.
- The brand of intravenous fluids or additives, concentrations, containers, rate and order of mixing, pH, and temperature all affect solubility and compatibility. Consult your pharmacist with any question, and document appropriate instructions on care plan.

TECHNIQUES

• **Do not hang** IV infusions in flexible plastic containers **in series connection, do not pressurize** IV infusions in flexible plastic containers **to increase flow rates without first fully evacuating residual air from the container, and do not use vented IV administration sets** with IV infusions in flexible plastic containers. **All may result in air embolism.**

• Confirm patency of peripheral and/or central sites. Avoid extravasation.

• Avoid accidental arterial injection; can cause gangrene.

RATE OF ADMINISTRATION

- Life-threatening reactions (time-related overdose or allergy) are frequently precipitated by a too-rapid rate of injection.
- If a common IV line is used to administer other drugs through the same IV line, flush the IV line before and after each infusion with a compatible solution (e.g., NS, D5W). When flushing before administration, be sure to flush with an amount adequate to clear the previous drug (e.g., mL of drug or mL of lumen of catheter). When flushing after administration, be sure to flush with an amount at least equal to that of the drug administered (e.g., mL of drug or mL of lumen of catheter).

PATIENT EDUCATION

- A well-informed patient is a great asset; review all appropriate drug information with every conscious patient.

SIDE EFFECTS

- Reactions may be caused by a side effect of the drug itself, allergic response, overdose, or the underlying disease process.

Resources

PUBLICATIONS

The following publications have been used as a resource to assemble the information found in *Intravenous Medications.* Additional and more detailed information on drugs may be found in these publications:

American Heart Association: *Handbook of Emergency Cardiovascular Care for Health Care Providers, 2015.*

American Hospital Formulary Service Drug Information 2018, Bethesda, MD, American Society of Health-System Pharmacists (updated via website).

ASHP Publications: *Handbook on Injectable Drugs,* ed 19, 2017, American Society of Health-System Pharmacists, Inc.

Lexi-Comp's Drug Information Handbook, ed 22, 2013-2014, Hudson, OH, American Pharmacists Association.

Elsevier Guide to Oncology Drugs and Regimens, Huntington, NY, 2006, Elsevier.

The Johns Hopkins Hospital: *The Harriet Lane Handbook,* ed 20, St Louis, 2014, Mosby.

Manufacturers' literature.

WEBSITE RESOURCES

http://www.accessdata.fda.gov/scripts/cder/drugsatfda—Drug Approvals and Updates

http://www.fda.gov/safety/medwatch/default.htm—Safety Information

http://evolve.elsevier.com/IVMeds

http://www.cancer.gov—Common Terminology Criteria for Adverse Events (CTCAE)

http://www.blackboxrx.com—A listing of all drugs with a black box warning

Generic drugs: A

ABATACEPT
ABCIXIMAB
ACETAMINOPHEN
ACETAZOLAMIDE SODIUM
ACETYLCYSTEINE INJECTION
ACYCLOVIR
ADENOSINE
ADO-TRASTUZUMAB EMTANSINE
AGALSIDASE BETA
ALBUMIN (HUMAN)
ALDESLEUKIN
ALEMTUZUMAB
ALFENTANIL HYDROCHLORIDE
AGLUCERASE
AGLUCOSIDASE ALFA *(LUMOSINE)*
AGLUCOSIDASE ALFA *(MYOSINE)*
ALLOPURINOL SODIUM
ALPHA$_1$-PROTEINASE INHIBITOR (HUMAN)
ALPROSTADIL
ALTEPLASE
AMIFOSTINE
AMIKACIN SULFATE
AMINOCAPROIC ACID
AMINOPHYLLINE
AMIODARONE HYDROCHLORIDE
AMMONIUM CHLORIDE
AMOBARBITAL SODIUM
AMPHOTERICIN B ■ AMPHOTERICIN B LIPID-BASED PRODUCTS
AMPICILLIN SODIUM
AMPICILLIN SODIUM AND SULBACTAM SODIUM
ANGIOTENSIN II INJECTION
ANIDULAFUNGIN
ANTHRAX IMMUNE GLOBULIN INTRAVENOUS (HUMAN)
ANTIHEMOPHILIC FACTOR (HUMAN ■ RECOMBINANT ■ RECOMBINANT [Fc FUSION PROTEIN] ■ RECOMBINANT [PEGYLATED] ■ RECOMBINANT [SINGLE CHAIN] ■ RECOMBINANT [PORCINE SEQUENCE])
ANTIHEMOPHILIC FACTOR ■ VON WILLEBRAND FACTOR COMPLEX (HUMAN)
ANTI-INHIBITOR COAGULANT COMPLEX
ANTITHROMBIN III (HUMAN)
ANTITHROMBIN RECOMBINANT
ANTI-THYMOCYTE GLOBULIN (RABBIT)
ANTIVENIN *(LATRODECTUS MACTANS)*
ANTIVENIN *(MICRURUS FULVIUS)*
ANTIVENIN CROTALIDAE POLYVALENT IMMUNE FAB (OVINE)
APREPITANT
ARGATROBAN
ARGININE HYDROCHLORIDE
ARSENIC TRIOXIDE
ASCORBIC ACID

ATEZOLIZUMAB
ATRACURIUM BESYLATE
ATROPINE SULFATE
AVELUMAB
AXICABTAGENE CILOLEUCEL SUSPENSION
AZACITIDINE
AZATHIOPRINE SODIUM
AZITHROMYCIN
AZTREONAM

ABATACEPT

(a-**BAY**-ta-sept)
Orencia
Antirheumatic
Disease-modifying agent
Selective T-cell costimulation blocker
pH 7.2 to 7.8

USUAL DOSE

Dose is based on body weight in kilograms as shown in the following chart. After the initial dose, repeat administration at 2 and 4 weeks. Administer every 4 weeks thereafter. May be used as monotherapy or concomitantly with disease-modifying anti-rheumatic drugs (DMARDs) other than TNF antagonists; see Contraindications and Drug Interactions. May be given by SC injection or as an IV infusion; formulation and dose are different; see Indications and prescribing information.

Abatacept Adult Dosing Guidelines		
Body Weight (kg)	**Dose (mg)**	**Number of Vials**
<60 kg	500 mg	2 vials
60 to 100 kg	750 mg	3 vials
>100 kg	1,000 mg	4 vials

Patients transitioning from IV therapy to subcutaneous administration should administer the first subcutaneous dose instead of the next scheduled IV dose. Abatacept is dosed weekly in the subcutaneous regimen. When administered for treatment of rheumatoid arthritis, it may be initiated with or without an IV loading dose. If the subcutaneous regimen is initiated with an IV loading dose, determine loading dose as outlined in the previous chart. The first subcutaneous injection should be administered within a day of the IV loading dose. A loading dose **is not** used when administered for treatment of psoriatic arthritis.

PEDIATRIC DOSE

May be given by SC injection or as an IV infusion in pediatric patients. Formulation and dose are different; see Indications and prescribing information. When administered subcutaneously, **do not** administer an IV loading dose. May be used as monotherapy or concomitantly with methotrexate.

Pediatric patients 6 to 17 years of age who weigh less than 75 kg:

10 mg/kg/dose based on patient's body weight at each administration. After the initial dose, repeat administration at 2 and 4 weeks. Administer every 4 weeks thereafter.

Pediatric patients 6 to 17 years of age who weigh more than 75 kg:

See Usual Dose and the Abatacept Adult Dosing Guidelines chart. Do not exceed a maximum dose of 1,000 mg.

DOSE ADJUSTMENTS

There is a trend toward a higher clearance with increasing body weight; see Usual Dose. No specific dose adjustments are required based on age or gender when corrected for body weight. ■ Withhold therapy in patients with severe infections. ■ The effects of renal or hepatic impairment have not been studied.

DILUTION

Using ***ONLY the silicone-free disposable syringe provided*** with each vial and an 18- to 21-gauge needle, reconstitute each 250-mg vial with 10 mL SWFI; final concentration is 25 mg/mL. (If reconstituted with a siliconized syringe, the solution must be discarded.) Direct stream of SWFI toward side of vial. Do not use vial if vacuum is not present. Rotate or swirl vial gently until contents have dissolved. Do not shake. After dissolution, vent vial with a needle to dissipate any foam that may be present. Solution should be clear and colorless to pale yellow. Reconstituted solution must be further diluted to 100 mL as follows: From a 100-mL infusion bag or bottle, withdraw a volume of NS equal to the volume of reconstituted abatacept solution required for the patient's dose (for 2 vials, remove 20 mL; for 3 vials, remove 30 mL; for 4 vials, remove 40 mL). Using the ***same silicone-free disposable syringe provided,*** slowly add the reconstituted abatacept into the infusion bag or bottle. Mix gently.

Orencia prefilled syringes and Orencia ClickJet autoinjectors are intended for subcutaneous use only and are not intended for IV infusion.

Filter:

Administration through a 0.2- to 1.2-micron, nonpyrogenic, low–protein binding filter is required.

Storage:

Refrigerate unopened vials at 2° to 8° C (36° to 46° F). Do not use beyond expiration date. Protect from light by storing in original packaging. Before administration, the diluted solution may be stored at RT or refrigerated; however, infusion of the diluted solution should be completed within 24 hours of reconstitution. Discard diluted solution if not administered within 24 hours. Any unused portion in a vial must be discarded.

COMPATIBILITY

Manufacturer states, "Should not be infused concomitantly in the same intravenous line with other agents." **Compatibility** studies have not been performed.

RATE OF ADMINISTRATION

Administration through a 0.2- to 1.2-micron, nonpyrogenic, low–protein binding filter is required.

A single dose equally distributed over 30 minutes.

ACTIONS

A selective T-cell costimulation modulator. A soluble fusion protein that consists of the extracellular domain of human cytotoxic, T-lymphocyte–associated antigen 4 linked to the modified Fc portion of human immunoglobulin G1 (IgG1). Produced by recombinant DNA technology. Acts as a selective biologic response modulator by inhibiting T-lymphocyte activation. Activated T-lymphocytes are implicated in the pathogenesis of rheumatoid arthritis and psoriatic arthritis. Abatacept reduces pain and joint inflammation and slows the progression of structural damage to bone and cartilage. Mean half-life is 13.1 days (range 8 to 25 days).

INDICATIONS AND USES

Reduce the S/S, induce a major clinical response, inhibit the progression of structural damage, and improve the physical function in adult patients with moderately to severely active rheumatoid arthritis. May be used as monotherapy or concomitantly with DMARDs other than TNF antagonists. SC injection may be used in adult patients unable to receive an infusion, and/or adult infusion patients may transition to SC injection; see prescribing information. ■ Reduce the S/S in pediatric patients 2 years of age and older with moderately to severely active polyarticular juvenile idiopathic arthritis. May be used as monotherapy or concomitantly with methotrexate. SC injection may be used in pediatric patients 2 years of age and older. IV dosing has not been studied in patients younger than 6 years of age; see prescribing information. ■ Treatment of adult patients with active psoriatic arthritis. May be used with or without nonbiologic DMARDs.

Limitation of use:

Should not be administered concomitantly with TNF antagonists (e.g., adalimumab [Humira], etanercept [Enbrel]) or other biologic rheumatoid arthritis therapy, such as anakinra (Kineret).

CONTRAINDICATIONS

Manufacturer states, "None." Consider known hypersensitivity to abatacept or any of its components (maltose, monobasic sodium phosphate). See Limitation of Use and Drug/Lab Interactions.

PRECAUTIONS

Concurrent use with a TNF antagonist (e.g., adalimumab [Humira], etanercept [Enbrel]) is associated with an increased risk of infections with no associated increased efficacy when compared with use of the TNF antagonist alone. Concurrent use is not recommended; see Limitation of Use, Contraindications, and Drug/Lab Interactions. ■ Hypersensitivity reactions, including anaphylaxis, have been reported and can occur after the first infusion. Emergency medical equipment and medications for treating these reactions must be readily available. ■ Serious infections, including sepsis and pneumonia, have been reported; some have been fatal. Patients receiving concomitant immunosuppressive therapy may be at increased risk. ■ Use caution in patients with a history of recurrent infections, underlying conditions that may predispose them to infections, or chronic, latent, or localized infections; see Monitor. ■ Antirheumatic therapies have been associated with hepatitis B reactivation. Screening for viral hepatitis should be done before starting therapy with abatacept. Patients who screened positive for hepatitis were excluded from clinical studies. ■ Use with caution in patients with COPD. May be at increased risk for developing respiratory adverse events (e.g., COPD exacerbation, cough, dyspnea, rhonchi). ■ As with all therapeutic proteins, there is a potential for immunogenicity. A small number of patients have developed binding antibodies to abatacept. No correlation of antibody development to clinical response or adverse events has been observed. ■ T-cells mediate cellular immune responses. Drugs that inhibit T-cell activation, including abatacept, may affect patient defenses against infection and malignancies. The impact of abatacept on the development and course of malignancies is not fully understood. ■ See Maternal/Child.

Monitor:

Evaluate patients for latent tuberculosis (TB) with a TB skin test. Patients testing positive in TB screening should be treated with a standard TB regimen before initiating therapy with abatacept. ■ Screening for viral hepatitis should be performed before initiating therapy with abatacept. ■ Monitor for S/S of infection, especially if transitioning patient from TNF antagonist therapy to therapy with abatacept. Discontinue therapy if a serious infection develops. ■ Monitor COPD patients for worsening of respiratory status. ■ Monitor for S/S of hypersensitivity or infusion-related reactions; see Side Effects. ■ See Precautions and Drug/Lab Interactions.

Patient Education:

Read manufacturer's patient information sheet before each infusion. ■ Review disease states, medication list, and vaccination status with physician; see Precautions. ■ Report S/S of allergic reaction (e.g., rash, itching, wheezing), infusion reaction (e.g., dizziness, headache), or infection promptly. Discuss previous infections, current infections, or exposure to TB.

Maternal/Child:

Safety for use in pregnancy has not been established. Has been shown to cross the placenta in animal studies. Use caution. ■ There is no information regarding the presence of abatacept in human milk, the effects on the breast-fed infant, or the effects on milk production. ■ A pregnancy registry has been established; contact manufacturer. ■ Safety and effectiveness for use in pediatric patients under 2 years of age not established. IV dosing has not been studied in patients younger than 6 years of age. ■ Safety and effectiveness for uses other than juvenile idiopathic arthritis in pediatric patients have not been established. ■ Patients with juvenile idiopathic arthritis should be brought up-to-date with all immunizations before initiating therapy with abatacept. ■ Because it is

unknown whether abatacept can cross the placenta and because it is an immunomodulatory agent, the safety of administering live vaccines to infants exposed to abatacept in utero is unknown. Consider risk versus benefit.

Elderly:

Specific differences in safety and efficacy not noted. Incidence of infection and malignancy is higher in the elderly. Use caution; see Precautions.

DRUG/LAB INTERACTIONS

Formal drug interaction studies have not been conducted. ■ Has been used with methotrexate, NSAIDs (e.g., naproxen [Naprosyn, Aleve], ibuprofen [Motrin, Advil]), and corticosteroids (e.g., prednisone). ■ Methotrexate, NSAIDs, corticosteroids, and TNF antagonists do not appear to influence abatacept clearance. ■ Concurrent use with a **TNF antagonist** (e.g., adalimumab [Humira], etanercept [Enbrel], infliximab [Remicade]) is associated with an increased risk of serious infections and no significant additional efficacy over use of the TNF antagonist alone. Concurrent use is not recommended. ■ With the IV formulation, falsely elevated blood glucose readings may occur on the day of the infusion with **specific blood glucose monitoring systems** that react to drug products containing maltose. IV formulation contains maltose; SC formulation does not contain maltose; see prescribing information. ■ Safety and efficacy of concurrent use with **anakinra** (Kineret) has not been established. Concurrent use is not recommended. ■ **Live virus vaccines** should not be given concurrently with or within 3 months of abatacept. ■ May blunt the effectiveness of some **vaccinations.**

SIDE EFFECTS

In adult and pediatric patients, side effects are similar in type and frequency. The most commonly reported side effects are headache, nasopharyngitis, nausea, and upper respiratory tract infections. The most serious adverse effects are infections and malignancies. Infections are the most likely adverse event to cause interruption or discontinuation of therapy. Acute infusion-related reactions (cough, dizziness, dyspnea, flushing, headache, hypertension, hypotension, nausea, pruritus, rash, urticaria, wheezing) have been reported and usually occur within 1 hour of the infusion. Hypersensitivity reactions (anaphylaxis [rare], dyspnea, hypotension, urticaria) have been reported, usually within 24 hours of infusion. Other reactions include back or extremity pain, COPD exacerbation, dyspepsia, immunogenicity (antibody formation), and rhonchi.

Post-Marketing:

Vasculitis (including cutaneous vasculitis and leukocytoclastic vasculitis).

ANTIDOTE

Notify physician of any side effects; most will be treated symptomatically. During clinical studies, most infusion-related reactions were mild to moderate, and therapy was discontinued in very few patients. Discontinue abatacept for any serious reaction or infection. Therapy may need to be interrupted in patients who develop infections. Treat infusion and hypersensitivity reactions as indicated (e.g., oxygen, diphenhydramine, epinephrine, corticosteroids, vasopressors, and/or fluids). Resuscitate as necessary.

ABCIXIMAB

(ab-**SIX**-ih-mab)
ReoPro
Antiplatelet agent
Antithrombotic
Monoclonal antibody
pH 7.2

USUAL DOSE

Administered concomitantly with heparin and aspirin as described in Clinical Studies; see prescribing information.

Percutaneous coronary intervention:

0.25 mg/kg as an IV bolus administered 10 to 60 minutes before percutaneous coronary intervention (PCI). Follow with a continuous infusion of 0.125 mcg/kg/min (weight adjusted) to a maximum of 10 mcg/min (non–weight adjusted) for 12 hours.

Unstable angina not responding to conventional medical therapy with planned PCI within 24 hours:

0.25 mg/kg as an IV bolus followed by an 18- to 24-hour continuous infusion of 10 mcg/min. Discontinue abciximab 1 hour after the PCI.

Based on an integrated analysis of data from all studies, the following guidelines may be used to minimize the risk for bleeding:

- When abciximab is initiated 18 to 24 hours before PCI, the aPPT should be maintained between 60 and 85 seconds during the abciximab and heparin infusion period.
- During PCI, the ACT should be maintained between 200 and 300 seconds.
- If anticoagulation is continued in these patients following PCI, the aPTT should be maintained between 55 and 75 seconds.

DILUTION

Available in 5-mL vials (2 mg/mL). Solution must be clear. Must be filtered with a nonpyrogenic, low–protein binding, 0.2- or 5-micron filter before administering the bolus and a 0.2- or 0.22-micron filter before administering the infusion; see Filters. Filtering of the infusion may be done during preparation or at administration, using the appropriate in-line filter. Do not shake.

IV injection:

Bolus injection may be given undiluted.

Infusion:

Withdraw desired dose and further dilute with NS or D5W (5 mL [10 mg] diluted with 250 mL NS or D5W equals 40 mcg/mL).

Filters:

Must be filtered before administering the bolus and the infusion. Bolus may be given using a sterile, nonpyrogenic, low–protein binding, 0.2- or 5-micron syringe filter. Filtering of the infusion may be done during preparation using a sterile, nonpyrogenic, low–protein binding, 0.2- or 5-micron syringe filter or at administration using an in-line, sterile, nonpyrogenic, low–protein binding, 0.2- or 0.22-micron filter; see Dilution.

Storage:

Refrigerate before use. Do not freeze. Check expiration date on vial. Contains no preservative; discard any unused portion.

COMPATIBILITY

Consider any drug NOT listed as compatible to be INCOMPATIBLE until consulting a pharmacist; specific conditions may apply.

According to the manufacturer, no **incompatibilities** have been shown with IV fluids or commonly used cardiovascular drugs; however, administration through a separate IV line and not mixing with other medications is recommended. No **incompatibilities** observed with glass bottles or polyvinyl chloride bags and administration sets.

One source suggests the following **compatibilities:**

Y-site:

Adenosine (Adenocard), argatroban, atropine, bivalirudin (Angiomax), diphenhydramine (Benadryl), fentanyl, metoprolol (Lopressor), midazolam (Versed).

RATE OF ADMINISTRATION

IV injection:

An initial dose as a bolus injection; filtration required.

Infusion:

See Usual Dose. Must be administered through an in-line, nonpyrogenic, low–protein binding filter (0.2 or 0.22 microns), if not done during preparation, and controlled by a continuous infusion pump. A 40-mcg/mL solution (10 mg in 250 mL) at a rate of 10.5 mL/hr will deliver 7 mcg/min, and 15 mL/hr will deliver 10 mcg/min. Discard unused portion at the end of the infusion.

ACTIONS

The fab fragment of the chimeric human-murine monoclonal antibody, abciximab binds to the glycoprotein GPIIb/IIIa receptor of human platelets and produces rapid dose-dependent inhibition of platelet function. It inhibits platelet aggregation by preventing the binding of fibrinogen, von Willebrand factor, and other adhesive molecules to GPIIb/IIIa receptor sites on activated platelets. Also binds to the vitronectin receptor found on platelets and on the endothelial and smooth muscle cells of the vessel wall. The vitronectin receptor mediates the procoagulant properties of platelets and the proliferative properties of vascular endothelial and smooth muscle cells. Onset of action is rapid, reducing platelet aggregation to less than 20% of baseline within 10 minutes. Inhibition of platelet function is temporary following a bolus dose, but can be sustained at greater than 80% by continuous IV infusion. Has prevented acute thrombosis and resulted in lower rates of thrombosis as compared to aspirin and/or heparin. Initial half-life is 10 minutes. Second phase half-life is 30 minutes. After the infusion is ended, platelet function generally recovers gradually over 48 hours. In most patients, bleeding time returns to less than 12 minutes within 12 to 24 hours. Some abciximab remains in the circulation for 15 days or more.

INDICATIONS AND USES

An adjunct to PCI for the prevention of cardiac ischemic complications in patients undergoing PCI and in patients with unstable angina not responding to conventional medical therapy when PCI is planned within 24 hours. Safety and effectiveness of abciximab use in patients not undergoing PCI have not been established. Used concurrently with aspirin and heparin.

CONTRAINDICATIONS

Active internal bleeding, administration of oral anticoagulants (e.g., warfarin [Coumadin]) within 7 days unless PT is at or less than 1.2 times control, aneurysm, arteriovenous malformation, bleeding diathesis, clinically significant GI or GU bleeding within 6 weeks, history of CVA within 2 years, history of CVA with significant residual neurologic deficit, history of vasculitis (presumed or documented), hypertension (severe and uncontrolled), intracranial neoplasm, known hypersensitivity to any component of abciximab or to murine proteins, major surgery or trauma

within 6 weeks, thrombocytopenia (less than 100,000/mm^3), or the use of IV dextran before PCI or intent to use it during PCI.

PRECAUTIONS

Administered only in the hospital under the direction of a physician knowledgeable in its use and with appropriate diagnostic, laboratory, and surgical facilities available. ■ May cause major bleeding complications (e.g., retroperitoneal bleeding, spontaneous GI and GU bleeding, bleeding at the arterial access site). Fatalities have occurred. ■ Risk of bleeding may be minimized by using weight-adjusted dosing of abciximab and low-dose weight-adjusted doses of heparin, with adherence to stricter anticoagulation guidelines, careful vascular access site management, discontinuation of heparin after the procedure, and early sheath removal. ■ Incidence of major bleeding is increased in patients receiving heparin, other anticoagulants, or thrombolytics (e.g., alteplase [tPA], reteplase [r-PA], streptokinase). Consider if benefits will outweigh risks, and proceed with extreme caution if use is considered necessary. ■ Incidence of major bleeding is also increased if PCI occurs within 12 hours of the onset of symptoms of an acute MI, if the PCI procedure is prolonged (lasting more than 70 minutes), or if PCI procedure fails. ■ Extreme care must be taken in accessing the femoral artery for femoral sheath placement. Only the anterior wall of the femoral artery should be punctured (avoid a Seldinger [through and through technique] for obtaining sheath access). ■ Avoid femoral vein sheath placement if possible. ■ Hypersensitivity reactions, including anaphylaxis, can occur at any time (a protein solution). Emergency drugs and equipment must always be available. ■ Thrombocytopenia, including severe thrombocytopenia, has been reported. Usually seen within the first 24 hours of abciximab administration. ■ Administration may result in the formation of human antichimeric antibody (HACA). Can cause hypersensitivity reactions including anaphylaxis, thrombocytopenia, or diminished benefit if abciximab is readministered at another time or other monoclonal antibodies are administered. Incidence and severity of thrombocytopenia may be increased with readministration. ■ See Drug/Lab Interactions.

Monitor:

Before initiating, obtain results of baseline CBC, platelet count, PT, ACT, and aPTT. Type and cross-match would also be appropriate. ■ Monitor heparin anticoagulation (ACT or aPTT) and PT closely. ■ While a femoral sheath is in place, the patient must be on strict bed rest, head of the bed should be less than 30 degrees, and the appropriate limb(s) restrained in a straight position. Monitor sheath insertion site(s) and distal pulses of affected leg(s) frequently while sheath is in place and for 6 hours after removal. Measure any hematoma and monitor for enlargement. ■ Monitor platelet count 2 to 4 hours following the bolus dose and at 24 hours or before discharge, whichever is first. More frequent monitoring may be indicated. ■ Monitor patient carefully and frequently for signs of bleeding; take vital signs (avoiding automatic BP cuffs); observe any invaded sites at least every 15 minutes (e.g., sheaths, IV sites, cutdowns, punctures, Foleys, NGs); watch for hematuria, hematemesis, hemoptysis, bloody stool, petechiae, hematoma, flank pain, muscle weakness; and do neuro checks every hour. Continue until clotting functions move toward normal. ■ Use care in handling patient; avoid arterial puncture, venipuncture, and IM injection. Use extreme precautionary methods and only compressible sites if these procedures are absolutely necessary. Apply pressure for 30 minutes to any invaded site and then apply pressure dressings. Saline or heparin locks are suggested to facilitate blood draws. ■ Minimize use of urinary catheters, nasotracheal intubation, nasogastric tubes, and automatic blood pressure cuffs. Discontinue heparin after PCI and remove sheath no sooner than 2 hours and no later than 6 hours after heparin is discontinued (aPTT must be at or less than 50 seconds or ACT at or less than 175 seconds). After removal, apply pressure to the femoral artery for at least 30 minutes. When hemostasis is confirmed, apply a pressure dressing. Maintain strict bed rest for at least 6 to 8 hours after sheath removal and/or abciximab is discontinued or 4 hours after heparin is discontinued, whichever is later. ■ Throughout process medicate as needed for back or groin pain and nausea or vomiting. ■ Remove pressure dressing before ambulation. ■ In the event of serious, uncontrolled bleeding or the need for emergency surgery, discontinue abciximab. Platelet function may be partly restored with platelet transfusions. ■ See Precautions, Drug/Lab Interactions, and Antidote.

Patient Education:

Compliance with all measures to minimize bleeding (e.g., strict bed rest, positioning) is imperative. ■ Avoid use of razors, toothbrushes, and other sharp items. ■ Use caution while moving to avoid excessive bumping. ■ Report all episodes of bleeding and apply local pressure if indicated. ■ Expect oozing from IV sites.

Maternal/Child:

Category C: use only if clearly needed and with extreme caution. ■ Safety for use during breast-feeding not established. Not known if it is secreted in breast milk; use extreme caution; probably best to postpone breast-feeding until bleeding time approaches normal. ■ Safety and effectiveness for use in pediatric patients not established.

Elderly:

No overall difference in safety or efficacy observed in patients between 65 and 75 years of age as compared with younger patients. Insufficient data to determine whether patients age 75 or older respond differently. ■ Increased risk of major bleeding complications if weight less than 75 kg; see Precautions. ■ Consider age-related organ impairment, concomitant disease, or drug therapy; may also increase risk of bleeding.

DRUG/LAB INTERACTIONS

Formal drug interaction studies have not been conducted. ■ Use with extreme caution with other drugs that affect hemostasis (e.g., **thrombolytics** [e.g., alteplase (tPA), streptokinase], **anticoagulants** [e.g., heparin, warfarin (Coumadin)], **NSAIDs** [e.g., ibuprofen (Advil, Motrin), naproxen (Aleve, Naprosyn)], **platelet aggregation inhibitors** [e.g., clopidogrel (Plavix), dipyridamole (Persantine), ticlopidine (Ticlid)] and **other glycoprotein GPIIb/IIIa receptor antagonists** [e.g., eptifibatide (Integrilin), tirofiban (Aggrastat)], **and selected antibiotics** [e.g., cefotetan]). ■ **Dextran solutions** increased the risk of major bleeding events when used concurrently with abciximab; see Contraindications. ■ **HACA titer** may precipitate an acute hypersensitivity reaction with other **diagnostic or therapeutic monoclonal antibodies** (e.g., muromonab-CD3). ■ Has been administered to patients with ischemic heart disease treated concomitantly with heparin, warfarin, beta-adrenergic receptor blockers (e.g., metoprolol [Lopressor]), calcium channel antagonists (e.g., diltiazem [Cardizem]), angiotensin-converting enzyme inhibitors (e.g., enalapril [Vasotec]), nitrates, ticlopidine (Ticlid), and aspirin.

SIDE EFFECTS

May cause major bleeding incidents (e.g., femoral artery or other access site, intracranial hemorrhage, spontaneous gross hematuria and other GU bleeds, spontaneous hematemesis and other GI bleeds, pulmonary alveolar hemorrhage, retroperitoneal bleeding). Decreases in hemoglobin greater than 5 Gm/dL or intracranial hemorrhage were defined as major during trials. Thrombocytopenia is common and may require platelet transfusion. Abdominal pain, back pain, bradycardia, chest pain, headache, hypotension, nausea, peripheral edema, positive HACA response, hypersensitivity reactions (including anaphylaxis), puncture site pain, and vomiting may occur. Other side effects that may occur are anemia, arrhythmias (e.g., atrial fibrillation/flutter, bradycardia, complete AV block, supraventricular tachycardia, ventricular PVCs, tachycardia, or fibrillation), confusion, hyperesthesia, intermittent claudication, leukocytosis, limb embolism, pericardial effusion, pleural effusion or pleurisy, pneumonia, pulmonary edema, pulmonary embolism, and visual disturbances.

ANTIDOTE

Stop the infusions of abciximab and heparin if any serious bleeding not controllable with pressure occurs. Stop infusion in patients with failed PCI. Stop infusion if a hypersensitivity reaction occurs. Treat hypersensitivity reactions as indicated; may require epinephrine, airway management, oxygen, IV fluids, antihistamines (e.g., diphenhydramine [Benadryl]), corticosteroids (e.g., hydrocortisone sodium succinate [Solu-Cortef]), and pressor amines (e.g., dopamine). Keep

physician informed. If an acute platelet decrease occurs (less than 100,000/mm^3 or a decrease of at least 25% from pretreatment value), obtain additional platelet counts in separate tubes containing ethylenediaminetetraacetic acid (EDTA), citrate, and heparin. This is to exclude pseudothrombocytopenia due to anticoagulant interaction. If true thrombocytopenia is verified, discontinue abciximab immediately. Platelet transfusions may be required. Heparin and aspirin should also be avoided if the platelet count drops below 60,000/mm^3.

ACETAMINOPHEN BBW

(ah-**SEAT**-ah-**MIN**-oh-fen)
Ofirmev
Antipyretic
Analgesic
pH 5.5

USUAL DOSE

May be given as a single or repeated dose. Minimum dosing interval is 4 hours. No dose adjustment is necessary when converting from oral to IV dosing.

Care must be taken to avoid dosing errors, which could result in accidental overdose and death. In particular, be careful to ensure that:

- Dose in milligrams and milliliters is not confused
- Dosing is based on weight for patients under 50 kg
- Infusion pump is programmed properly
- Total daily dose of acetaminophen from all sources (i.e., all routes [IV, oral, and rectal]) and all acetaminophen-containing products does not exceed maximum daily limits.

Summary of Acetaminophen Dosing in Adults and Adolescents

Age-Group	Dose Given q 4 hr	Dose Given q 6 hr	Maximum Single Dose	Maximum Total Daily Dose of Acetaminophen (By All Routes)
Adults and adolescents (13 years and older) weighing ≥50 kg	650 mg	1,000 mg	1,000 mg	4,000 mg in 24 hr
Adults and adolescents (13 years and older) weighing <50 kg	12.5 mg/kg	15 mg/kg	15 mg/kg	75 mg/kg in 24 hr (up to 3,750 mg)

PEDIATRIC DOSE

See comments under Usual Dose.

Management of pain and reduction of fever in pediatric patients 2 to 12 years of age:

15 mg/kg every 6 hours or 12.5 mg/kg every 4 hours. Do not exceed a maximum single dose of 15 mg/kg or a maximum daily dose of 75 mg/kg/day. Minimum dosing interval is 4 hours.

Reduction of fever in infants 29 days to 2 years of age:

15 mg/kg every 6 hours to a maximum daily dose of acetaminophen 60 mg/kg/day, with a minimum dosing interval of 6 hours.

Reduction of fever in neonates, including premature neonates born at 32 weeks or more gestational age, up to 28 days chronologic age:

12.5 mg/kg every 6 hours, to a maximum daily dose of acetaminophen of 50 mg/kg/day, with a minimum dosing interval of 6 hours.

DOSE ADJUSTMENTS

A reduced total daily dose of acetaminophen may be appropriate in patients with hepatic impairment or active liver disease. ■ A reduced total daily dose and longer dosing intervals may be appropriate in patients with a CrCl less than or equal to 30 mL/min.

DILUTION

Available in a single-use vial or bag containing 1,000 mg/100 mL (10 mg/mL) of acetaminophen. For adults and adolescent patients weighing 50 kg or more requiring a 1,000-mg dose, administer the dose by inserting a vented IV set through the septum of the 100-mL vial or a nonvented IV set through the administration spike port of the 100-mL bag. Doses less than 1,000 mg should be withdrawn from the container and placed into a separate empty container before administration to avoid inadvertent administration of an overdose. Withdraw appropriate dose (650 mg or weight-based) from 100-mL vial or bag and place in an empty container (e.g., syringe, glass bottle, plastic IV container) for IV infusion.

Filter:

Information not available.

Storage:

Store unopened vial or bag at CRT. Do not refrigerate or freeze. Do not remove bag from overwrap until ready to use. After removing the outer wrap, check the container for minute leaks by squeezing the solution bag firmly. Discard 6 hours after entry into the container or transfer into an empty container. Single-use product. Discard any unused solution.

COMPATIBILITY

Manufacturer states, "Do not add other medications to solution. **Incompatible** with diazepam and chlorpromazine. Do not administer simultaneously."

One source suggests the following **compatibilities**.

Solutions:

D5W, NS.

Y-site:

Buprenorphine (Buprenex), butorphanol (Stadol), cefoxitin (Mefoxin), ceftriaxone (Rocephin), clindamycin (Cleocin), D5LR, D5NS, D10W, dexamethasone (Decadron), diphenhydramine (Benadryl), dolasetron (Anzemet), droperidol (Inapsine), fentanyl, granisetron (Kytril), heparin, hydrocortisone sodium succinate (Solu-Cortef), hydromorphone (Dilaudid), ketorolac (Toradol), lidocaine, lorazepam (Ativan), LR, mannitol (Osmitrol), meperidine (Demerol), methylprednisolone sodium succinate (Solu-Medrol), metoclopramide (Reglan), midazolam (Versed), morphine, nalbuphine, ondansetron (Zofran), piperacillin/tazobactam (Zosyn), potassium chloride, prochlorperazine (Compazine), ranitidine (Zantac), sufentanil (Sufenta), vancomycin.

RATE OF ADMINISTRATION

Administer as an infusion, equally distributed over 15 minutes. Pediatric doses up to 600 mg may be drawn up into a syringe and delivered via a syringe pump.

ACTIONS

A nonsalicylate antipyretic and a nonopioid analgesic agent. Exact mechanism of action is unknown but is thought to act through central actions. Widely distributed into most tissues except fat. Low protein binding (10% to 25%). Half-life is approximately 2 to 3 hours. Metabolized in the liver via three different pathways. Metabolites excreted in the urine.

INDICATIONS AND USES

Management of mild to moderate pain in adults and pediatric patients 2 years of age and older. ■ Management of moderate to severe pain with adjunctive opioid analgesics in adults and pediatric patients 2 years of age and older. ■ Reduction of fever in adults and pediatric patients.

CONTRAINDICATIONS

Known hypersensitivity to acetaminophen or to any components of the IV formulation. ■ Patients with severe hepatic impairment or severe active liver disease.

PRECAUTIONS

Acetaminophen has been associated with cases of acute liver failure, at times resulting in liver transplant and death. Most cases of liver injury are associated with the use of acetaminophen at doses that exceed the maximum daily limits and often involve more than one acetaminophen-containing product. Do not exceed the maximum recommended daily dose. ■ Use with caution in patients with hepatic impairment or active hepatic disease, alcoholism, chronic malnutrition, severe hypovolemia (e.g., due to dehydration or blood loss), or severe renal impairment (CrCl less than or equal to 30 mL/min). ■ Serious skin reactions such as acute generalized exanthematous pustulosis, Stevens-Johnson syndrome, and toxic epidermal necrolysis have been reported rarely. ■ Hypersensitivity and anaphylactic reactions have been reported. ■ Care must be taken when prescribing, preparing, or administering acetaminophen to avoid dosing errors, which could result in accidental overdose and death; see Usual Dose. ■ Antipyretic effects may mask fever in patients treated for postsurgical pain.

Monitor:

Monitor for S/S of hypersensitivity reaction (e.g., pruritus; rash; respiratory distress; swelling of the face, mouth, and throat; urticaria). ■ Monitor for S/S of serious skin reactions. ■ Baseline SCr and liver function tests may be indicated.

Maternal/Child:

Epidemiologic studies on oral acetaminophen use in pregnant women have not reported a clear association between acetaminophen use and birth defects, miscarriage, or adverse maternal or fetal outcomes. Safety of IV formulation for use in pregnancy not established. Use only if clearly needed. ■ Safety for use in breast-feeding not established. Acetaminophen is secreted in human milk in small quantities after oral administration. Use caution. ■ The effectiveness for treatment of acute pain has not been established in pediatric patients less than 2 years of age. ■ The safety and effectiveness for treatment of fever in pediatric patients, including premature neonates born at 32 weeks or more gestational age, is supported by adequate and well-controlled studies.

Elderly:

No overall differences in safety and efficacy were observed between older and younger patients, but greater sensitivity of some older individuals cannot be ruled out.

DRUG/LAB INTERACTIONS

Substances that induce or regulate hepatic cytochrome enzyme CYP2E1 (e.g., ethanol, isoniazid) may alter the metabolism of acetaminophen and increase its hepatotoxic potential. Effects have not been studied. ■ Ethanol may induce hepatic cytochromes but may also act as a competitive inhibitor of the metabolism of acetaminophen. ■ Chronic acetaminophen doses of 4,000 mg/day may cause an increase in INR in patients stabilized on **warfarin.** Effect of short-term use on INR has not been studied. Monitoring of INR recommended. ■ **Many available analgesics contain acetaminophen in combination with another analgesic** (e.g., hydrocodone/acetaminophen [Vicodin, Norco], oxycodone/acetaminophen [Percocet]). **Over-the-counter cold and allergy preparations and sleep aids** may also contain acetaminophen in combination with other active ingredients. Monitor total daily dose of acetaminophen coming from all possible sources.

SIDE EFFECTS

Adult patients:

The most common adverse reactions were headache, insomnia, nausea, and vomiting. Less

frequently reported side effects included anxiety, dyspnea, fatigue, hypersensitivity reaction, hypertension, hypokalemia, hypotension, increased aspartate aminotransferase, infusion site pain, muscle spasms, peripheral edema, and trismus.

Pediatric patients:

The most common adverse reactions were constipation, nausea, pruritus, and vomiting. Less commonly reported side effects included abdominal pain, agitation, anemia, atelectasis, diarrhea, fever, headache, hypersensitivity reaction, hypertension, hypervolemia, hypoalbuminemia, hypokalemia, hypomagnesemia, hypophosphatemia, hypotension, hypoxia, increased hepatic enzymes, injection site pain, insomnia, muscle spasm, oliguria, pain in extremities, periorbital edema, peripheral edema, pleural effusion, pulmonary edema, rash, stridor, tachycardia, and wheezing.

Overdose:

Early symptoms may include diaphoresis, general malaise, nausea, and vomiting. More serious adverse effects include hepatic necrosis, renal tubular necrosis, hypoglycemic coma, and thrombocytopenia.

Post-Marketing:

Hypersensitivity and anaphylaxis (e.g., respiratory distress; pruritus; rash; swelling of the face, mouth, and throat; urticaria).

ANTIDOTE

Notify the physician of significant side effects. Discontinue immediately at the first appearance of skin rash or any other sign of hypersensitivity. Treat as indicated (e.g., diphenhydramine, epinephrine, albuterol). Resuscitate as necessary. If an acetaminophen overdose is suspected, obtain a serum acetaminophen level and baseline liver function studies. *N*-acetylcysteine antidote may be indicated. See acetylcysteine monograph. Contact a regional poison control center for additional information.