Part XXXIII ■ Laboratory Medicine

Chapter 714 ■ Laboratory Testing in Infants and Children Michael A. Pesce

Because of genetic heterogeneity, biologic and environmental variability, and inhomogeneity of subclinical health status, normal values for many laboratory tests do not show a gaussian bell-shaped distribution curve. As a result, the population mean and the standard deviation (SD) are frequently less useful than the range of normal values, generally given as the 95% normal range, or the range of values obtained in testing a normal population minus the lowest 2.5% and the highest 2.5%. The serum sodium concentration in children, which is tightly controlled physiologically, has a distribution that is essentially gaussian; the mean value ±2 SD gives a range very close to that actually observed in 95% of children (Table 714-1). Alternatively, the serum creatine kinase level, which is subject to diverse influences and is not actively controlled, does not show a gaussian distribution, as evidenced by the lack of agreement between the range actually observed and that predicted by the mean value ±2 SD.

A refinement of referencing that is used with increasing frequency is reporting the value obtained together with the percentile of normal values into which the value obtained falls. This method is useful when testing for risk factors such as determination of serum cholesterol. A further modification that is necessary for many tests performed in infants and children is calculating the age-related adjustment of the normal range. Both age adjustment and the use of percentiles are illustrated in the normal values for serum cholesterol. A final modification needed for reporting normal ranges is referencing the Tanner stage of sexual maturation, which is most useful in assessing pituitary and gonadal function.

ACCURACY AND PRECISION OF LABORATORY TESTS. Technical accuracy is an important consideration in interpreting the results of a laboratory test. Because of improvements in methods of analysis and elimination of analytic interference, the accuracy of most tests is limited primarily by their precision. **Accuracy** is a measure of the nearness of a test result to the actual value, whereas **precision** is a measure of the reproducibility of a result. No test can be more accurate than it is precise. Analysis of precision by repetitive measurements of a single sample gives rise to a gaussian distribution with a mean and an SD. The estimate of precision is the coefficient of variation (CV):

$$CV = \frac{SD}{Mean} \times 100$$

The CV is not likely to be constant over the full range of values obtained in clinical testing, but it is approximately 5% in the normal range. The CV is generally not reported, but is always known by the laboratory. It is particularly important in assessing the significance of changes in laboratory results. For example, a common situation is the need to assess hepatotoxicity incurred as a result of the administration of a therapeutic drug and reflected in the serum alanine aminotransferase (ALT) value. If serum ALT increases from 25 U/L to 40 U/L, is the change significant? The CV for ALT is 7%. Using the value obtained ±2 × CV to express the extremes of imprecision, it can be seen that a value of 25 U/L is unlikely to reflect an actual concentration of >29 U/L, and a value of 40 U/L is unlikely to reflect an actual concentration of <34 U/L. Therefore, the change in the value as obtained by testing is likely to reflect a real change in circulating ALT levels. Continued monitoring of serum ALT is indicated, even though both values for ALT are within normal limits. *Likely* in this case is only a probability. Inherent biologic variability is such that the results of 2 successive tests may suggest a trend that will disappear on further testing.

The precision of a test may also be indicated by providing confidence limits for a given result. Ordinarily, 95% confidence limits are used, indicating that it is 95% certain that the value obtained lies between the 2 limits reported. Confidence limits are calculated using the mean and SD of replicate determinations:

$$95\%\ \text{confidence limits} = \text{mean} \pm t \times SD$$

where t is a constant derived from the number of replications. In most cases, $t = 2$.

SENSITIVITY, ACCURACY, AND ANALYTIC TESTING. In some circumstances, the sensitivity and accuracy of an analysis are reduced or increased as functions of clinical purpose. For example, ion exchange chromatography of plasma amino acids for the diagnosis of inborn errors of metabolism is usually performed at an analytic sensitivity that allows measurement of all of the amino acids with a single set of standards. The range of values is approximately 20–800 µmol/L, and accuracy is poor at values of ≤20 µmol/L. The detection of homocysteine in this type of analysis suggests an inborn error of methionine metabolism. If the analysis is adjusted to achieve greater analytic sensitivity, it is possible to measure homocysteine accurately in normal plasma (3–12 µmol/L). This more sensitive test is used to assess cobalamin status and analyze risk factors for atherosclerotic cardiovascular disease.

PREDICTIVE VALUE OF LABORATORY TESTS. Predictive value (PV) theory deals with the usefulness of tests as defined by their clinical sensitivity (ability to detect a disease) and specificity (ability to define the absence of a disease).

$$\text{Sensitivity} = \frac{\text{Number positive by test}}{\text{Total number positive}} \times 100$$

$$\text{Specificity} = \frac{\text{Number negative by test}}{\text{Total number without disease}} \times 100$$

$$\text{PV of a positive test result} = \frac{\text{True positive results}}{\text{Total positive results}} \times 100$$

$$\text{PV of a negative test result} = \frac{\text{True negative results}}{\text{Total negative results}} \times 100$$

The problems addressed by PV theory are false-negative and false-positive test results. Both are major considerations in interpreting the results of screening tests in general and neonatal screening tests in particular.

Testing for HIV seroreactivity illustrates some of these considerations. If it is assumed that approximately 1,100,000 of 284,000,000 residents of the United States are infected with HIV (prevalence = 0.39%) and that 90% of those infected demonstrate antibodies to HIV, then we can consider the usefulness of a simple test with 99% sensitivity and 99.5% specificity. If the entire pop-

TABLE 714-1. Gaussian and Nongaussian Laboratory Values in 458 Normal School Children 7–14 Yr of Age

	SERUM SODIUM (mmol/L)	SERUM CREATINE KINASE (U/L)
Mean	141	68
SD	1.7	34
Mean ± 2 SD	138–144	0–136
Actual 95% range	137–144	24–162

SD = standard deviation.

ulation of the USA were screened, it would be possible to identify most of those infected with HIV.

$$1{,}100{,}000 \times 0.9 \times 0.99 = 980{,}100 (89.1\%)$$

However, there will be 119,900 false-negative test results. Even with 99.5% specificity, the number of false-positive test results would be larger than the number of true-positive results:

$$284{,}000{,}000 \times 0.005 = 1{,}420{,}000$$

In addition, there will be 281,480,000 true-negative results.

$$\text{PV of positive test result} = \frac{980{,}100}{(980{,}100 + 1{,}420{,}000)} \times 100 = 41\%$$

$$\text{PV of negative test result} = \frac{281{,}480{,}000}{(281{,}480{,}000 + 119{,}900)} \times 100 = 99.96\%$$

Given the high cost associated with follow-up and the anguish produced by a false-positive result, it is easy to see why universal screening for HIV seropositivity received a low priority immediately after the introduction of testing for HIV infection.

By contrast, we can consider the screening of 100,000 individuals from groups at increased risk for HIV in whom the overall prevalence of disease is 10%, with all other considerations being unchanged.

$$\text{True-positive results} = 0.9 \times 0.99 \times 10{,}000 = 8{,}910$$

$$\text{False-positive results} = 0.005 \times 90{,}000 = 450$$

$$\text{False-negative results} = 10{,}000 - 8{,}910 = 1{,}090$$

$$\text{PV of positive test result} = \frac{8{,}910}{8{,}910 + 450} \times 100 = 95\%$$

$$\text{PV of negative test result} = \frac{89{,}500}{89{,}550 + 1{,}090} \times 100 = 99\%$$

These 2 hypothetical testing strategies show that the diagnostic efficiency of testing depends heavily on the prevalence of the disease being tested for, even with a superior test, such as the test for HIV antibodies. Because the treatment of pregnant women infected with HIV is effective in preventing vertical transmission of the infection, screening has now been expanded to all pregnant women. The proven effectiveness of current therapy in preventing neonatal infection has intensified screening for HIV early in pregnancy.

However, because of the long time needed to test for HIV antibodies, it was difficult to screen women during labor and provide the necessary therapy. Recently, rapid HIV antibody testing procedures using a fingerstick or venipuncture to obtain whole blood, plasma, or serum, and tests using oral fluid were approved (Table 714-2). The HIV test results are usually obtained in <20 min. The collection of oral fluid samples provides an alternative for individuals who avoid HIV testing because of their dislike of needlesticks. HIV testing using whole blood or oral fluid is classified as a waived test under the **Clinical Laboratory Improvement Amendments of 1988 (CLIA)**, and these tests are allowed in a point-of-care setting. Waived tests are simple laboratory procedures that use methodologies that are so simple and accurate as to render the likelihood of an erroneous result by the user negligible. A positive rapid HIV test result is then confirmed by Western blot analysis or immunofluorescence assay.

According to the U.S. Centers for Disease Control and Prevention, in the USA, between 280 and 370 infants were born with HIV in 2000. Rapid HIV testing during labor allows for implementation of antiretroviral therapy for HIV-infected women who have not been tested or are unaware of their HIV status. The initiation of therapy at the time of labor or within the 1st 12 hr of an infant's birth significantly reduces the risk of mother-to-child transmission. In the mother-infant rapid intervention at delivery study, it was shown that the sensitivity and specificity of a rapid whole blood test for HIV during labor were 100% and 99.9%, respectively, with a positive PV of 90%. The median turnaround time for obtaining results from blood collection to patient notification was only 66 min. The performance of the rapid blood test was better than that of the standard HIV enzyme immunoassay, which had sensitivity and specificity of 100% and 99.8%, respectively, with a positive PV of 76%. In addition, the median turnaround time from blood collection to patient notification was 28 hr. As a result, rapid whole blood HIV testing is now the standard of care for women in labor with undocumented HIV status.

Rapid HIV testing can also be used in developing countries. In resource-poor settings, because of the lack of properly equipped laboratories, skilled technologists, and basic resources, such as electricity and water, these self-contained, point-of-care HIV tests are very attractive. In areas of Asia and Africa in which HIV is epidemic, screening pregnant women with rapid HIV tests and offering antiretroviral therapy can significantly reduce the transmission of HIV to hundreds of thousands of infants.

NEONATAL SCREENING TESTS. Almost all of the diseases detected in neonatal screening programs have a very low prevalence, and

TABLE 714-2. Rapid HIV Antibody Tests and Status Under the Clinical Laboratory Improvement Amendments of 1988 (CLIA)

RAPID HIV TEST	SPECIMEN TYPE	CLIA* CATEGORY	TIME FOR PERFORMING ASSAY	WAIT TIME TO READ RESULTS	MANUFACTURER
OraQuick ADVANCE Rapid HIV-1/2 Antibody Test	Oral fluid	Waived	<5 min	20–40 min	OraSure Technologies, Inc. www.orasure.com
	Whole blood (fingerstick or venipuncture)	Waived			
	Plasma	Moderate complexity			
Uni-Gold Recombigen HIV-1	Whole blood (fingerstick or venipuncture)	Waived	<5 min	10–12 min	Trinity Biotech www.unigoldhiv.com
	Serum and plasma	Moderate complexity			
Reveal G-2 Rapid HIV-1 Antibody Test	Serum and plasma	Moderate complexity	<5 min	Read result immediately	MedMira, Inc. www.medmira.com
MultiSpot HIV-1/HIV-2 Rapid Test	Serum and plasma	Moderate complexity	10–15 min	Result can be read immediately or up to 4 hr later	BioRad Laboratories www.biorad.com

*Clinical Laboratory Improvement Amendment.

for the most part, the tests are quantitative rather than qualitative. In general, the strategy is to use the initial screening test to separate a highly suspect group of patients from normal infants (i.e., to increase the prevalence) and then to follow this suspect group aggressively. This strategy is illustrated by a scheme used in screening newborns for congenital hypothyroidism, the prevalence of which is 25/100,000 liveborn infants. The initial test performed is for thyroxine in whole blood, and infants with the lowest 10% of test results are considered suspect. If all infants with hypothyroidism were included in the suspect group, the prevalence of disease in this group would be 250/100,000 infants. The original samples obtained from the suspect group are retested for thyroxine and are tested for thyroid-stimulating hormone. This 2nd round of testing results in an even more highly suspect group composed of 0.1% of the infants screened and having a prevalence of hypothyroidism of 25,000/100,000 subjects. This final group is aggressively pursued for further testing and treatment. Even with a 1,000-fold increase in prevalence, 75% of the aggressively tested population is euthyroid. The justifications advanced for the program are that treatment is easy and effective and that the alternative, if congenital hypothyroidism is undetected and untreated—long-term custodial care—is both unsatisfactory and expensive.

At its inception, neonatal screening was driven by the selection of genetic diseases whose clinical manifestations developed postnatally, such as phenylketonuria, galactosemia, and homocystinuria. The diseases could be treated effectively by simple means instituted shortly after birth. The classic screening tests are disease-specific microbiologic assays.

More common diseases have also become targets for neonatal screening programs. Congenital hypothyroidism was selected for screening because of its frequency and its ease of treatment. Sickle cell disease, also easily detected, can be treated more effectively if it is diagnosed before clinical signs appear. In addition, the results of neonatal screening for cystic fibrosis (CF) show that there are clear benefits associated with preclinical diagnosis, but also that there are some inherent difficulties associated with genetic screening for complex autosomal recessive diseases that are common and are caused by a rather large number of mutations of a single gene. The definitive diagnostic test for CF is the measurement of concentrations of sodium and chloride in sweat, a test that is not practical during the 1st wk of life. Neonates with CF generally have elevations in whole blood trypsinogen. This test allows the identification of a group of neonates at risk for CF. Performing DNA analysis for common mutations that cause CF reduces the size of the suspect group and identifies neonates with a higher likelihood of disease. This strategy identifies a manageable number of infants on whom to perform sweat tests. Problems include the following: (1) uncommon mutations are not included in the screening panel (thus, cases of CF caused by these mutations can be missed); (2) common mutations that cause clinically innocent elevations of whole blood trypsinogen in heterozygous neonates cause potentially alarming false-positive findings; and (3) CF in patients with normal sweat test results is rare, but is likely to be missed. Congenital adrenal hyperplasia, another common disorder, is now included in neonatal screening programs.

Tandem mass spectrometry (MS/MS) is a technically advanced method in which many compounds are initially separated by molecular weight. Each compound is then fragmented to allow identification. The process requires roughly 2 min/sample and can detect 20 or more inborn errors of metabolism. The effects of prematurity, neonatal illness, and intensive neonatal management on metabolites in blood complicate the interpretation of results. The PV of a positive screening result is likely to be <10%; that is, 90% of positive results are not indicative of a genetic disorder of metabolism. Nonetheless, MS/MS permits a diagnosis to be made before clinical illness develops. MS/MS is not directed toward diseases defined as treatable, but toward all of the diseases, each of which is rare, that the technique can identify (Table 714-3).

TABLE 714-3. Neonatal Screening by Tandem Mass Spectrometry

DISORDERS OF ORGANIC ACID METABOLISM AND FATTY ACID OXIDATION
Hydroxymethylglutaryl CoA lyase deficiency
Glutaric aciduria type 1
Isobutyryl CoA dehydrogenase deficiency
Isovaleric acidemia
2-Methylbutyryl CoA dehydrogenase deficiency
2,4-Dienoyl CoA reductase deficiency
3-Methylcrotonyl CoA carboxylase deficiency
3-Methylglutaconyl CoA hydratase deficiency
Methylmalonic acidemia
3-Ketothiolase deficiency
Multiple CoA carboxylase deficiency
Propionic acidemia
Carnitine/acylcarnitine translocator deficiency
Medium-chain acyl CoA dehydrogenase deficiency
Medium-chain ketoacyl CoA thiolase deficiency
Glutaric aciduria, type 2
Carnitine palmitoyl transferase deficiency
Short-chain acyl CoA dehydrogenase deficiency
Short-chain hydroxy acyl CoA dehydrogenase deficiency
Trifunctional protein deficiency
Long-chain 3-hydroxy acyl CoA dehydrogenase deficiency
Very long chain acyl CoA dehydrogenase deficiency
DISORDERS OF AMINO ACID METABOLISM
Argininosuccinic aciduria
Citrullinemia
Citrullinemia type II
Homocystinuria
Hyperphenylalaninemia
Maple syrup urine disease
Phenylketonuria
Tyrosinemia

CoA, coenzyme A

Electrospray tandem mass spectrometry permits the detection of rare inborn errors of metabolism and has been introduced as a newborn screening tool in Australia. In the 4 yr since mass spectrometry was implemented, the rate of detection per 100,000 births was 15.7, significantly higher than the rate of 8.6–9.5 in the 6 preceding 4-yr periods. Disorders of fatty acid oxidation, particularly medium-chain acyl coenzyme A dehydrogenase deficiency, accounted for the majority of increased diagnoses.

Expanded newborn screening programs using MS/MS increase the detection of inherited metabolic disorders. As of 2006, 34 U.S. states used MS/MS in their neonatal screening programs. However, the metabolic conditions screened for by states using MS/MS vary, ranging from <3 to >20.

In an attempt to standardize newborn screening programs, the American College of Medical Genetics recommends that every baby born in the United States be screened for a uniform panel of 29 disorders. The March of Dimes and the American Academy of Pediatrics also endorse the recommendation by the American College of Medical Genetics. However, expansion of the screening test menu raises several issues. For example, the cost of implementation can be significant because many states will need multiple MS/MS systems. In addition, staffing the laboratory with qualified technical personnel to run the MS/MS system and qualified clinical scientists to interpret the profiles can be a challenge. A number of false-positive results will also be obtained with these newborn screening programs. Many of these findings are due to parenteral nutrition, biologic variation, or treatment, and are not the result of an inborn error of metabolism. Therefore, qualified staff will be needed to ensure that patients with abnormal results are contacted and receive follow-up testing and counseling, if needed. Even with these concerns, the American College of Medical Genetics report is a step in the right direction toward

standardizing guidelines for state newborn screening programs.

TESTING IN REFINING A DIFFERENTIAL DIAGNOSIS. The use of laboratory tests in refining a differential diagnosis satisfies PV theory because a correct differential diagnosis should result in a relatively high prevalence of the disease under consideration. An example of testing in refining a differential diagnosis is the measurement of urinary vanillylmandelic acid (VMA) for the diagnosis of neuroblastoma. A simple spot test for VMA is not useful in general screening programs because of the low prevalence of neuroblastoma (3 cases/100,000) and the low sensitivity of the test (69%). Even though the specificity of urinary VMA is 99.6%, testing of 100,000 children would produce 2 true-positive test results, 400 false-positive results, and 1 false-negative result. The PV of a positive result in this setting is 0.5%, and the PV of a negative result is 99.99%, not much different from the assumption that neuroblastoma is not present. Testing for urinary VMA in a 3 yr old child with an abdominal mass, however, gives a useful result because the prevalence of neuroblastoma is at least 50% in 3 yr old children with abdominal masses. If 100 such children are tested and the prevalence of neuroblastoma in the group is assumed to be 50%, then a satisfactory PV is obtained.

$$\text{PV of positive test result} = \frac{0.69 \times 50}{0.69 \times 50 + (0.004 \times 50)} \times 100 = 99\%$$

$$\text{PV of negative test result} = \frac{0.996 \times 50}{0.996 \times 50 + (0.31 \times 50)} \times 100 = 76\%$$

Thus, in this situation, a test with low sensitivity is powerful in refining the differential diagnosis because the PV of a positive result is almost 100% in the setting of high prevalence.

Serologic Testing. Using laboratory testing to refine a differential diagnosis poses problems, as exemplified by serologic testing for Lyme disease, which is a tick-borne infection by *Borrelia burgdorferi* that has various manifestations in both early and late stages of infection (see Chapter 219). Direct demonstration of the organism is difficult, and serologic test results for Lyme disease are not reliably positive in young patients presenting early with erythema chronicum migrans. These results become positive after a few wk of infection and remain positive for a number of yr. In an older population being evaluated for late-stage Lyme disease, some individuals will have recovered from either clinical or subclinical Lyme disease and some will have active Lyme disease, with both groups having true-positive serologic test results. Of individuals without Lyme disease, some will have true-negative serologic test results, but a significant percentage will have antibodies to other organisms that cross-react with *B. burgdorferi* antigens.

This set of circumstances gives rise to a number of problems. First, the protean nature of Lyme disease makes it difficult to ensure a high prevalence of disease in subjects to be tested. Second, the most appropriate antibodies to be detected are imperfectly defined, leading to a wide variety of tests with varying false-positive and false-negative rates. Third, the natural history of the antibody response to infection and the difficulty of showing the causative organism directly combine to make laboratory diagnosis of early Lyme disease difficult. Fourth, in the diagnosis of late-stage Lyme disease in older subjects, the laboratory diagnosis is plagued by misleading positive (either false-positive or true-positive, but not clinically relevant) results, typically an enzyme-linked immunosorbent assay that uses whole *B. burgdorferi* organisms. In a review of 788 patients referred to a specialty clinic with the diagnosis of Lyme disease, the diagnosis was correct in 180 patients, 156 patients had true seropositivity without active Lyme disease, and 452 had never had Lyme disease, even though 45% of them were found to be seropositive by at least one test before referral.

TABLE 714-4. Laboratory Profile as a Review of Systems

LABORATORY TEST	ASSESSMENT FACILITATED BY TESTS
Complete blood cell count and platelets	Nutrition, status of formed elements
Complete urinalysis	Renal function/genitourinary tract inflammation
Albumin and cholesterol	Nutrition
ALT, bilirubin, GGT	Liver function
BUN, creatinine	Renal function, nutrition
Sodium, potassium, chloride, bicarbonate	Electrolyte homeostasis
Calcium and phosphorus	Calcium homeostasis

ALT, alanine aminotransferase; BUN, blood urea nitrogen; GGT, γ-glutamyltransferase.

A two-step approach, similar to that used in HIV testing, is commonly used: a screening test that has high sensitivity (e.g., enzyme-linked immunosorbent assay) and excellent negative PV, followed by a very specific confirmatory test for verification of positive screening test results (e.g., Western blot to detect antibodies to selected bacterial antigens). Negative screening test results and negative verification test results are reported as negative. Positive verification test results are reported as positive. However, standardization of the testing procedures is difficult in North America, where only 1 pathogenic strain of *B. burgdorferi* is found, and is more difficult elsewhere in the Northern hemisphere, where as many as 3 pathogenic strains are present. Identification of microbial DNA in body fluids by polymerase chain reaction is definitive, but invasive.

Laboratory Screening. Screening profiles (Table 714-4) are used as part of a complete review of systems, to establish a baseline value, or to facilitate patient care in specific circumstances, such as: (1) when a patient clearly has an illness, but a specific diagnosis remains elusive; (2) when a patient requires intensive care; (3) for postmarketing surveillance and evaluation of a new drug; and (4) when a drug is used that is known to have systemic adverse effects. Laboratory screening tests should be used in a targeted manner to supplement, not supplant, a complete history and physical examination.

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Chapter 715 ■ Reference Ranges for Laboratory Tests and Procedures

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In Tables 715-1 through 715-6, the reference ranges apply to infants, children, and adolescents when possible. For many analyses, however, separate reference ranges for children and adolescents are not well delineated. When interpreting a test result, the reference range supplied by the laboratory performing the test should always be used. See Figures 715-1 and 715-2 for estimations related to dosages.

TABLE 715-1. Prefixes Denoting Decimal Factors

PREFIX	SYMBOL	FACTOR
Mega-	M	10^{6}
Kilo-	k	10^{3}
Hecto-	h	10^{2}
Deka-	da	10^{1}
Deci-	d	10^{-1}
Centi-	c	10^{-2}
Milli-	m	10^{-3}
Micro-	μ	10^{-6}
Nano-	n	10^{-9}
Pico-	p	10^{-12}
Femto-	f	10^{-15}

TABLE 715-2. Abbreviations

Ab	Absorbance
AU	Arbitrary unit
BB	Brain isoenzyme of creatine kinase
cap	Capillary
CH_{50}	Dilution required to lyse 50% of indicator red blood cells; indicates complement activity
Cr	Creatinine
CSF	Cerebrospinal fluid
F	Female
g	Gram
hr	Hour, hours
Hb	Hemoglobin
HbCO	Carboxyhemoglobin
hpf	High-power field
IU	International unit of hormone activity
L	Liter
M	Male
MB	Heart isoenzyme of creatine kinase
mEq/L	Milliequivalents per liter
min	Minute, minutes
mm^3	Cubic millimeter, microliter (μL)
mm Hg	Millimeters of mercury
mo	Month, months
mol	Mole
mmol	Millimole
mOsm	Milliosmole
MW	Relative molecular weight
ND	Not detected
nm	Nanometer (wavelength)
Pa	Pascal
pc	Postprandial
RBC	Red blood cell(s), erythrocyte(s)
RT	Room temperature
sec	Second, seconds
SD	Standard deviation
Tr	Trace
U	International unit of enzyme activity
V	Volume
WBC	White blood cell(s)
WHO	World Health Organization
wk	Week, weeks
yr	Year, years

TABLE 715-3. Symbols

> Greater than	≤ Less than or equal to
≥ Greater than or equal to	± Plus or minus
< Less than	≈ Approximately equal to

TABLE 715-4. Abbreviations for Specimens

S	Serum
P	Plasma
(H)	Heparin
(LiH)	Lithium heparin
(E)	Ethylenediaminetetraacetic acid (EDTA)
(C)	Citrate
(O)	Oxalate
W	Whole blood
U	Urine
F	Feces
CSF	Cerebrospinal fluid
AF	Amniotic fluid
(NaC)	Sodium citrate
(NH_4H)	Ammonium heparinate

TABLE 715-5. Key to Comments

30°C, 37°C	Temperature of enzymatic analysis (Celsius)
a	Values obtained are significantly method-dependent
b	Values in older males are higher than those in older females
c	Values in older females are higher than those in older males
d	Atomic absorption
e	Borate affinity chromatography
f	Cation-exchange chromatography
g	Vitros, a proprietary analytic system of Ortho Clinical Diagnostics, Inc.
i	Electrophoresis
j	Enzymatic assay
k	Enzyme-amplified immunoassay
l	Fluorometric method
m	Fluorescence-activated cell sorting (FACS)
n	Fluorescence polarization
o	Gas chromatography
p	High-performance liquid chromatography (HPLC)
q	Indirect fluorescence antibody (IFA) assay
r	Ion-selective electrode
s	Nephelometry
t	Optical density
u	Radial immunodiffusion (RID)
v	Radioimmunoassay (RIA)
w	Spectrophotometry

TABLE 715-6. Reference Ranges*†

ANALYTE OR PROCEDURE	SPECIMEN	REFERENCE VALUES (USA)		CONVERSION FACTOR	REFERENCE VALUES (SI)	COMMENTS
Complete Blood Count						
Hematocrit (HCT, Hct)	W(E)		% of packed red cells (V red cells/V whole blood cells × 100		Volume fraction (V red cells/V whole blood)	
Calculated from mean corpuscular volume (MCV) and RBC count (electronic displacement or laser)		1 day (cap)	48–69%	×0.01	0.48–0.69	
		2 days	48–75%		0.48–0.75	
		3 days	44–72%		0.44–0.72	
		2 mo	28–42%		0.28–0.42	
		6–12 yr	35–45%		0.35–0.45	
		12–18 yr M	37–49%		0.37–0.49	
		F	36–46%		0.36–0.46	
		18–49 yr M	41–53%		0.41–0.53	
		F	36–46%		0.36–0.46	
Hemoglobin (Hb)	W(E)		g/dL		mmol/L	
		1–3 days (cap)	14.5–22.5	×0.155	2.25–3.49	MW Hb = 64,500
		2 mo	9.0–14.0		1.40–2.17	
		6–12 yr	11.5–15.5		1.78–2.40	
		12–18 yr M	13.0–16.0		2.02–2.48	
		F	12.0–16.0		1.86–2.48	
		18–49 yr M	13.5–17.5		2.09–2.27	
		F	12.0–16.0		1.86–2.48	
	P(H)	See *Chemical Elements*				
Erythrocyte indices (RBC indices)						
Mean corpuscular hemoglobin (MCH)	W(E)		pg/cell		fmol/cell	
		Birth	31–37	×0.0155	0.48–0.57	
		1–3 days (cap)	31–37		0.48–0.57	
		1 wk–1 mo	28–40		0.43–0.62	
		2 mo	26–34		0.40–0.53	
		3–6 mo	25–35		0.39–0.54	
		0.5–2 yr	23–31		0.36–0.48	
		2–6 yr	24–30		0.37–0.47	
		6–12 yr	25–33		0.39–0.51	
		12–18 yr	25–35		0.39–0.54	
		18–49 yr	26–34		0.40–0.53	
Mean corpuscular hemoglobin concentration (MCHC)	W(E)		% Hb/cell or g Hb/dL RBC		mmol Hb/L RBC	
		Birth	30–36	×0.155	4.65–5.58	
		1–3 days (cap)	29–37		4.50–5.74	
		1–2 wk	28–38		4.34–5.89	
		1–2 mo	29–37		4.50–5.74	
		3 mo–2 yr	30–36		4.65–5.58	
		2–18 yr	31–37		4.81–5.74	
		>18 yr	31–37		4.81–5.74	
Mean corpuscular volume (MCV)	W(E)		μm^3		fL	
		1–3 days (cap)	95–121	×1	95–121	
		0.5–2 yr	70–86		70–86	
		6–12 yr	77–95		77–95	
		12–18 yr M	78–98		78–98	
		F	78–102		78–102	
		18–49 yr M	80–100		80–100	
		F	80–100		80–100	
Leukocyte count (WBC count)	W(E)		×1,000 cells/mm^3 (μL)		$\times 10^9$ cells/L	
		Birth	9.0–30.0	×1	9.0–30.0	
		24 hr	9.4–34.0		9.4–34.0	
		1 mo	5.0–19.5		5.0–19.5	
		1–3 yr	6.0–17.5		6.0–17.5	
		4–7 yr	5.5–15.5		5.5–15.5	
		8–13 yr	4.5–13.5		4.5–13.5	
		Adult	4.5–11.0		4.5–11.0	
Leukocyte differential	W(E)		%		Number fraction	
Myelocytes			0%	×0.01	0	
Neutrophils ("bands")			3–5%		0.03–0.05	
Neutrophils ("segs")			54–62%		0.54–0.62	
Lymphocytes			25–33%		0.25–0.33	
Monocytes			3–7%		0.03–0.07	
Eosinophils			1–3%		0.01–0.03	
Basophils			0–0.75%		0–0.0075	
			Cells/mm^3 (μL)		$\times 10^6$ cells/L	
Myelocytes			0	×1	0	
Neutrophils ("bands")			150–400		150–400	
Neutrophils ("segs")			3,000–5,800		3,000–5,800	
Lymphocytes			1,500–3,000		1,500–3,000	
Monocytes			285–500		285–500	
Eosinophils			50–250		50–250	
Basophils			15–50		15–50	

TABLE 715-6. Reference Ranges*†—cont'd

ANALYTE OR PROCEDURE	SPECIMEN	REFERENCE VALUES (USA)		CONVERSION FACTOR	REFERENCE VALUES (SI)	COMMENTS
Platelet count (thrombocyte count)	W(E)	$\times 10^3/mm^3$ (μL)			$\times 10^9/L$	
		Newborn 84–478 (after 1 wk, same as adult)		$\times 10^6$	84–478	(Buck, 1996)
		Adult 150–400			150–400	
Reticulocyte count	W(E,H,O)	Adults 0.5–1.5% of erythrocytes or 25,000–75,000/mm^3 (μL)		$\times 0.01$ $\times 10^6$	0.005–0.015 (number fraction) or 25,000–75,000 × 10^6/L	
			%		Number fraction	
	W(cap)	1 day	0.4–6.0	$\times 0.01$	0.004–0.060	
		7 days	<0.1–1.3		<0.001–0.013	
		1–4 wk	<1.0–1.2		<0.001–0.012	
		5–6 wk	<0.1–2.4		<0.001–0.024	
		7–8 wk	0.1–2.9		0.001–0.029	
		9–10 wk	<0.1–2.6		<0.001–0.026	
		11–12 wk	0.1–1.3		0.001–0.013	
Alanine aminotransferase (ALT, SGPT)	S	0–5 days	6–50 U/L	×1	6–50 U/L	37°bw
		1–19 yr	5–45		5–45	(Lockitch, Halstead, and Albersheim, 1988)
Albumin	P	Premature 1 day	1.8–3.0 g/dL	×10	18–30 g/dL	g (Meites, 1989)
		Full term <6 days	2.5–3.4		25–34	
		<5 yr	3.9–5.0		39–50	
		5–19 yr	4.0–5.3		40–53	
Ammonia	W	<30 days	21–95 µmol/L	×1	21–95 µmol/L	(Diaz et al., 1995)
		1–12 mo	18–74		18–74	
		1–14 yr	17–68		17–68	
		>14 yr	19–71		19–71	
Amylase	S,P	1–19 yr	30–100 U/L	×1	30–100 U/L	(Lockitch, Halstead, and Albersheim et al., 1988; Gillard et al., 1983)
			% pancreatic fraction		% pancreatic fraction	
Amylase isoenzymes	S,P(H)	Cord–8 mo	0–34%	×0.01	0–0.34%	
		9 mo–4 yr	5–56%		0.05–0.56%	
		5–19 yr	23–59%		0.23–0.59%	
Anion gap (sodium − [chloride + bicarbonate])	P(H)	7–16 mEq/L		×1	7–16 mEq/L	
Anti-deoxyribonuclease B titer (anti-DNase B titer)	S	Age	Upper limit of normal		Upper limit of normal	
		4–6 yr	240–480 U	×1	240–480 U	(Kaplan et al., 1998)
		7–12 yr	480–800 U		480–800 U	
Antidiuretic hormone (hADH, vasopressin)	P(E)	Plasma osmolarity (mOsm/kg)	Plasma ADH (pg/mL)		Plasma ADH ng/L	
		270–280	<1.5	×1	<1.5	
		280–285	<2.5		<2.5	
		285–290	1–5		1–5	
		290–295	2–7		2–7	
		295–300	4–12		4–12	
Antistreptolysin-O titer (ASO titer)	S	Age	Upper limit of normal		Upper limit of normal	(Kaplan et al., 1998)
		2–5 yr	120–160 Todd units	×1	120–160 Todd units	
		6–9 yr	240 Todd units		240 Todd units	
		10–12 yr	320 Todd units		320 Todd units	
Aspartate aminotransferase (AST, SGOT)	S		U/L		U/L	
		0–5 days	35–140	×1	35–140	37°b(Lockitch, Halstead, and Quigley et al., 1988)
		1–9 yr	15–55		15–55	
		10–19 yr	5–45		5–45	
Base excess	W(H)		mmol/L		mmol/L	
		Newborn	(−10)–(−2)	×1	(−10)–(−2)	
		Infant	(−7)–(−1)		(−7)–(−1)	
		Child	(−4)–(+2)		(−4)–(+2)	
		Thereafter	(−3)–(+3)		(−3)–(−3)	
Bicarbonate	S,P		mmol/L	×1	mmol/L	
		Arterial	21–28		21–28	
		Venous	22–29		22–29	
C-reactive protein (high sensitivity)	S		M (mg/dL) F (mg/dL)		M (mg/L) F (mg/L)	(Soldin et al., 2004)
		0–90 days	0.08–1.58 0.09–1.58	×10	0.8–15.8 0.9–15.8	
		91 days–12 mo	0.08–1.12 0.05–0.79		0.8–11.2 0.5–7.9	
		13 mo–3 yr	0.08–1.12 0.08–0.79		0.8–11.2 0.8–7.9	
		4–10 yr	0.06–0.79 0.5–1.0		0.6–7.9 0.5–10.0	
		11–14 yr	0.08–0.76 0.06–0.81		0.8–7.6 0.6–8.1	
		15–18 yr	0.04–0.79 0.06–0.79		0.4–7.9 0.6–7.9	
Calcium, ionized (Ca)	S,P(H), W(H)		mg/dL		mmol/L	
		Cord blood	5.0–6.0	×0.25	1.25–1.50	
		Newborn, 3–24 hr	4.3–5.1		1.07–1.27	
		24–48 hr	4.0–4.7		1.00–1.17	
		Thereafter	4.8–4.92		1.12–1.23	
		or	2.24–2.46 Eq/L	×0.5	1.12–1.23	

TABLE 715-6. Reference Ranges*†—cont'd

ANALYTE OR PROCEDURE	SPECIMEN	REFERENCE VALUES (USA)		CONVERSION FACTOR	REFERENCE VALUES (SI)	COMMENTS
Calcium, total	S		mg/dL		mmol/L	
		Cord blood	9.0–11.5	×0.25	2.25–2.88	
		Newborn, 3–24 hr	9.0–10.6		2.3–2.65	
		24–48	7.0–12.0		1.75–3.00	
		4–7 days	9.0–10.9		2.25–2.73	
		Child	8.8–10.8		2.20–2.70	
		Thereafter	8.4–10.2		2.10–2.55	
Carbon dioxide, partial pressure (PCO_2)	W(H)		mm Hg		kPa	
		Newborn	27–40	×0.1333	3.6–5.3	
		Infant	27–41		3.6–5.5	
		Thereafter M	35–48		4.7–6.4	
		F	32–45		4.3–6.0	
Carbon monoxide (carboxyhemoglobin)	W(E)	Nonsmoker	<2% HbCO	×0.01	HbCO fraction < 0.02	
		Smoker	<10%		<0.10	
		Lethal	>50%		>0.5	
Chloride	S,P(H)	Cord blood	96–104 mmol/L	×1	96–104 mmol/L	
		Newborn	97–110		97–110	
		Thereafter	98–106		98–106	
Cortisol	S,P(H)		µg/dL		nmol/L	
		Newborn	1–24	×27.59	28–662	
		Adults, 8:00 A.M.	5–23		138–635	
		4:00 P.M.	3–15		82–413	
		8:00 P.M.	<50% of 8:00 A.M.	×0.01	Fraction of 8:00 A.M.	
					≤0.50	
Creatine kinase	S	Cord blood	70–380 U/L	×1	70–380 U/L	30° b (Jedeikin et al., 1982)
		5–8 hr	214–1,175		214–1,175	
		24–33 hr	130–1,200		130–1,200	
		72–100 hr	87–725		87–725	
		Adult	5–130		5–130	
Creatine kinase isoenzymes	S		% MB	% BB		
		Cord blood	0.3–3.1	0.3–10.5		
		5–8 hr	1.7–7.9	3.6–13.4		
		24–33 hr	1.8–5.0	2.3–8.6		
		72–100 hr	1.4–5.4	5.1–13.3		
		Adult	0–2	0		
Creatinine						
Jaffe, kinetic, or enzymatic	S,P		mg/dL		µmol/L	
		Cord blood	0.6–1.2	×88.4	53–106	
		Newborn	0.3–1.0		27–88	
		Infant	0.2–0.4		18–35	
		Child	0.3–0.7		27–62	
		Adolescent	0.5–1.0		44–88	
		Adult M	0.6–1.2		53–106	
		F	0.5–1.1		44–97	
Creatinine clearance (endogenous)	S,P,U	Newborn 40–65 mL/min/1.73 m^2				
		<40 YR, M 97–137				
		F 88–128				
		Decreases <6.5 mL/min/decade				
Ferritin	S		ng/mL		µg/L	
		Newborn	25–200	×1	25–200	
		1 mo	200–600		200–600	
		2–5 mo	50–200		50–200	
		6 mo–15 yr	7–140		7–140	
		Adult, M	15–200		15–200	
		F	12–150		12–150	
Folate	S	Newborn 7.0–32 ng/mL		×2.265	15.9–72.4 nmol/L	
		Thereafter 1.8–9.0			4.1–20.4	
	W(E)	150–450 ng/mL RBCs			340–1,020 nmol/L cells	
Glucose	S		mg/dL		mmol/L	
		Cord blood	45–96	×0.0555	2.5–5.3	
		Premature	20–60		1.1–3.3	
		Neonate	30–60		1.7–3.3	
		Newborn				
		1 day	40–60		2.2–3.3	
		>1 day	50–90		2.8–5.0	
		Child	60–100		3.3–5.5	
		Adult	70–105		3.9–5.8	
	W(H)	Adult	65–95		3.6–5.3	
Glucose, 2 hr post	S	<120 mg/dL			<6.7 mmol/L	
Glucose tolerance test (GTT)	S		mg/dL		mmol/L	
Oral dose Adult: 75 g			Normal / Diabetic		Normal / Diabetic	
Child: 1.75 g/kg of ideal weight, up to a maximum of 75 g		Fasting	70–105 / ≥126	×0.0555	3.9–5.8 / ≥7.0	(American Diabetes Association, 1977)
		60 min	120–170 / ≥200		6.7–9.4 / ≥11	
		90 min	100–140 / ≥200		5.6–7.8 / ≥11	
		120 min	70–120 / ≥200		3.9–6.7 / ≥11	

TABLE 715-6. Reference Ranges*†—cont'd

ANALYTE OR PROCEDURE	SPECIMEN	REFERENCE VALUES (USA)		CONVERSION FACTOR	REFERENCE VALUES (SI)	COMMENTS
Glucose-6-phosphate dehydrogenase (G6PD) in erythrocytes Bishop, modified		W(E,H,C) Adult 3.4–8.0 U/g Hb 98.6–232 U/10^{12} RBC 1.16–2.72 U/mL RBC Newborn: 50% higher		×0.0645 ×10^{-3} ×1	Adult 0.22–0.52 mU/mol Hb 0.10–0.23 nU/10^{6} RBC 1.16–2.72 kU/L RBC Newborn: 50% higher	
γ-glutamyl transpeptidase (GGT, GGTP)	S		U/L		U/L	
		Cord blood	37–193	×1	37–193	37°b(Knight and Haymond, 1981)
		0–1 mo	13–147		13–147	
		1–2 mo	12–123		12–123	
		2–4 mo	8–90		8–90	
		4 mo–10 yr	5–32		5–32	
		10–15 yr	5–24		5–24	
Immunoglobulin A (IgA)	S		mg/dL	×10	mg/L	
		Cord blood	1.4–3.6		14–36	s (Meites, 1989)
		1–3 mo	1.3–53		13–530	
		4–6 mo	4.4–84		44–840	
		7 mo–1 yr	11–106		110–1,060	
		2–5 yr	14–159		140–1,590	
		6–10 yr	33–236		330–2,360	
		Adult	70–312		700–3,120	
Immunoglobulin D (IgD)	S	Newborn: none detected Thereafter: 0–8 mg/dL		×10	None detected 0–80 mg/L	
Immunoglobulin E (IgE)	S	M 0–230 IU/mL F 0–170		×1	0–230 kIU/L 0–170	
Immunoglobulin G (IgG)	S		mg/dL		g/L	
		Cord blood	636–1,606	×0.01	6.36–16.06	s (Meites, 1989)
		1 mo	251–906		2.51–9.06	
		2–4 mo	176–601		1.76–6.01	
		5–12 mo	172–1,069		1.72–10.69	
		1–5 yr	345–1,236		3.45–12.36	
		6–10 yr	608–1,572		6.08–15.72	
		Adult	639–1,349		6.39–13.49	
Immunoglobulin M (IgM)	S		mg/dL		mg/L	
		Cord blood	6.3–25	×10	63–250	s (Meites, 1989)
		1–4 mo	17–105		170–1,050	
		5–9 mo	33–126		330–1,260	
		10 mo–1 yr	41–173		410–1,730	
		2–8 yr	43–207		430–2,070	
		9–10 yr	52–242		520–2,420	
		Adult	56–352		560–3,520	
Iron	S	All ages	22–184 µg/dL	×0.1791	4–33 µmol/L	(Lockitch, Halstead, and Wadsworth et al., 1988)
Iron-binding capacity, total (TIBC)	S	Infant 100–400 µg/dL Thereafter 250–400		×0.179	17.90–71.60 µmol/L 44.75–71.60	
L-lactate	W		mmol/L		mmol/L	(Bonnefont et al., 1990)
		1–12 mo	1.1–2.3	×1	1.1–2.3	
		1–7 yr	0.8–1.5		0.8–1.5	
		7–15 yr	0.6–0.9		0.6–0.9	
D-lactate	P(H)					j (Rosenthal and Pesce, 1985)
		6 mo–3 yr	0.0–0.3	×1	0.0–0.3	
Lactate dehydrogenase	S		U/L		U/L	
		<1 yr	170–580	×1	170–580	37° a (Meites, 1989)
		1–9 yr	150–500		150–500	
		10–19 yr	120–330		120–330	
Isoenzymes	S		% of total activity 1–6 yr / 7–19 yr			
		LD1	20–38 / 20–35			
		LD2	27–38 / 31–38			
		LD3	16–26 / 19–28			
		LD4	5–16 / 7–13			
		LD5	3–13 / 5–12			
Lead	W(H)		µg/dL		mmol/L	
		Child	<10	×0.0483	<0.48	
		Toxic	≥70		≥3.38	
Lipase	P,S	1–18 yr	145–216 U/L	×1	145–216 U/L	(Ghoshal and Soldin, 2003)
Magnesium	P(H)		mg/dL		mmol/L	
		0–6 days	1.2–2.6	×0.411	0.48–1.05	w (Meites, 1989)
		7 days–2 yr	1.6–2.6		0.65–1.05	
		2–14 yr	1.5–2.3		0.60–0.95	

TABLE 715-6. Reference Ranges*†—cont'd

ANALYTE OR PROCEDURE	SPECIMEN	REFERENCE VALUES (USA)	CONVERSION FACTOR	REFERENCE VALUES (SI)	COMMENTS
Methemoglobin (MetHb)	W(E,H,C)	0.06–0.24 g/dL or 0.78 ± 0.37% of total Hb	×155 ×0.01	9.3–37.2 µmol/L 0.0078 ± 0.0037 (mass fraction)	
Osmolality	S	Child, adult 275–295 mOsmol/kg H_2O			
Phosphatase, alkaline	S	U/L 1–9 yr 145–420 10–11 yr 130–560 M F 12–13 yr 200–495 105–420 14–15 yr 130–525 70–230 16–19 yr 65–260 50–130	×1	U/L 145–420 130–560 M F 200–495 105–420 130–525 70–230 65–260 50–130	37°C aw (Lockitch, Halstead, and Albersheim et al., 1988)
Phosphorus, inorganic	S,P(H)	mg/dL 0–5 days 4.8–8.2 1–3 yr 3.8–6.5 4–11 yr 3.7–5.6 12–15 yr 2.9–5.4 16–19 yr 2.7–4.7	×0.3229	mmol/L 1.55–2.65 1.25–2.10 1.20–1.80 0.95–1.75 0.90–1.50	w (Meites, 1989)
Potassium	S	mmol/L <2 mo 3.0–7.0 2–12 mo 3.5–6.0 >12 mo 3.5–5.0	×1	mmol/L 3.0–7.0 3.5–6.0 3.5–5.0	r (Meites, 1989) Increased by hemolysis; serum values systematically higher than plasma values
	P(H)	3.5–4.5 mmol/L		3.5–4.5 mmol/L	
Prealbumin (transthyretin)	P	mg/L 2–6 mo 142–330 6–12 mo 120–274 1–3 yr 108–259	×1	mg/L 142–330 120–274 108–259	s (Sherry et al., 1988)
Protein, total	S	g/dL Premature 4.3–7.6 Newborn 4.6–7.4 1–7 yr 6.1–7.9 8–12 yr 6.4–8.1 13–19 yr 6.6–8.2	×10	g/L 43–76 46–74 61–79 64–81 66–82	(Meites, 1989)
Pyruvate	W	7–17 yr 0.076 ± 0.026 mmol/L	×1	0.076 ± 0.026 mmol/L	(Pianosi et al., 1995)
Sodium	S,P (Li,NH_4,H)	mmol/L Newborn 134–146 Infant 139–146 Child 138–145 Thereafter 136–146	×1	mmol/L 134–146 139–146 138–146 136–146	
Thyroid-stimulating hormone	S	Premature (28–36 wk) mIU/L 1st wk of life 0.7–27.0 Term infants Cord blood 2.3–13.2 1–2 days 3.2–34.6 3–4 days 0.7–15.4 2–20 wk 1.7–9.1 21 wk–20 yr 0.7–6.4	×1	mIU/L 0.7–27.0 2.3–13.2 3.2–34.6 0.7–15.4 1.7–9.1 0.7–6.4	(Nichols Institute Diagnostics)
Thyroid uptake of radioactive iodine	Activity over thyroid gland	2 hr <6% 6 hr 3–20% 24 hr 8–30%	×0.01	2 hr <0.06 6 hr 0.03–0.20 24 hr 0.08–0.30	
Thyroid uptake of technetium 99 m	Activity over thyroid gland	After 24 hr 0.4–3.0%	×0.01	Fractional uptake 0.004–0.030	
Thyrotropin-releasing hormone (hTRH)	P	5–60 pg/mL	×2.759	14–165 pmol/L	
Thyroxine-binding globulin (TBG)	S	mg/dL Cord blood 1.4–9.4 1–4 wk 1.0–9.0 1–12 mo 2.0–7.6 1–5 yr 2.9–5.4 5–10 yr 2.5–5.0 10–15 yr 2.1–4.6 Adult 1.5–3.4	×10	mg/L 14–94 10–90 20–76 29–54 25–50 21–46 15–34	
Thyroxine, total	S	Full-term infants µg/dL 1–3 days 8.2–19.9 1 wk 6.0–15.9 1–12 mo 6.1–14.9 Prepubertal children 1–3 yr 6.8–13.5 3–10 yr 5.5–12.8 Pubertal children and adults 4.2–13.0	×12.9	Full-term infants nmol/L 1–3 days 106–256 1 wk 77–205 1–12 mo 79–192 Prepubertal children 1–3 yr 88–174 3–10 yr 71–165 Pubertal children and adults 54–167	(Esoterix Endocrinology)

TABLE 715-6. Reference Ranges*†—cont'd

ANALYTE OR PROCEDURE	SPECIMEN	REFERENCE VALUES (USA)		CONVERSION FACTOR	REFERENCE VALUES (SI)		COMMENTS
Thyroxine, free	S	Newborn infants	ng/dL	×12.9	Full-term infants	pmol/L	(Esoterix Endocrinology)
		3 days	2.0–4.9		3 days	26–63	
		Infants	0.9–2.6		Infants	12–33	
		Prepubertal children	0.8–2.2		Prepubertal children	10–28	
		Pubertal children and adults	0.8–2.3		Pubertal children and adults	10–30	
Thyroxine, total	W	Newborn screen (filter paper)	6.2–22.0 µg/dL	×12.9	80–283 nmol/L		
Triiodothyronine, free	S		pg/dL		pmol/L		
		Cord blood	20–240	×0.01536	0.3–3.7		
		1–3 dys	200–610		3.1–9.4		
		6 wk	240–560		3.7–8.6		
		Adult (20–50 yr)	230–660		3.5–10.0		
Triiodothyronine resin uptake test (T_3RU)	S				Fractional uptake		
		Newborn 26–36%		×0.01	0.26–0.36		
		Thereafter 26–35%			0.26–0.35		
Triiodothyronine, total	S		ng/dL		nmol/L		
		Cord blood	30–70	×0.0154	0.46–1.08		
		Newborn	75–260		1.16–4.00		
		1–5 yr	100–260		1.54–4.00		
		5–10 yr	90–240		1.39–3.70		
		10–15 yr	80–210		1.23–3.23		
		Thereafter	115–190		1.77–2.93		
Urea nitrogen	S,P		mg/dL		mmol urea/L		
		Cord blood	21–40	×0.357	7.5–14.3		
		Premature (1 wk)	3–25		1.1–9.0		
		Newborn	3–12		1.1–4.3		
		Infant or child	5–18		1.8–6.4		
		Thereafter	7–18		2.5–6.4		
Uric acid	S		mg/dL		µmol/L		J (Meites, 1989)
		1–5 yr	1.7–5.8	×59.48	100–350		
		6–11 yr	2.2–6.6		130–390		
		M 12–19 yr	3.0–7.7		180–460		
		F 12–19 yr	2.7–5.7		160–340		

A more comprehensive list of reference ranges can be found online at: *www.nelsonpediatrics.com.

†In preparing the reference range listings, a number of abbreviations, symbols, and codes were used (see Table 715-2).

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TABLE 715-7. Composition of Commonly Used Oral and Parenteral Solutions (Raymond Adelman and Michael Solhaug) [see related conversion Tables 715-8 to 715-10]

FLUID	CARBOHYDRATE (g/dL)	PROTEIN*	CALORIES/L	Na (mEq/L)	K (mEq/L)	Cl (mEq/L)	$HCO_3^{\dagger}$ (mEq/L)	Ca (mEq/L)	P‡ (mEq/L)	Mg (mEq/L)	Osm§‖ (mOsm/kg H_2O)
ORAL											
Apple juice¶	11.9	0.1	480	0	0.4	26	0	3	4.5	0	700
Coca-Cola	10.9	0	435	4.3	0.1	0	13.4	0	0	0	656
Ginger ale	9.0	0	360	3.5	0.1	0	3.6	0	0	0	565
Grape juice	16.6	0.2	672	0.4	30	0	32	0	0	0	1,027
Grapefruit juice (canned, sugar added)	17.8	0.6	736	0.2	35	0	0	6.5	0	0	591
Milk	4.9	3.5	670	22	36	28	30	60	54	0	260
Orange juice	10.4	0.7	444	0.2	49	0	50	0	0	0	654
Pepsi-Cola	12	0	480	6.5	0.8	0	7.3	0	0	0	0
Pineapple juice (canned)	13.5	0.4	556	0.2	38	0	0	7.5	9	0	783
Prune juice	19	0.4	776	0.9	60	0	0	7	20	0	0
Root beer	0	0	0	3.5	3.9	0	0	0	0	0	588
7Up	8.0	0	320	7.5	0.2	0	0	0.3	0	0	564
Tomato juice (canned, salted)	4.3	0	172	100	59	150	10	3	18	0	592
Gatorade	5.9	0	250	21	2.5	17	0	0	6.8	0	377
Hydralyte	2.5	0	100	84	10	59	15	<1	<1	0	300
Lytren	7.0	0	280	30	25	25	36	4	5	4	267§‖
Pedialyte	5.0	0	200	30	20	30	28	4	0	4	387
Rhydrate	2.5	0	100	75	25	65	30	0	0	0	305
Resol Solution	2.0	0	83	50	20	50	34	4	5	4	269
Ricelyte Oral Solution (rice syrup solids)	3.0	0	140	50	25	45	34	0	0	0	200
PARENTERAL											
Carbohydrate†† in H_2O	5–10	0	200–400	0	0	0	0	0	0	0	266–532
Isotonic saline	0–5	0	0–200	154	0	154	0	0	0	0	292–558
½ isotonic saline	2.5–5	0	100–200	77	0	77	0	0	0	0	280–415
3% (M/2) saline	0	0	0	513	0	513	513	0	0	0	969
5% saline	0	0	0	855	0	855	855	0	0	0	1,616
M/6 sodium lactate	0	0	0	167	0	0	167	0	0	0	0
5% sodium bicarbonate	0	0	0	595	0	0	595	0	0	0	0
Lactated Ringer solution	0–5–10	0	0–20	130	4	109	28	3	0	0	261–531–801
			0–40	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0
Modified Butler 1 (a)	5	0	200	25	20	22	23	0	3	3	360
Modified Butler 2 (b)	5–10	0	200–400	56	25	49	26	0	12	5	423–719
Talbot (c)	5	0	200	40	35	40	20	0	15	0	409
Human plasma protein fraction (d)	0	5	0	130	2	50	50	0	0	0	0
Blood	0	3	0	95	4	50	40	0	2	1–2	0
Dextran 10% (low molecular weight) [e]	5	0	200	0	0	0	0	0	0	0	0
Dextran 10% in saline (f)	0	0	0	154	0	154	0	0	0	0	0
Dextran 6% (high molecular weight) [g]	5–10	0	200–400	0	0	0	0	0	0	0	0
Dextran 6% in saline (h)	0	0	0	154	0	154	0	0	0	0	0
Mannitol 20%**	0	0	0	0	0	0	0	0	0	0	0

AVAILABLE ADDITIVES

Glucose 50%	0.5 g/mL
Sodium chloride	2.5 and 5 mEq/mL
Sodium acetate	2 and 4 mEq/mL
Sodium lactate	5 mEq/mL
Sodium bicarbonate	0.5 (4.2%) mEq/mL and 0.9 (7.5%) mEq/mL
Potassium acetate	2 and 4 mEq/mL
Potassium chloride	2 and 3 mEq/mL
Potassium phosphate	4.4 mEq/mL of potassium and 3 mM/mL of phosphate
Calcium gluconate 10%	9.3 mg (0.465 mEq/mL) elemental calcium
Calcium chloride 10%	27.3 mg (1.4 mEq/mL) elemental calcium
Ammonium chloride	5 mEq/mL
Magnesium sulfate	0.8 mEq/mL, 1 mEq/mL, and 4 mEq/mL available as the 10%, 12.5%, and 50% solutions

SELECTED COMMERCIAL PREPARATIONS IN THE UNITED STATES (POSSIBLE SLIGHT VARIATIONS IN COMPOSITION FROM VALUES IN TABLE)

(a)	Ionosol MB in D_5W (A), Isolyte P with 5% dextrose (M)
(b)	Ionosol B in D_5W (A), Electrolyte #2 with 10% invert sugar (C,M), 10% Travert in electrolyte #2 (B)
(c)	Ionosol T in D_5W (A), Isolyte M (M)
(d)	Plasmatein (A), Plasmanate (C)
(e) (f)	LMD 10% (A), dextran 40 (C,M), Rheomacrodex (P), Gentran 40 (B)
(g) (h)	Dextran 70 (A), Macrodex (P), Gentran 75 in 10% Travert (B)

(A–Abbott; B–Baxter; C–Cutter; M–McGraw; P–Pharmacia)

‡Pennington JAT (editor): *Bowes & Church's Food Values of Portions Commonly Used*, 17th ed. Philadelphia, Lippincott Williams & Wilkins, 1997.

*Protein or amino acid equivalent.

†Actual or potential bicarbonate, such as acetate, lactate, or citrate.

‡Calculated according to a valence of 1.8.

§Osmolality, except for values shown (‖), which are osmolarity (in mOsm/L).

¶Composition varies slightly, depending on source.

#Red cell contents not included in calculations.

**Also available: mannitol 5%, 10%, 15%, and 20%.

††Glucose (dextrose, fructose, or invert sugar).

Sources: Pennington JAT (editor): *Bowes & Church's Food Values of Portions Commonly Used*, 17th ed. Philadelphia, Lippincott Williams & Wilkins, 1997; Olin BR (editor): *Facts and Comparisons*. Philadelphia, JB Lippincott, 1993; Murray BN, Peterson LJ: Unpublished observations. Additional values in Wendland BE, Arbus GS: Oral fluid therapy: Sodium and potassium content and osmolality of some commercial soups, juices and beverages. *Can Med Assoc J* 1979;121:564.

TABLE 715-8. Method for Conversion of Milligrams to Milliequivalents per Liter (or to Millimoles per Liter)

mg = milligrams mL = milliliter
g = grams 1 mL = 1.000027 cc
dL = deciliter = 100 mL

$$\text{mEq/L (milliequivalents per liter)} = \frac{\text{mg/L}}{\text{Equivalent weight}}$$

$$\text{Equivalent weight} = \frac{\text{Atomic weight}}{\text{Valence of element}}$$

Example. A sample of blood serum contains 10 mg of Ca in 1 dL (100 mL). The valence of Ca is 2, and the atomic weight is 40. The equivalent weight of Ca is therefore 40 ÷ 2, or 20. Milliequivalents of Ca per liter are 10 (mg/dL) × 10 (dL/L) ÷ 20, or 5 milliequivalents per liter.

$$\text{mmol/L (millimoles per liter)} = \frac{\text{mg/L}}{\text{Molecular weight}}$$

TABLE 715-9. Factors of Conversion of Concentration Expressed in Milliequivalents per Liter to Milligrams per Deciliter (100 L), and Vice Versa, for Common Ions that Occur in Physiologic Solutions

ELEMENT OR RADICAL	mEq/L to mg/dL	mg/dL to mEq/L
Sodium	2.30	0.4348
Potassium	3.91	0.2558
Calcium	2.005	0.4988
Magnesium	1.215	0.8230
Chloride	3.55	0.2817
Bicarbonate (HCO_3^-)	6.1	0.1639
Phosphorus valence 1	3.10	0.3226
Phosphorus valence 1.8	1.72	0.5814
Sulfur valence 2	1.60	0.625

Example: To convert milliequivalents of magnesium per liter to milligrams per deciliter (100 mL), multiply by the factor 1.215; to convert milligrams of potassium per deciliter (100 mL) to milliequivalents per liter, multiply by the factor 0.2558.

TABLE 715-10. Milliequivalents and Milligrams of Cations and Anions Present in 1 Millimole of Salts Commonly Used in Physiologic Solutions

SALT	SALT (mg/mmol)	CATION	SALT (mEq/mmol)	SALT (mg/mmol)	ANION	SALT (mEq/mmol)	SALT (mg/mmol)
Sodium chloride (NaCl)	58.5	Na^+	1	23.0	Cl^-	1	35.5
Potassium chloride (KCl)	74.6	K^+	1	39.1	Cl^-	1	35.5
Sodium bicarbonate ($NaHCO_3$)	84.0	Na^+	1	23.0	HCO_3^-	1	61.0
Sodium lactate ($CH_3CHOHCOONa$)	112.0	Na^+	1	23.0	$CH_3CHOHCOO^-$	1	89.0
Potassium phosphate monobasic (K_2HPO_4)	174.2	K^+	1	78.2	HPO_4^{2-}	2	96.0
Potassium phosphate dibasic (KH_2PO_4)	136.1	K^+	1	39.1	$H_2PO_4^-$	1	97.0
Calcium chloride, anhydrous ($CaCl_2$)	111.0	Ca^{2+}	2	40.0	Cl_2^{2-}	2	71.0
Calcium chloride dihydrate ($CaCl_2 \cdot 2H_2O$)	147.0	Ca^{2+}	2	40.0	Cl_2^{2-}	2	71.0
Magnesium chloride, anhydrous ($MgCl_2$)	95.2	Mg^{2+}	2	24.3	Cl_2^{2-}	2	71.0
Magnesium chloride hexahydrate ($MgCl_2 \cdot 6H_2O$)	203.3	Mg^{2+}	2	24.3	Cl_2^{2-}	2	71.0
Ammonium chloride (NH_4Cl)	53.5	NH_4^+	1	18.0	Cl^-	1	35.5

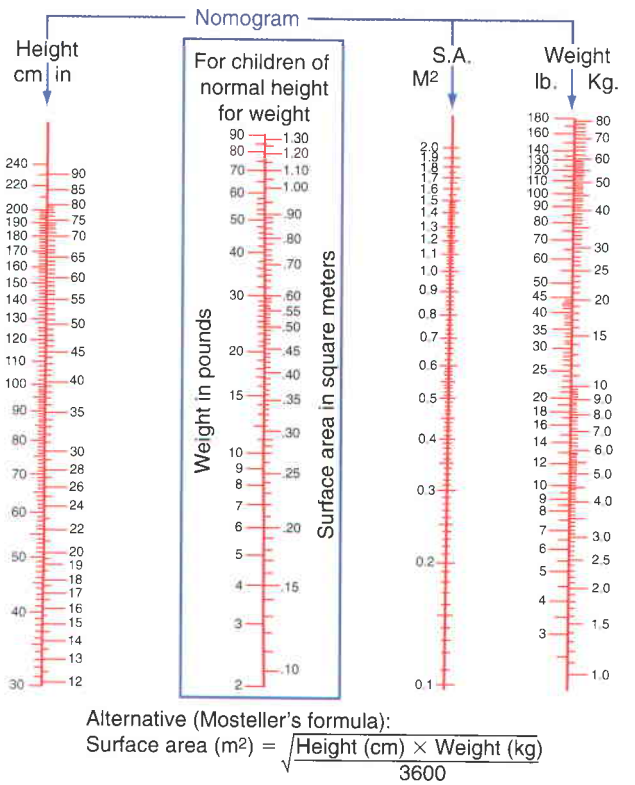

Figure 715-1. Nomogram for the estimation of surface area. The surface area is indicated where a straight line that connects the height and weight levels intersects the surface area column, or if the patient is roughly of average size, from the weight alone *(enclosed area)*. (Nomogram modified from the data of E. Boyd by C. D. West. See also Briars GL, Bailey BJ: Surface area estimation: Pocket calculator v nomogram. *Arch Dis Child* 1994;70:246–247.)

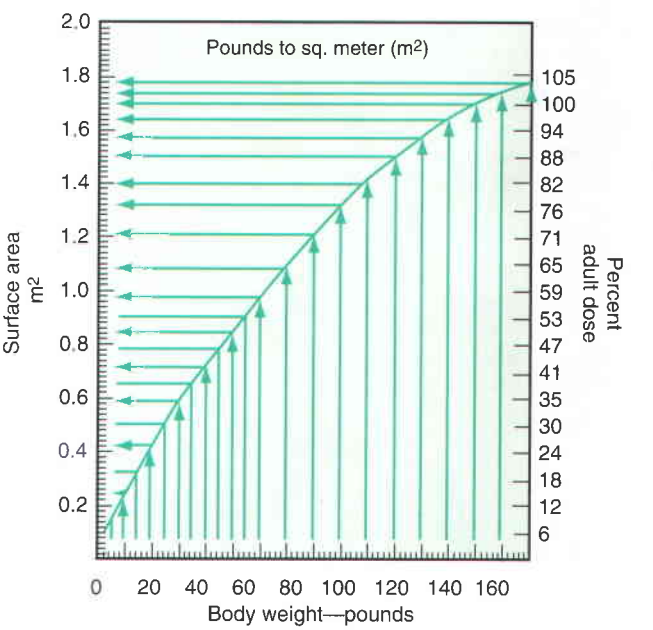

Figure 715-2. Relationships among body weight (lb), body surface area, and adult dosage. The surface area values correspond with those set forth by Crawford JD, Terry ME, Rourke GM: Simplification of drug dosage calculation by application of the surface area principle. *Pediatrics* 1950;5:783–790. Note that the 100% adult dose is for a patient weighing approximately 140 lb and having a surface area of approximately 1.7 M^2. (From Talbot NB, Richie RH, Crawford JH: *Metabolic Homeostasis: A Syllabus for Those Concerned with the Care of Patients.* Cambridge, Harvard University Press, 1959.)

TABLE 715-11. Food Composition for Short Method of Dietary Analysis (Lewis A. Barness and John S. Curran)*

FOOD AND APPROXIMATE MEASURE	WEIGHT (g)	FOOD ENERGY (kcal)	PROTEIN (g)	FAT (g)	CARBOHYDRATE (g)	CALCIUM (mg)	IRON (mg)	VITAMIN A (IU)	THIAMINE (mg)	RIBOFLAVIN (mg)	NIACIN (mg)	ASCORBIC ACID (mg)
MILK, CHEESE, CREAM; RELATED PRODUCTS												
Cheese: blue, cheddar (1 in³), 17 g, cheddar process (1 oz), Swiss (1 oz) cottage (from skim) creamed (½ c)	30	105	6	9	1	165	0.2	345	0.01	0.12	Trace	0
	115	120	16	5	3	105	0.4	190	0.04	0.28	0.1	0
Cream: half and half (cream and milk) [2 tbs] For light whipping, add 1 pat butter	30	40	1	4	2	30	Trace	145	0.01	0.04	Trace	Trace
Milk: whole (3.5% fat) [1 c] fluid, nonfat (skim), and buttermilk (from skim)	245	160	9	9	12	285	0.1	350	0.08	0.42	0.1	2
	245	90	9	Trace	13	300	Trace	0	0.10	0.44	0.2	2
Milk beverage (1 c): cocoa, chocolate drink made with skim milk For malted milk, add 4 tbs half and half (270 g)	245	210	8	8	26	280	0.6	300	0.09	0.43	0.3	Trace
Milk desserts, custard (1 c), 248 g, ice cream (8 fl oz), 142 g		290	8	17	29	210	0.4	785	0.07	0.34	0.1	1
Cornstarch pudding (248 g), ice milk (1 c) 187 g		280	9	10	40	290	0.1	390	0.08	0.41	0.3	2
White sauce, medium (½ c)	130	215	5	16	12	150	0.2	610	0.06	0.22	0.3	Trace
Egg: 1 Large	50	80	6	6	Trace	25	1.2	590	0.06	0.15	Trace	0
MEAT, POULTRY, FISH, SHELLFISH, RELATED PRODUCTS												
Beef, lamb, veal: lean and fat, cooked, including corned beef (3 oz) [all cuts]	85	245	22	16	0	10	2.9	25	0.06	0.19	4.2	0
lean only, cooked; dried beef (2+ oz) [all cuts]	65	140	20	5	0	10	2.4	10	0.05	0.16	3.4	0
Beef, relatively fat, such as steak and rib, cooked (3 oz)	85	350	18	30	0	10	2.4	60	0.05	0.14	3.5	0
Liver: beef, fried (2 oz)	55	130	15	6	3	5	5.0	30,280	0.15	2.37	9.4	15
Pork, lean and fat, cooked (3 oz) [all cuts]	85	325	20	24	0	10	2.6	0	0.62	0.20	4.2	0
lean only, cooked (2+ oz) [all cuts]	60	150	18	8	0	5	2.2	0	0.57	0.19	3.2	0
ham, light cure, lean and fat, roasted (3 oz)	85	245	18	19	0	10	2.2	0	0.40	0.16	3.1	0
Luncheon meats: bologna (2 slices), pork sausage, cooked (2 oz), frankfurter (1), bacon, broiled or fried crisp (3 slices)		185	9	16	0	5	1.3	0	0.21	0.12	1.7	0
Chicken: flesh only, broiled (3 oz)	85	115	20	3	0	10	1.4	80	0.05	0.16	7.4	0
fried (2+ oz)	75	170	24	6	1	10	1.6	85	0.05	0.23	8.3	0
Turkey, light and dark, roasted (3 oz)	85	160	27	5	0	0	1.5	0	0.03	0.15	6.5	0
Salmon, canned (3 oz)	85	130	17	5	0	165	0.7	60	0.03	0.16	6.8	0
Fish sticks, breaded, cooked (3–4)	75	130	13	7	5	10	0.3	0	0.03	0.05	1.2	0
Mackerel, halibut, cooked	85	175	19	10	0	10	0.8	515	0.08	0.15	6.8	0
Bluefish, haddock, herring, perch, shad, cooked (tuna canned in oil, 20 g)	85	160	19	8	2	20	1.0	60	0.06	0.11	4.4	0
Clams, canned; crab meat, canned; lobster; oyster, raw; scallop; shrimp, canned	85	75	14	1	2	65	2.5	65	0.10	0.08	1.5	0
MATURE DRY BEANS AND PEAS, NUTS, PEANUTS, RELATED PRODUCTS												
Beans: white with pork and tomato, canned (1 c)	260	320	16	7	50	140	4.7	340	0.20	0.08	1.5	5
Red (128 g), lima (96 g), cowpeas (125 g), cooked (½ c)		125	8	0	25	35	2.5	5	0.13	0.06	0.7	0
Nuts: almonds (12), cashews (8), peanuts (1 tbs), peanut butter (1 tbs), pecans (12), English walnuts (2 tbs), coconut (¼ c)	15	95	3	8	4	15	0.5	5	0.05	0.9	0	
VEGETABLES AND VEGETABLE PRODUCTS												
Asparagus, cooked, cut spears (⅔ c)	115	25	3	Trace	4	25	0.7	1,055	0.19	0.20	1.6	30
Beans: green (½ c), cooked, 60 g; canned, 120 g		15	1	Trace	3	30	0.4	340	0.04	0.06	0.3	8
Lima, immature, cooked (½ c)	80	90	6	1	16	40	2.0	225	0.14	0.08	1.0	14
Broccoli spears, cooked (⅔ c)	100	25	3	Trace	4	90	0.8	2,500	0.09	0.20	0.8	90
Brussels sprouts, cooked (⅔ c)	85	30	3	Trace	5	30	1.0	450	0.07	0.12	0.7	75
Cabbage (110 g); cauliflower, cooked (80 g); sauerkraut, canned (150 mg) [reduce ascorbic acid value by ⅓ for sauerkraut] [⅔ c]		20	1	Trace	4	35	0.5	80	0.05	0.05	0.3	37
Carrots, cooked (⅔ c)	95	30	1	Trace	7	30	0.6	10,145	0.05	0.05	0.5	6
Corn, 1 ear, cooked (140 g); canned (130 g) [½ c]		75	2	Trace	18	5	0.4	315	0.06	0.06	1.1	6
Leafy greens: collards (125 g), dandelions (120 g), kale (75 g), mustard (95 g), spinach (120 g), turnip (100 g cooked, 150 g canned) [⅔ c] cooked and canned)		30	3	Trace	5	175	1.8	8,570	0.11	0.18	0.8	45
Peas, green (½ c)	80	60	4	1	10	20	1.4	430	0.22	0.09	1.8	16
Potatoes: baked, boiled (100 g), 10 pieces		85	3	Trace	30	10	0.7	Trace	0.08	0.04	1.5	16
French fried (55 g) [for fried, add 1 tbs cooking oil]												
Pumpkin, canned (½ c)	115	40	1	1	9	30	0.5	7,295	0.03	0.06	0.6	6
Squash, winter, canned (½ c)	100	65	2	1	16	30	0.8	4,305	0.05	0.14	0.7	14
Sweet potato, canned (½ c)	110	120	2	0	27	25	0.8	8,500	0.05	0.05	0.7	15
Tomato, 1 raw, ⅔ c canned, ⅔ c juice	150	35	2	Trace	7	14	0.8	1,350	0.10	0.06	1.0	29
Tomato catsup (2 tbs)	35	30	1	Trace	8	10	0.2	480	0.04	0.02	0.6	6
Other, cooked (beets, mushrooms, onions, turnips) [½ c]	95	25	1	0	5	20	0.5	15	0.02	0.10	0.7	7

TABLE 715-11. Food Composition for Short Method of Dietary Analysis (Lewis A. Barness and John S. Curran)*—cont'd

Other, commonly served raw, cabbage		10	Trace	Trace	2	15	0.3	100	0.03	0.03	0.2	20
(½ c, 50 g), celery (3 small stalks, 40 g),	25	10	Trace	Trace	2	10	0.2	2,750	0.02	0.02	0.2	2
cucumber (¼, 30 g), radishes (5, 40 g)	50	10	1	Trace	2	34	0.7	950	0.03	0.04	0.2	9
medium, 50 g), green pepper (½) carrots, raw (½ carrot), lettuce leaves (2 large)												
FRUITS AND FRUIT PRODUCTS												
Cantaloupe (½ medium)	385	60	1	Trace	14	25	0.8	6,540	0.08	0.06	1.2	63
Citrus and strawberries: orange (1), grapefruit		50	1	0	13	25	0.4	165	0.08	0.03	0.3	55
(½, juice (½ c), strawberries (½ c), lemon												
(1), tangerine (1)												
Yellow, fresh: apricots (3), peach (2 medium);		85	0	0	22	10	1.1	1,005	0.01	0.05	1.0	5
canned fruit and juice (½ c) or dried, cooked,												
unsweetened: apricot, peaches (½ c)												
Other, dried: dates, pitted (4), figs (2), raisins (¼ c)	40	120	1	0	31	35	1.4	20	0.04	0.04	0.5	0
Other, fresh apple (1), banana (1), figs (3), pear (1)		80	0	0	21	15	0.5	140	0.04	0.03	0.2	6
GRAIN PRODUCTS												
Enriched and whole grain: bread (1 slice, 23 g),		65	2	1	16	20	0.6	10	0.09	0.05	0.7	0
biscuit (½), cooked cereal (½ c), prepared												
cereal (1 oz), graham crackers (2 large),												
macaroni, noodles, spaghetti (½ c, cooked),												
pancake (1, 27 g), roll (½), waffle (½, 38 g)												
Unenriched bread (1 slice, 23 g), cooked cereal		65	2	1	16	10	0.3	5	0.02	0.02	0.3	0
(½ c), macaroni, noodles, spaghetti (½ c),												
popcorn (½ c), pretzel sticks, small (15),												
roll (½)												
Cake, plain (1 piece), doughnut (1)	45	145	2	5	24	30	0.4	65	0.02	0.05	0.2	0
For iced cake or doughnut, add value for sugar												
(1 tbs)												
For chocolate cake, add chocolate (30 g)												
Cookies, plain (1)	25	120	1	5	18	10	0.2	20	0.01	0.01	0.01	0
Pie crust, single crust (1/7 shell)	20	95	1	6	8	3	0.3	0	0.04	0.03	0.3	0
Flour, white, enriched (1 tbs)	7	25	1	Trace	5	1	0.2	0	0.03	0.02	0.2	0
FATS AND OILS												
Butter, margarine (1 pat, ½ tbs)	7	50	Trace	6	Trace	1	0	230	0	0	0	0
Fats and oils, cooking (1 tbs), French dressing	14	125	0	14	0	0	0	0	0	0	0	0
(2 tbs)												
Salad dressing, mayonnaise-type (1 tbs)	15	80	Trace	9	1	2	0.1	45	Trace	Trace	Trace	0
SUGARS, SWEETS												
Candy, plain (½ oz), jam and jelly (1 tbs), syrup		60	0	0	14	3	0.1	Trace	Trace	Trace	Trace	Trace
(1 tbs), gelatin dessert, plain (½ c), beverage,												
carbonated (1 c)												
Chocolate fudge (1 oz), chocolate syrup (3 tbs)		125	1	2	30	15	0.6	10	Trace	0.02	0.1	Trace
Molasses (1 tbs), caramel (½ oz)		40	Trace	Trace	8	20	0.3	Trace	Trace	Trace	Trace	Trace
Sugar (1 tbs)	12	45	0	0	12	0	Trace	0	0	0	0	0
MISCELLANEOUS												
Chocolate, bitter (1 oz)	30	145	3	15	8	20	1.9	20	0.01	0.07	0.4	0
Sherbet (½ c)	96	130	1	1	30	15	Trace	55	0.01	0.03	Trace	2
SOUPS												
Bean, pea (green) [1 c]		150	7	4	22	50	1.6	495	0.09	0.06	1.0	4
Noodle, beef, chicken (1 c)		65	4	2	7	10	0.7	50	0.03	0.04	0.9	Trace
Clam chowder, minestrone, tomato, vegetable (1 c)		90	3	2	14	25	0.9	1,880	0.05	0.04	1.1	3

*See related conversion tables (Tables 715–8 to 715–10).

From Wilson ED, Fisher KH, Fuqua ME: *Principles of Nutrition*, 2nd ed. New York, John Wiley & Sons, 1965, pp. 528–533.

TABLE 715-12. Nutritive Value of Baby Foods (Per Serving)*

FOOD	SERVING (G)	ENERGY (KCAL)	PROTEIN (G)	FAT (G)	CARBOHYDRATE (G)	SODIUM (MG)	CALCIUM (MG)	IRON (MG)	VITAMIN A (IU)	THIAMINE (MG)	RIBOFLAVIN (MG)	NIACIN (MG)	ASCORBIC ACID (MG)
CEREALS													
Barley	2.4	9	0.3	0.1	1.8	1	19	1.1		0.07	0.07	0.9	0
High protein	2.4	9	0.9	0.1	1.1	1	17	1.8		0.06	0.07	0.8	0
Mixed	2.4	9	0.3	0.1	1.8	1	18	1.5		0.06	0.07	0.8	0
Oatmeal	2.4	10	0.3	0.2	1.7	1	18	1.8		0.07	0.06	0.9	0
Rice	2.4	9	0.2	0.1	1.9	1	20	1.8		0.06	0.05	0.8	0
DINNERS, JAR													
Beef and egg noodle	213	122	5.4	4.0	15.7	37	18	0.9	1,400	0.06	0.08	1.2	3
Chicken and noodles, jr.	213	109	4.1	3.0	16.1	36	36	0.8	1,900	0.06	0.07	1.1	3
Macaroni and ham, jr.	213	127	6.8	2.9	18.0	101	159	0.8	1,100	0.12	0.21	1.7	5
Turkey and rice, jr.	213	104	3.8	2.9	15.3	33	50	0.6	2,200	0.02	0.06	0.6	3
Spaghetti, tomato, beef, jr.	213	135	5.4	2.7	21.6	42	39	1.1	1,500	0.14	0.15	2.3	5
FRUITS													
Applesauce, jr.	213	79	0.1	0.0	21.9	5	10	0.4	20	0.03	0.06	0.1	81
Applesauce, apricots, jr.	220	104	0.5	0.5	27.3	6	13	0.6	745	0.03	0.07	0.3	39
Bananas, tapioca, jr.	220	147	0.8	0.4	39.1	21	17	0.7	100	0.03	0.04	0.5	57
Peaches	220	157	1.3	0.4	41.6	10	11	0.6	400	0.03	0.07	1.4	42
Pears	213	93	0.6	0.2	24.7	4	18	0.5	70	0.03	0.06	0.4	47
MEATS, POULTRY													
Beef	99	105	14.3	4.9	0	65	8	1.6	100	0.01	0.16	3.3	2
Chicken	99	148	14.6	9.5	0	50	54	1.0	200	0.01	0.16	3.4	2
Ham	99	123	14.9	6.6	0	66	5	1.0	30	0.14	0.19	2.8	2
Lamb	99	111	15.0	5.2	2.5	73	7	1.6	30	0.02	0.20	3.2	2
Turkey	99	128	15.2	7.0	0	72	28	1.3	600	0.02	0.25	3.4	2
EGG YOLKS	94	191	9.4	16.3	0.9	37	72	2.6	1,200	0.07	0.25	1.45	1
VEGETABLES													
Beans	206	51	2.5	0.3	11.8	3	133	2.2	900	0.04	0.21	0.7	17
Beets	128	43	1.7	0.1	9.8	106	18	0.4	40	0.01	0.06	0.2	4
Carrots	213	67	1.7	0.4	15.4	104	49	0.8	25,000	0.05	0.09	1.1	12
Mixed	213	88	3.1	0.8	17.4	77	24	0.9	9,000	0.06	0.07	1.4	5
Peas	213	113	7.0	1.1	19.0	15	34	1.9	700	0.15	0.13	2.0	9
Squash	213	51	1.8	0.4	12.0	3	50	0.7	4,000	0.02	0.14	0.8	17
Sweet potatoes	220	113	2.4	0.3	30.7	49	35	0.8	15,000	0.06	0.08	0.8	21

*See related conversion tables 715-8 to 715-10. Data from Pennington JAT (editor): *Bowes and Church's Food Values of Portions Commonly Used*, 17th ed. Philadelphia, Lippincott Williams & Wilkins, 1997.

TABLE 715-13. Equivalent Temperature Readings (Celsius [C] and Fahrenheit [F])

C	F	C	F	C	F	C	F
0	32.0	37.2	99.0	39.2	102.6	41.2	106.2
20	68.0	37.4	99.3	39.4	102.9	41.4	106.5
30	86.0	37.6	99.7	39.6	103.3	41.6	106.9
31	87.8	37.8	100.1	39.8	103.7	41.8	107.2
32	89.6	38.0	100.4	40.0	104.0	42.0	107.6
33	91.7	38.2	100.8	40.2	104.4	43.0	109.4
34	93.2	38.4	101.2	40.4	104.7	44.0	111.2
35	95.0	38.6	101.5	40.6	105.1	100.0	212.0
36	96.8	38.8	101.8	40.8	105.4		
37	98.6	39.0	102.2	41.0	105.8		

*To convert Celsius (centigrade) readings to Fahrenheit, multiply by 1.8 and add 32. To convert Fahrenheit readings to Celsius, subtract 32 and divide by 1.8.

Chapter 716 ■ Medications Peter Gal and Michael D. Reed

TABLE 716-1. General Medications

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Abciximab ReoPro Intravenous solution, 2 mg/mL in 5 mL vials.	**Inhibits platelet aggregation through inhibiting the glycoprotein IIb/IIIa receptor pathway. Used in combination with IV immunoglobulin and aspirin to accelerate regression of coronary aneurysms in Kawasaki disease. In adults, used to prevent platelet aggregation in various acute coronary syndromes and procedures.** *Children and adults:* Loading dose of 0.25 mg/kg, followed by infusion of 0.125 μg/kg/min for 12 hr.	*Adverse events:* Bleeding.
Acarbose Precose. Tablet: 25, 50, 100 mg.	**Treatment of type 2 diabetes mellitus; treatment of postprandial hypoglycemia in children after Nissen fundoplication.** *Children:* 12.5–50 mg with each feed. *Adults:* Initial dose of 25 mg tid at the start of each meal; titrate to response (max: 100 mg tid).	*Adverse events:* Flatulence, abdominal pain, diarrhea.
Acetaminophen Analgesic, non-narcotic; antipyretic. Tempra; Tylenol; multiple generic and brand-name products. Caplet: 160, 325, 500 mg. Capsule: 325, 500 mg. Drops: 100 mg/mL (15 mL); 120 mg/2.5 mL (35 mL). Granules, premeasured packs: 30 mg. Suppositories: 120, 325 mg. Combination products with acetaminophen include cough and cold preparations and those with codeine.	**Mild to moderate pain** (inhibits prostaglandin synthesis in CNS and peripheral pain impulse generation). **Fever** (inhibits hypothalamic heat regulation center). *Infants and children <12 yr:* 10–15 mg/kg/dose q 4–6 hr. *Children > 12 yr and adults:* 325–650 mg q 4–6 hr or 1,000 mg 3–4 × daily. Maximum: 5 doses/24 hr (children) or 4 g/24 hr (adults) administered PO or rectally.	*Cautions:* Overdose can cause fatal hepatic necrosis. Treat acute overdoses with acetylcysteine. Chronic concurrent use with enzyme inhibitors, especially alcohol, can lead to hepatic necrosis. Avoid aspartame-containing products in patients with phenylketonuria (e.g., chewable tablets).
Acetazolamide Diuretic, carbonic anhydrase inhibitor. Dazamide; Diamox. Capsule, sustained-release: 500 mg. Injection: 500 mg/5 mL. Tablet: 125, 250 mg.	**Hydrocephalus due to communicating intraventricular hemorrhage** (carbonic anhydrase inhibition decreases cerebrospinal fluid production). *Neonates:* 25 mg/kg/24 hr to start, and increase to bid, tid, and qid over 4–7 days. **Glaucoma** (carbonic anhydrase inhibition decreases formation of aqueous humor). *Children:* 8–30 mg/kg/24 hr PO divided q 6–8 hr or 20–40 mg/kg/24 hr IV divided q 6 hr. **Epilepsy, as adjunct to other drugs in refractory seizures** (uncertain mechanism). *Children and adults:* 8–30 mg/kg/24 hr in 1–4 divided doses (max: 1 g/24 hr). **Edema** (diuretic). *Children:* 5 mg/kg/24 hr IV or PO. *Adults:* 250–375 mg/24 hr IV or PO.	*Caution:* Used in combination with furosemide for hydrocephalus. Reduce dose and extend dosing interval if renal function is compromised. Avoid if patient has sulfa allergy. IM route very painful because of alkaline pH of drug. *Adverse events:* Metabolic acidosis, hypochloremia, hypokalemia, nausea, anorexia, drowsiness, fatigue, muscle weakness, renal calculi.
Acetylcysteine Antidote, acetaminophen; mucolytic agent. Mucomyst; Mucosil; Mucosol. Solution, as sodium: 10% (100 mg/mL) [4, 10, 30 mL]; 20% (200 mg/mL) [4, 10, 30, 100 mL].	**Mucolytic** (free sulfhydryl group opens up disulfide bonds in mucoproteins, lowering viscosity). Dose based on 10% solution or diluted 20% solution (1 : 1) for inhalation. *Infants:* 2–4 mL tid–qid. *Children:* 6–10 mL tid–qid. *Adolescents:* 10 mL tid–qid. Acute acetaminophen overdose (provides alternative metabolic pathway for conjugation of toxic metabolites, restoring normal glutathione levels). *Children and adults:* 140 mg/kg loading dose, followed by 70 mg/kg q 4 hr for 17 doses. Repeat dose if emesis occurs within 1 hr of administration.	*Cautions:* Give a bronchodilator 10–15 min before nebulized Mucomyst to avoid bronchospasm. Follow treatment with chest percussion and suction to manage increased secretions. Dilute nebulized doses with saline or sterile water and oral solutions with soft drinks or orange juice. Prepare inhaled as 1 : 1 and PO as 1 : 3 solutions. *Adverse events:* Stomatitis nausea, vomiting, urticaria. *Monitoring:* Check acetaminophen concentration no earlier than 4 hr post overdose. Give complete acetylcysteine course, regardless of acetaminophen concentrations.
Adenosine Antiarrhythmic agent, miscellaneous. Adenocard. Injection, preservative-free: 3 mg/mL (2 mL).	**Paroxysmal supraventricular tachycardia** treatment (slows conduction time through the AV node). *Neonates and children:* 0.05 mg/kg IV push, then increase bolus doses by 0.05 mg/kg q 2 min until a clinical response occurs or a maximum dose of either 0.25 mg/kg or 12 mg is achieved. *Adults:* 6 mg IV push, if no response in 2 min, give 12 mg IV push. May repeat 12 mg IV bolus if needed.	*Cautions:* Use a peripheral IV site. May cause bronchoconstriction in asthmatics. Methylxanthines (e.g., theophylline or caffeine) antagonize adenosine effects, so higher adenosine doses are needed Contraindicated in 2nd or 3rd degree AV block or sick sinus syndrome. *Adverse events:* Heart block, flushing, chest palpitations, bradycardia, hypotension, dyspnea, headache, dizziness, nausea. *Monitoring:* Continuous ECG, blood pressure, respirations.
Albumin, human Blood product derivative; plasma volume expander. Albuminar; Albumisol; Albutein; Buminate; Plasbumin. Injection: 5% (50 mg/mL) [50, 250, 500, 1,000]; 25% (250 mg/mL) [10, 20, 50, 100 mL].	**Plasma volume expansion and treatment of hypovolemia** (increases intravascular oncotic pressure and mobilizes fluid from interstitium to intravascular space). *Neonates:* 0.5–1 g/kg/dose (max: 1 g/kg/24 hr). *Infants and children:* 0.5–1 g/kg/dose (max: 6 g/kg/24 hr). *Adults:* 25 g/dose (max: 250 g/24 hr).	*Cautions:* 25% albumin may increase risk of intraventricular hemorrhage in preterm infants, so 5% form is preferred in these cases. Infuse over at least 2 hr in neonates. Infusion may be over 30–60 min for hypovolemia. *Adverse events:* Precipitation of heart failure, pulmonary edema, hypertension, tachycardia due to volume overload. Immune reactions (e.g., fever, chills, rash). Increased mortality in critically ill patients. *Monitoring:* Vital signs.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Albuterol Adrenergic agonist agent; β_2-adrenergic agonist agent; bronchodilator; sympathomimetic. Proventil; Ventolin; Volmax. Aerosol, oral: 90 µg/spray (200 inhalations) [17 g]. Capsule, microfine, for inhalation, as sulfate (Rotacaps): 200 µg. Solution, inhalation, as sulfate: 0.083% Syrup, as sulfate (strawberry flavor): 2 mg/5 mL (480 mL). Tablet, as sulfate: 2, 4 mg. Tablet, extended-release: 4 mg.	**Bronchoilator** (β_2 agonist). **Inhalation dose:** *Neonates, infants, children, and adults:* **Metered-dose inhaler:** 1–2 puffs prn, or 5 min before exercise or tid–qid. **Rotahaler:** 1–2 capsules prn, or q 4–6 hr, or before exercise. **Nebulizer solution:** *Neonates:* 0.1–0.5 mg/kg/dose prn or q 2–6 hr. *Children:* 1.25–2.5 mg prn or q 4–6 hr. *Adults:* 1.25–5 mg prn or q 4–6 hr **PO:** *Neonates:* 0.1–0.3 mg/kg/dose q 6–8 hr. *Children:* *<6 yr:* 0.1–0.2 mg/kg/dose tid. *6–12 yr:* 2 mg/dose tid–qid *>12 yr:* 2–4 mg tid–qid.	*Cautions:* Increased use or lack of effect may indicate loss of asthma control, requiring medical attention. Better to use prn or before exercise. *Adverse events:* Hyperglycemia, hypokalemia, tachycardia, palpitations, nervousness, CNS stimulation, insomnia, tremor.
Alfentanil hydrochloride Analgesic, narcotic; general anesthetic. Alfenta Injection. Injection, preservative-free: 500 µg/mL (2, 5, 10, 20 mL).	**Analgesia, anesthesia** (narcotic analgesic). *Neonates, infants, and children < 12 yr:* 5–15 µg/kg IV injected over 3–5 min or 0.5–3 µg/kg/min continuous infusion (limited experience and doses poorly established). *Adults:* IV continuous infusion 0.5–1.5 µg/kg/min.	*Cautions:* Bolus doses of 9–15 µg/kg caused chest wall rigidity in 9 of 20 newborns, compromising respiration in 4 patients. Use a skeletal muscle relaxant concurrently. Avoid in patients with increased intracranial pressure or severe respiratory depression. *Adverse events:* Bradycardia, hypotension, increased intracranial pressure, antidiuretic hormone release. *Comment:* Dose based on lean weight for obese patients.
Alglucerase Enzyme, glucocerebrosidase. Ceredase Injection. Injection: 10 u/mL (5 mL); 80 u/mL (5 mL).	**Enzyme replacement therapy for type I Gaucher disease** (replaces the missing enzyme β-glucosidase needed to break down and thus avoid accumulation of glycosyl ceramide-laden macrophages in bone, liver, and spleen in type 1 Gaucher disease). 20–60 u/kg IV infused over 1–2 hr. Typically repeated q 2 wk, but varies from q 2 days to q 4 wk, depending on response.	*Adverse events:* Fever, chills, abdominal discomfort, nausea, vomiting, local IV site burning or edema. *Monitoring:* Resolution of anemia, thrombocytopenia, bleeding tendencies, and hepatosplenomegaly (within 6 mo). Improved bone mineralization (usually noted at 80–104 wk of therapy).
Allopurinol Antigout agent; uric acid–lowering agent. Lopurin; Zyloprim. Tablet: 100, 300 mg.	**Prevent attacks of gouty arthritis and nephropathy.** **Prevent cancer chemotherapy-induced hyperuricemia** (inhibits xanthine oxidase, thus preventing conversion of hypoxanthine to uric acid). *Children ≤ 10 yr:* 10 mg/kg/24 hr in 2–3 divided doses. *Children > 10 yr and adults:* 200-600 mg/24 hr in 2–3 divided doses. **Gout, chemotherapy-induced hyperuricemia.** 600–800 mg/24 hr in 2–3 divided doses starting 1–2 days before chemotherapy and continuing for 3 days. **Renal impairment:** CrCl 10–50: reduce dose to 50%. CrCl < 10: reduce dose to 30% of suggested.	*Cautions:* Discontinue at first signs of rash. *Adverse events:* Rashes, including erythema multiforme, renal impairment, hepatitis, peripheral neuropathy, vasculitis. *Monitoring:* Uric acid levels decrease in 1–2 days, with maximum effect seen in 1–3 wk.
Alprazolam Antianxiety agent. Benzodiazine. Xanax. Tablet: 0.25, 0.5, 1, 2 mg.	**Treatment of anxiety or panic attacks** (not certain, but may be mediated through γ-aminobutyric acid). *Children:* 0.005–0.02 mg/kg/dose tid. *Adults:* 0.25–0.5 mg bid–tid (max: 4 mg/24 hr) [anxiety] (max: 10 mg/24 hr) [panic].	*Cautions:* Abrupt discontinuation results in withdrawal reactions, including seizures. Safety not established in children < 18 yr. Pregnancy risk factor D. *Adverse events:* Drowsiness, confusion, sedation.
Alprostadil Prostaglandin. Prostin VR Pediatric Injection. Injection: 500 µg/mL (1 mL).	**Maintains patency of ductus arteriosus in cyanotic heart lesions.** Direct vasodilation of ductus smooth muscle. *Neonates and infants:* 0.05–0.1 µg/kg/min as continuous IV infusion may gradually increase to maximum of 0.4 µg/kg/min or wean as low as 0.005 µg/kg/min, depending on response.	*Adverse events:* Apnea, bradycardia, hypotension, tachycardia, flushing, seizure-like activity, cortical hyperostosis (with > 6 mo use), diarrhea, gastric outlet obstruction (≥ 5 days use). *Monitoring:* Therapeutic response includes increase in systemic blood pressure, improved oxygen saturation or Po_2, and less acidosis on blood pH. Discontinue immediately if severe apnea or bradycardia.
Aluminum acetate Topical skin product. Acid Mantle; Bluboro; Boropak; Domeboro; Pedi-Boro. Power, to make topical solution: 1 packet/pint of water = 1 : 40 solution. Solution, otic: Aluminum acetate 1 : 10 with acetic acid 2% (60 mL). Tablet: 1 tablet/pint = 1 : 40 dilution.	**Astringent wet dressing for relief of inflammatory conditions of the skin; prophylaxis of swimmer's ear.** *Children and adults:* Otic: Instill 4–6 drops q 2–3 hr initially, then q 4–6 hr until itching or burning resolves. Topical: Soak affected area in solution for 15–30 min 2–4 × daily.	*Adverse events:* Local irritation.
Aminocaproic acid Hemostatic agent. Amicar. Injection: 250 mg/mL (20, 96, 100 mL). Syrup (raspberry flavor): 250 (480 mL). Tablet: 500 mg.	**Treatment of excessive bleeding resulting from systemic hyperfibrinolysis (inbihits activation of plasminogen).** *Children:* PO, IV: Loading dose of 100–200 mg/kg, maintenance dose of 100 mg/kg q 6 hr or 33.3 mg/kg/hr continuous infusion. Traumatic hyphema: 100 mg/kg q 4 hr (max: 30 g/24 hr). *Adults:* Loading dose of 5 g over 1 hr, then 1–1.25 g/hr until bleeding stops (max: 30 g/24 hr).	*Cautions:* Avoid in disseminated intravascular coagulation and hematuria of the upper urinary tract. Contains benzyl alcohol, so avoid in neonates < 1500 g. *Adverse events:* Hypotension, bradycardia, arrhythmias, dizziness, headache, nasal congestion. *Monitoring:* D-dimer or fibrin split products, activated clotting time (target 180–200 sec), serum potassium (especially if renal function decreased).

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Aminophylline (Theophylline equivalent listed in parentheses.) Bronchodilator; respiratory stimulant; theophylline derivative. Aminophyllin; Phyllocontin; Somophyllin; Truphylline. Injection, IV (Aminophyllin): 25 mg/mL (19.7 mg/ML) [10, 20 mL]. Liquid, oral: 105 mg/5 mL (90 mg/5 mL) [240 mL]. Suppository, rectal (Truphylline): 250 mg (197.5 mg), 500 mg (395 mg). Tablet (Aminophyllin): 100 mg (79 mg), 200 mg (158 mg). Tablet, controlled-release (12 hr) (Phyllocontin): 225 mg (178 mg). Tablet, enteric-coated: 100 mg (79 mg), 200 mg (158 mg). See *Theophylline* for oral dosing.	**Apnea of prematurity, ventilator weaning in neonates, bronchodilator, weak pulmonary anti-inflammatory effects.** Increases contractility and decreases fatigability of diaphragm and respiratory muscles; weak bronchodilator, stimulates CNS; decreases airway responsiveness to stimuli. Exact mechanisms for these effects remain controversial. *Neonates* (for apnea of prematurity, ventilator weaning, or bronchospasm): Loading dose: 6 mg/kg IV or PO. Maintenance dose: 2.5–3 mg/kg/dose q 12 hr IV or PO. **Asthma chronic therapy (see *Theophylline*).** Use in acute therapy is of questionable value. If used as continuous IV infusion: *Children:* *6 wk–6 mo:* 0.5 mg/kg/hr. *6 mo–1 yr:* 0.7 mg/kg/hr. *1–9 yr:* 1 mg/kg/hr. *9–12 yr:* 0.9 mg/kg/hr. *12 yr–adult:* 0.7 mg/kg/hr.	*Cautions:* May cause or worsen arrhythmias, seizures, or gastroesophageal reflux. Theophylline clearance is modified by numerous disease states and drugs, requiring dosing adjustments guided by serum theophylline concentrations. Clearance is reduced by viral illnesses, fever > 102°F for > 24 hr, cor pulmonale, and drugs that inhibit P450 enzymes (cimetidine, verapamil, macrolides, quinolones); reduce dose by 50%. *Adverse events:* Feeding intolerance in neonates, gastrointestinal discomfort in children and adults, nausea, vomiting, CNS irritability, agitation, tachycardia, tachyarrhythmias. *Monitoring:* Theophylline blood levels correlate with clinical effects and toxicity. Target levels are somewhat controversial. *Neonates:* 6–15 mg/L (65% of neonates will not have apnea eliminated until levels exceed 10 mg/L if continuous electronic monitoring is performed. Levels >10 mg/L are needed for ventilator weaning. Levles of 5–15 mg/L are sufficient for bronchodilation). *Children:* Theophylline alone is ineffective for acute asthma. For chronic asthma, theophylline levels of 5–15 mg/L are effetive, but levels should exceed 10 mg/L for prevention of exercise-induced bronchospasm.
Amiodarone hydrochloride Antiarrhythmic agent, class III. Cordarone. Tablet: 200 mg. Injection: 50 mg/mL (3 mL). Cordarone contains benzyl alcohol and polysorbate (Tween) 80. Injection, benzyl alcohol–free and polysorbate-free: 15 mg/mL (10 mL); Amio-Aqueous contains an aqueous acetate buffer; available via orphan drug status or compassionate use from the manufacturer, Academic Pharmaceuticals, Inc. (847) 735-1170.	**Management of resistant, life-threatening ventricular arrhythmias or paroxysmal supraventricular tachycardia (PSVT) unresponsive to less toxic agents** (class III antiarrhythmic agent; prolongs action potential and refractory period in myocardial tissue). **Oral dose:** *Infants and children:* <*1 yr:* 600–800 mg/1.73 m^2/24 hr in 2 divided doses >*1 yr:* 10–20 mg/kg/24 hr in 2 divided doses for 10 days, then 5–10 mg/kg/24 hr. *Adults:* 800 mg/24 hr in 2 divided doses. Cut all doses in half (i.e., 1 dose/day) after 1–4 wk of treatment or when arrhythmias are controlled. **IV dose:** *Infants and children:* Loading dose of 5 mg/kg over 1 hr, then continuous infusion of 5–15 µg/kg/min. *Adults:* 150 mg over 10 min, then 0.5 mg/min.	*Cautions:* Use benzyl alcohol–free product in neonates. Minimize risk of torsades de pointes by correcting potassium and magnesium imbalance. Inhibits cytochrome P450 enzymes, so many drugs that are metabolized will have markedly increased levels and effects, including theophylline, phenytoin, warfarin, other antiarrhythmics, methotrexate, and cyclosporine. *Adverse events:* Proarrhythmias (may be bradyarrhythmias, tachyarrhythmias, or heart block), fatigue, malaise, nightmares, behavioral changes, hypothyroidism, hyperglycemia, elevated triglycerides, skin color changes (slate blue), photosensitivity, rash, liver toxicity (may be fatal or just increased liver enzymes), pulmonary toxicity (potentially fatal) including pulmonary fibrosis, interstitial pneumonitis, hypersensitivity pneumonitis (cough, fever, dyspnea, chest radiographic changes), photophobia, thrombocytopenia. *Monitoring:* Pulmonary, liver, and thyroid function tests; chest radiograph, ECG, eye examination; and clinical signs and symptoms of toxicity. Amiodarone concentration: 2–4 µmol/L.
Amitriptyline hydrochloride Antidepressant, tricyclic; antimigraine agent. Elavil; Emitrip; Endep. Injection: 10 mg/mL (10 mL). Tablet: 10, 25, 50, 75, 100, 150 mg.	**Depression (increases CNS concentration of serotonin and norepinephrine by inhibiting reuptake).** *Children:* 1–1.5 mg/kg/24 hr divided tid. *Adolescents:* 30–100 mg at bedtime or divided bid (max: 200 mg/24hr). *Adults:* 30–100 mg q 24 hr (max: 300 mg/24 hr). **Analgesic for neuropathic or chronic pain or migraine prophylaxis.** *Children:* 0.1 mg/kg at bedtime and advance over 2–3 wk to effect (max: 2 mg/kg at bedtime). *Adolescents:* 25 mg divided bid and increase dose to effect (max: 200 mg/24 hr). *Adults:* 25 mg at bedtime and increase dose to effect (max: 300 mg/24 hr).	*Cautions:* Cardiac conduction abnormalities may occur, monitor ECG. Do not discontinue abruptly because withdrawal syndrome may occur. *Adverse events:* Dry mouth, constipation, weight gain, postural hypotension, drowsiness, confusion, headache, visual disturbance. *Monitoring:* Amitriptyline concentrations: therapeutic 100–250 ng/mL; nortriptyline concentrations: therapeutic 50–150 ng/mL.
Ammonium chloride Metabolic alkalosis, treatment agent; urinary acidifying agent. Generic. Injection: 26.75% (5 mEq/mL) [20 mL]. Tablet: 500 mg. Tablet, enteric-coated: 500 mg.	**Systemic or urinary acidification (dissociation of ammonium and chloride and replacement of bicarbonate ions by chloride ions).** *Children:* 75 mg/kg/24 hr IV divided q 6 h (max: 6 g daily). *Adults:* 1.5 g/dose IV q 6 hr.	*Adverse events:* Hyperchloremia, hyperammonemia, hyperkalemia.
Amrinone lactate Adrenergic agonist agent. Inocor. Injection: 5 mg/mL (20 mL).	**Treatment of low cardiac output states (increase cellular levels of cyclic adenosine monophosphate).** *Neonates:* 0.75 mg/kg IV bolus over 2–3 min, then 3–5 µg/kg/min continuous infusion IV. *Infants and children:* 0.75 mg/kg IV bolus over 2–3 min, then 5–10 µg/kg/min continuous infusion. *Adults:* 0.75 mg/kg IV bolus over 2–3 min, then 5–10 µg/kg/min.	*Cautions:* Increased cardiac output may cause excess diuresis if diuretic doses are not adjusted. May repeat bolus doses if clinical response is inadequate. *Adverse events:* Hypotension, arrhythmias, thrombocytopenia.
Antihemophilic factor, human Antihemophilic agent; blood product derivative. Alphanate; Hemofil M; Humate-P; Koate-HP; Koate-HS; Monoclate-P; Profilate OSD. Injection (approximate factor VIII activity/vial): 200, 250, 500, 750, 1,000, 1,250, 1,500 units; exact potency labeled on each vial.	**Factor VIII deficiency in hemophilia (provides factor VIII).** *All patients:* Units required = weight (kg) × 0.5 × desired increase in factor VIII (% of normal).	*Monitoring:* Plasma antihemophilic factor levels *Adverse events:* Tachycardia, allergy, blood-borne viral infections.
Antipyrine and benzocaine. Otic agent, analgesic; otic agent, ceruminolytic. Allergan Ear Drops: Aurafair; Auralgan; Aurodex; Auroto: Oto; Otocalm Ear Solution, otic: antipyrine 5.4% and benzocaine 1.4% (10, 15 mL).	**Temporary relief of ear pain and inflammation (topical anesthetic and anti-inflammatory).** *All patients:* Fill ear canal, and then moisten cotton pledget and place into meatus. May repeat q 1–2 hr until pain relief. Limit use to about 3 days.	*Adverse events:* Stinging, methemoglobinemia.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Antithrombin III **Thrombate III**	**Antithrombin III (ATIII) deficiency due to disseminated intravascular coagulation or shock and surgery complications. Treatment of thrombosis in ATIII deficiency.** *All patients:* Dose (IU) = (120 − patient ATIII) × weight (kg).	*Monitoring:* Check ATIII levels; maintain at 80–120%.
Antivenin (Crotalidae) polyvalent Antivenom. Generic. Injection: Lyophilized serum, diluent (10 mL); 1 vacuum vial to yield 10 mL of antivenom.	**Antivenom for snake bite from North and South American crotalids (i.e., rattlesnake, copperhead, cottonmouth, tropical moccasin, fer-de-lance, bushmaster).** Dosing based on severity of bit: mild, vial; moderate, 10 vials; severe, >15 vials.	*Cautions:* Sensitivity reactions, including anaphylaxis (treat with epinephrine and antihistamine and brief holding of dose).
Arginine hydrochloride Diagnostic agent, growth hormone function; metabolic alkalosis, treatment agent. R-Gene. Injection: 10% (0.475 mEq chloride/mL) [500 mL].	**Pituitary function test (stimulates pituitary, release of growth hormone and prolactin).** *Children:* 500 mg/kg over30 min. *Adults:* 300 mL over 30 min	*Adverse events:* Flushing, headache, hyperglycemia, hyperkalemia, metabolic acidosis. *Monitoring:* Plasma growth hormone concentrations.
Ascorbic acid Nutritional supplemnt; urinary acidifying agent; vitamin, water-soluble. Ascorbicap; C-Crystals; Cecon, Cetane; Cevalin, Ce-Vi-Sol; Dull-C; Flavorcee; Vita-C. Capsule, timed-release: 500 mg. Crystals: 4 g/tsp (1,000 g). Injection: 25 mg/mL (2, 30 mL), 500 mg/mL (1, 2, 50 mL). Lozenge: 60 mg. Powder: 4 g/tsp (1,000 g). Solution, oral: 35 mg/0.6 mL (50 mL), 100 mg/mL (50 mL). Syrup: 500 mg/5 mL (5, 10, 120, 480 mL). Tablet: 25, 50, 100, 250, 500, 1,000 mg. Tablet, chewable: 100, 250, 500, 1,000 mg. Tablet, timed-release: 500, 1,000, 500 mg.	**Scurvy.** *Children:* 100–300 mg/24 hr. *Adults:* 100–250 mg bid **Urinary acidification.** *Children:* 500 mg q 6 hr. *Adults:* 4–12 g/24 hr in 3–4 divided doses.	*Adverse events:* Gastrointestinal upset, renal stones.
Asparaginase Antineoplastic agent, miscellaneous. Elspar. Injection: 10,000 u/vial	**Cancer chemotherapy (inhibits protein synthesis to deprive cancer cells of asparagine).** *Children and adults:* Doses may vary depending on specific protocol being used; 6,000 unit/m^2 IM, 3 × wk for 3 wk as part of combination therapy. High-dose IM therapy: 25,000 units/m^2/dose q wk × 9 doses. IV therapy: 1,000 units/kg/24 hr for 10 days; or 200 units/kg/24 hr for about 28 days.	*Cautions:* Stop drug if any signs of renal failure or pancreatitis occur. Be prepared to treat anaphylaxis at each dose. *Adverse events:* Myelosuppression (WBCs and platelets; mild and rare) onset, 7 days; nadir, 14 days; recovery, 21 days. Hepatotoxicity, pancreatitis, gastrointestinal upset, azotemia, hyperglycemia, coagulopathy.
Aspirin Analgesic, non-narcotic; anti-inflammatory agent; antiplatelet agent; antipyretic; nonsteroidal anti-inflammatory agent, oral; salicylate. Anacin; A.S.A.; Ascriptin; Aspergum, Bayer Aspirin; Bufferin; Easprin; Ecotrin; Empirin; Gensan; Halfrin; Measurin, ZORprin. Suppository, rectal: 60, 120, 125, 130, 195, 200, 300, 325, 600, 650, 1,200 mg. Tablet: 325, 500, 650 mg Tablet, buffered: 325 mg with aluminum hydroxide 75 mg and magnesium hydroxide 75 mg; 325 mg with aluminum hydroxide 150 mg and magnesium hydroxide 150 mg; 500 mg with aluminum hydroxide 33 mg and magnesium hydroxide 150 mg. Chewable: 75, 81 mg. Chewing gum: 227 mg. Tablets controlled-release: 800 mg. Tablets enteric-coated (delayed-release): 80, 165, 325, 500, 650, 975 mg. Tablets timed-release: 650 mg. Tablet, with caffeine: 400 mg and caffeine 32 mg; 500 mg and caffeine 32 mg.	**Pain, inflammation, fever (prostaglandin synthesis inhibition).** *Children:* 10–15 mg/kg/dose q 4–6 hr. *Adults:* 650–1,000 mg/dose q 4–6 hr (max: 4 g/24 hr). **Kawasaki disease (acute phase).** *Children:* 80–100 mg/kg/24 hr divided q 6 hr. **Rheumatic fever.** 60–100 mg/kg/24 hr divided q 6 hr.	*Cautions:* Contraindicated in children < 16 yr with chickenpox or flu-like symptoms due to risk of Reye syndrome. Discontinue if hearing loss or tinnitus occurs. *Adverse events:* Bleeding from gums or gastrointestinal tract, gastric ulcers, bronchospasm in asthmatics, hearing loss, tinnitus. *Monitoring:* Check serum concentration 2 hr after a dose for Kawasaki disease (target 150–300 μg/mL) or rheumatic fever (target 250–400 μg/mL).
Astemizole Antihistamine. Hismanal. Tablet: 10 mg	**Allergy and rhinitis (competitive H_1 receptor blocker).** *Children:* <*6 yr:* 0.2 mg/kg once daily. *6–12 yr:* 5 mg once daily. *>12 yr and adults:* 10–30 mg/24 hr	*Cautions:* Syncopal episodes may be a maker of arrhythmias, including Q-T interval prolongation, leading to fatal arrhythmias. Discontinue if ECG shows Q-T prolongation, syncopal episode, or if drugs that impair hepatic metabolism (e.g., erythromycin, ketoconazole) are added.
Atenolol Antianginal agent, antihypertensive; β-adrenergic blocker. Tenormin. Injection: 0.5 mg/mL (10 mL). Tablet: 25, 50, 100 mg.	**Hypertension, arrhythmias (competitive β_1 blocker).** *Children:* 0.8–1.5 mg/kg/24 hr (max: 2 mg/kg/24 hr). *Adults:* 25–200 mg/24 hr PO, 5 mg IV over 5 min.	*Cautions:* Avoid abrupt discontinuation; taper over 1–2 wk. *Adverse events:* Bradycardia, lethargy, headache, constipation, wheezing, dyspnea.
Atorvastatin calcium Lipitor. Tablet: 10, 20, 40 mg	**Hypercholesterolemia, including homozygous familial hypercholesterolemia (inhibit HMG-CoA reductase).** *Children > 6 yr:* 10–80 mg/24 hr. *Adults:* 10–80 mg/24 hr.	*Adverse events:* Dyspepsia, flatulence, pancreatitis, hepatitis, myalgia, arthralgia. *Monitoring:* Plasma lipid profile.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Atracurium besylate Neuromuscular blocker agent; nondepolarizing skeletal muscle relaxant; paralytic. Tracrium. Injection: 10 mg/mL (5, 10 mL).	**Neuromuscular blocker for muscle paralysis; binds to cholinergic receptor sites to block neural transmission).** *Children:* <2 yr: 0.3–0.4 mg/kg as needed. >2 yr–adults: 0.4–0.5 mg/kg, then 1 mg/kg 20–45 min after each initial block to maintain effect. Continuous IV infusion: 0.4–0.8 mg/kg/hr.	*Cautions:* Make sure airway and respiratory support are secure before use. Contains benzyl alcohol; neonatal use should be limited. Does not have sedative or analgesic properties, so adjunct sedative or analgesic should be used. *Monitoring:* Muscle twitch response to peripheral nerve stimulator.
Atropine sulfate Anticholinergic agent; anticholinergic agent, ophthalmic; antidote, organophosphate poisoning; antispasmodic agent, gastrointestinal; bronchodilator; ophthalmic agent, mydriatic. Atropair Ophthalmic; Atropine-Care Ophthalmic; Atropisol Ophthalmic; Isopto Atropine Ophthalmic; I-Tropine Ophthalmic; Ocu-Tropin. Ophthalmic injection: 0.05 mg/mL); (5 mL); 0.1 mg/mL (5, 10 mL 0.3 mg/mL (1, 30 mL); 0.4 mg /mL (1, 20, 30 mL); 0.5 mg/mL (1, 5, 30 mL); 0.8 mg/mL (0.5, 1 mL); 1 mg/mL (1, 10 mL). Ointment, ophthalmic: 0.5% (3.5 g); 1% (3.5 g) Solution, ophthalmic: 0.5% (1, 5 mL), 1% (1, 2, 5, 15 mL); 2% (1, 2 mL). Tablet: 0.4 mg. Tablet, soluble: 0.4, 0.6 mg.	**Preoperative medication to inhibit secretions and salivation (blocks action of acetylcholine and antagonizes histamine and serotonin).** *Neonates and children:* <5 kg: 0.2 mg/kg 30 min preoperatively, then q 4–6 hr. >5 kg: 0.1–0.2 mg/kg/dose (max: 0.4 mg/dose). *Adults:* 0.4–0.6 mg IV or SC 30 min preoperatively. **Treatment of sinus bradycardia.** *Neonates and children:* 0.02 mg/kg (minimum: 0.1 mg); IV or intratracheal (max: 0.5 mg); may repeat 5 min later, 1× *Adults:* 0.5–1 mg q 5 min (max total dose: 2 mg). **Antidote to organophosphate poisoning.** 0.02–0.05 mg/kg q 10–20 min until atropine effect (tachycardia, mydriasis, fever), then q 1–4 hr for at least 24 hr.	*Cautions:* Avoid in narrow-angle glaucoma, gastrointestinal obstruction, thyrotoxicosis, and tachycardia. *Adverse events:* Tachycardia; palpitations; delirium; ataxia; dry, hot skin; tremor; impaired vision.
Attapulgite Antidiarrheal. Children's Kaopectate, Diasorb; Donnagel; Kaopectate Advanced Formula; Kaopectate Maximum Strength Caplets, K-Pec; Parepectolin; Rheaban. Caplet: 750 mg. Liquid: 600 mg activated attapulgite/15 mL (180, 240, 360, 480 mL); 750 mg activated attapulgite/15 mL (120 mL). Suspension: 600 mg/15 mL. Tablet, chewable: 300, 600, 750 mg.	**Uncomplicated diarrhea (absorbent action).** *Children:* 3–6 yr: 300–750 mg/dose (max: 7 doses). 6–12 yr: 600–1,500 mg/dose (max: 7 doses).	*Caution:* Do not use for diarrhea due to dysentery, enterocolitis, or toxigenic bacteria.
Auranofin Gold compound. Ridaura. Capsule: 3 mg (gold 29%).	**Treatment of active stage of rheumatoid or psoriatic arthritis (immunomodulating effect).** *Children:* Initial dose: 0.1 mg/kg/24 hr; usual maintenance dose: 0.15 mg/kg/24 hr in 1–2 doses (max: 0.2 mg/kg/24 hr). *Adults:* 6 mg/24 hr in 1–2 doses (max: 9 mg/24 hr in 1–3 doses).	*Adverse events:* Itching, skin rash, stomatitis, conjunctivitis, proteinuria, alopecia, glossitis, leukopenia, thrombocytopenia, hematuria, anemia, agranulocytosis, eosinophilia, peripheral neuropathy, interstitial pneumonitis, angioedema, hepatotoxicity. *Monitoring:* Discontinue if WBCs, < 4,000/mm^3, granulocytes < 1,500/mm^3, platelets < 100,000/mm^3. *Cautions:* Administer by deep IM injection. *Adverse events:* Same as for auranofin.
Aurothioglucose Gold compound. Solganal. Suspension, sterile: 50 mg/mL (gold 50%) [10 mL].	**Treatment of active rheumatoid or psoriatic arthritis immunomodulator.** *Children:* 0.25 mg/kg/dose in wk 1, increased by 0.25 mg/kg/dose q wk to maintenance dose of 0.75–1.0 mg/kg/dose weekly (max: 25 mg/dose, total 20 doses). *Adults:* 10 mg in wk 1, then 25 mg in wk 2 and 3, then 50 mg/wk until cumulative dose or 1 g given.	
Azatadine maleate Antihistamine. Optimine. Tablet: 1 mg	**Treatment of allergy, allergic rhinitis, and urticaria (antihistamine, anticholinergic).** *Children < 12 yr:* Not recommended. *Children > 12 yr and adults:* 1–2 mg twice daily.	*Adverse events:* Sedation, dry mouth, thickened bronchial secretions.
Azathioprine Immunosuppressant agent. Imuran. Injection, as sodium: 100 mg (10 mL). Tablet: 50 mg.	**Prevent transplant rejection.** *Children and adults:* Initial dose of 2–5 mg/kg/24 hr IV or PO, with a maintenance dose of 1–3 mg/kg/24 hr. **Treatment of autoimmune disease (e.g., lupus, arthritis, nephrotic syndrome).** Inhibits synthesis of DNA, RNA, and proteins. Antagonizes purine metabolism. *Adults:* 1 mg/kg/24 hr × 6–8 wk.	*Cautions:* Chronic use causes increased risk of lymphoma and skin cancer. May cause irreversible bone marrow suppression. Reduce dose to 25% of normal if allopurinol used concurrently. *Adverse events:* Fever, chills, nausea, vomiting, diarrhea, thrombocytopenia, leukopenia, hepatotoxicity, rash.
Baclofen Skeletal muscle relaxant; nonparalytic Lioresal Injection, intrathecal: 0.5 mg/mL (20 mL); 2 mg/mL (5 mL). Tablet: 10, 20 mg.	**Spasticity associated with multiple sclerosis or spinal cord lesions.** **Trigeminal neuralgia (inhibits transmission of monosynaptic and polysynaptic reflexes at the spinal cord level).** *Children: 2–7 yr:* 10–15 mg/24 hr divided q 8 hr and titrated up q 3 days (max: 40 mg/24 hr PO). Intrathecal 25–50 µg. *Adults:* 5 mg q 8 hr and gradually increase by 5 mg q 3 days (max: 80 mg/24 hr PO). Intrathecal 50 µg to max 100 µg.	*Caution:* Avoid abrupt discontinuation; slowly titrate to discontinue *Adverse events:* Drowsiness, vertigo, psychiatric reactions, ataxia, hypotonia.
Beclomethasone Adrenal corticosteroid; anti-inflammatory agent; corticosteroid, inhalant (oral); corticosteroid, nasal; glucocorticoid. Beclovent Oral Inhaler; Beconase AQ Nasal Inhaler; Beconase Nasal Inhaler; Vancenase AQ Inhaler; Vanceril Oral Inhaler. Inhalation: Nasal (Beconase, Vancenase): 42 µg/inhalation (200 metered doses) [16.8 g]. Oral (Beclovent, Vanceril): 42µg/inhalation (200 metered doses) [16.8 g]. Spray, aqueous, nasal (Beconase AQ, Vancenase AQ): 42 µg /inhalation (200 metered doses) [25 g].	**Asthma (oral inhalation), rhinitis (nasal aerosol) [anti-inflammatory, immune modulator].** *Adults and children (inhaler):* 1–2 puffs bid–qid. (max children: 10 puffs daily; adults: 20 puffs daily). *Adults and children (nasal spray):* 1 spray in each nostril bid–qid.	*Adverse events: Candida* in mouth, burning and irritation of nasal mucosa, cough, hoarseness, headache. *Monitoring:* Inhaled corticosteroids should be administered via an extender device for better lung delivery and less local toxicity.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Benzocaine Local anesthetic, oral; local anesthetic, topical. Americaine; Anbesol Maximum Strenth; Babee Teething Lotion; BiCOZENE; chigger tox; Dermaplast; Foille Plus; Hurricaine; Orabase-B; Orabase Gel; Orabase-O, Oral Jel Brace-Aid Oral Anesthetic; Ora Jel Maximum Strength; Ora Jel Mouth-Aid; Rhulicaine, Solar Caine; Unguentine. Topical: Aerosol: 5% (97.5, 105 mL) 20% (20, 60, 120 g). Cream: 5% (30, 454 g); 6% (28.4 g). Gel 15% (7 g). Liquid, with benzyl benzoate and soft soap: 30 mL. Lotion: 8% (90 mL). Ointment: 5% (3.5, 30 g).	**Temporary relief of pain associated with minor skin injury (local anesthetic).** *Children and adults:* Apply to affected area as needed.	*Adverse events:* Local irritation or sensitization.
Benzonatate Topical anesthetic. Tessalon Perles.	**Relief of nonproductive cough (topical anesthetic action).** *Children < 10 yr:* Not indicated. *Children > 10 yr and adults:* 100 mg tid or q 4 hr (max: 600 mg/24 hr).	*Adverse events:* Sedation, numbness, dizziness, headache.
Benzoyl peroxide Acne products, topical skin product. Benzoxyl; Benzac W; Clear by Design; Clearasil; Dermo Xyl; Desquam-X; Loroxide; Oxy-5; Panoxyl; Panoxyl-AQ, Persa-Gel, Phiso AC-BP; Vanoxide. Cleansing bar: 5% (120 g); 10% (120 g). Cleansing lotion: 5% (120, 150, 240 mL); 10% (120, 150 mL). Cream: 5% (30 g); 10% (30, 45 g). Facial mask: 5%. Gel: 2.5% (45, 60, 90 g); 5% (45, 60, 90, 120 g); 10% (45, 60, 90, 120 g). Lotion: 5% (30, 42.5, 60 mL); 5.5% (25 mL); 10% (30, 42.5, 60 mL). Stick: 10%.	**Acne treatment (keratolytic and comedolytic effects, and killing anaerobic bacteria).** *Children and adults:* Apply sparingly tid for 15 min. May increase strength and duration of exposure as tolerated.	*Adverse events:* Contact dermatitis, local irritation, stinging, erythema.
Benztropine mesylate Anticholinergic agent: antidote, drug-induced dystonic reactions; anti-Parkinson agent. Cogentin. Injection: 1 mg/mL (2 mL). Tablet: 0.5, 1, 2 mg.	**Parkinsonism, drug-induced extrapyramidal reaction (block-age of striatal cholinergic receptors).** *Children > 3 yr:* 0.02–0.05 mg/kg/dose 1–2 × daily. *Adults:* 1–4 mg/dose 1–2 × daily.	*Adverse events:* Tachycardia, drowsiness, nervousness, hallucinations, dry mouth, blurred vision, mydriasis.
Benzylpenicilloyl-polylysine Diagnostic agent, penicillin allergy skin text. Pre-Pen. Injection: 0.25 mL.	**Adjunct to assessing the risk of penicillin hypersensitivity (elicits type 1 urticarial reactions by Immunoglobulin E-mediated reaction).** *Children and adults:* Scratch technique uses a 20-gauge needle to make a 3–5 mm scratch on dermis; apply a small drop of solution to scratch and rub it in gently with applicator. Intradermal injection of 0.1–0.2 mL of Pre-Pen and 0.9% saline in 2 sites at least 1 in apart.	*Monitoring:* Scratch test is positive if a pale wheal of ≥5–15 mm occurs within 10 min. Intradermal test is positive in 5–15 min. Discontinue antihistamines before performing tests (hydroxyzine and diphenhydramine for at least 4 days, astemizole for 6–8 wk).
Beractant Lung surfactant. Survanta. Suspension: 200 mg (8 mL).	**Prophylaxis and treatment of respiratory distress syndrome in premature infants (replaces deficiency of endogenous surfactant).** *Neonates:* 4 mL/kg via endotracheal tube. May repeat q 6 hr to a total of 4 doses. Rotate infant to right, then to left, and administer 1/2 dose on each side over 2–3 sec.	*Adverse events:* Bradycardia, hypotension, oxygen desaturation, pulmonary air leaks, airway obstruction, pulmonary hemorrhage, hypocarbia. *Monitoring:* Heart rate, oxygen saturation, and frequent arterial blood gases. Adjust ventilator to minimize episodes of hyperoxia and hypocarbia.
Betamethasone Adrenal corticosteroid; anti-inflammatory agent; corticosteroid, systematic; corticosteroid, topical; glucocorticoid. Alphatrex Topical; Betalene Topical; Betatrex Topical; Beta Val Topical; Celestone Oral, Celestone Phosphate Injection; Celestone Soluspan; Cel-U-Jec Injection; Diprolene AF Topical; Diprolene Topical; Diprosone Topical; Maxivate Topical; Psorion Topical; Selestoject Injection; Teledar Topical; Uticort Topical; Valisone Topical. Base (Celestone): Syrup: 0.6 mg/5 mL. Tablet: 0.6 mg. Benzoate (Uticort): Cream, emollient base: 0.025% (60 g). Gel, topical: 0.025% (15, 60 g). Lotion: 0.025% (60 mL). Dipropionate (Alphatrex, Diprosone, Maxivate, Tela Dar): Aerosol, topical: 0.1% (85 g). Cream: 0.05% (15, 45 g). Lotion: 0.05% (20, 30, 60 mL). Ointment, topical: 0.05% (15, 45 g). Diproprionate (Psorion): Cream: 0.05% (15, 45 g).	**Systemic use to stimulate fetal lung maturation in preterm labor. Topical use to treat inflammatory dermatoses.** *Children and adults:* Topical application of thin film to affected area bid–qid daily. *Pregnant female:* 12 mg IM q 24 hr for 2 doses.	*Adverse events:* Maternal pulmonary edema and hypertension, headache.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Diproponate, augmented (Diprolene, Diprolene AF): Cream, emollient base: 0.05% (15, 45 g). Gel, topical: 0.05% (15, 45 g). Lotion: 0.05% (30, 60 mL). Ointment, topical: 0.05% (15, 45 g). Valerate (Betatrex, Beta-Val, Valisone): Cream: 0.01% (15, 60 g); 0.1% (15, 45, 110, 430 g). Lotion: 0.1% (20, 60 mL). Ointment, topical: 0.1% (15, 45 g). Powder for compounding: 5, 10 g. Sodium phosphate (Celestone Phosphate, Selestoject): Injection: Equivalent to 3 g/mL (5 mL). Sodium phosphate and acetate (Celestone Soluspan): Injection, suspension: 6 mg/mL (3 mg betamethasone and betamethasone sodium phosphate and 3 mg betamethasone acetate/mL) [5 mL].		
Bethanechol Cholinergic agent. Duvoid; Myotonachol; Urecholine. Injection: 5 mg/mL (1 mL). Tablet: 5, 10, 25, 50 mg.	**Treatment of nonobstructive urinary retention or gastroesophageal reflux (stimulates cholinergic receptors in smooth muscle in urinary and gastrointestinal tracts).** *Children:* 0.3–0.6 mg/kg/24 hr divided into 3–4 doses. *Adults:* 10–50 mg bid–qid.	*Adverse events:* Hypotension, abdominal cramps, diarrhea, vomiting, salivation, urinary frequency, bronchial constriction, sweating.
Biotin Biotinidase deficiency; treatment agent; vitamin, water-soluble. Biotin Forte; Biotin Forte Extra Strength; Bio-Tin; d-Biotin Tablet: 300, 400, 600, 800 µg; 2.5, 3, 5, 10 mg.	**Treatment of primary biotinidase deficiency or nutritional biotin deficiency, component of vitamin B complex (required for various metabolic functions).** *Children and adults:* Biotin deficiency: 5–20 mg daily. Biotinidase deficiency: 5–10 mg daily.	
Bisacodyl Laxative, stimulant. Bisacodyl Uniserts; Bisco-Lax; Carter's Little Pills; Clysodrast V; Dulcagen; Dulcolax; Fleet Laxative. Enema. 10 mg/30 mL. Powder: 1.5 mg with tannic acid 2.5 g/packet (25, 50's). Suppository, rectal: 5, 10 mg. Tablet, enteric-coated: 5 mg.	**Treatment of constipation (direct smooth muscle irritation to stimulate gastrointestinal peristalsis).** *Children:* *<2 yr:* 5 mg rectal suppository. *>2 yr:* 10 mg rectal suppository. *>6 yr:* 5–10 mg PO at bedtime or before breakfast. *Adults:* 5–30 mg PO, 10 mg rectal suppository.	*Adverse events:* Fluid and electrolyte imbalance, abdominal cramps.
Bismuth subsalicylate Antidiarrheal; gastrointestinal agent; gastric or duodenal ulcer treatment. Bismatrol; Pepto-Bismol. Liquid: 262 mg/15 mL (120, 240, 360, 480 mL); 524 mg/15 mL (120, 240, 360 mL). Tablet, chewable: 262 mg.	**Treatment of diarrhea or gastrointestinal ulcer (absorbs extra water and toxins in large intestine and kills bacterial pathogens).** *Children or adults:* Up to 8 doses/24 hr. *3–6 yr:* 1/3 tablet or 5 mL. *6–9 yr:* 2/3 tablet or 10 mL. *9–12 yr:* 1 tablet or 15 mL. *Adults:* 2 tablets or 30 mL.	*Cautions:* Avoid in patients with influenza or chickenpox because of salicylate content. *Adverse events:* Discoloration of tongue, grayish-black stools.
Bleomycin Antineoplastic agent, antibiotic type. Blenoxane. Powder for injection: 15 U.	**Palliative treatment for several cancers and sclerosing agent for malignant effusions (inhibits synthesis of DNA).** *Children and adults:* 10–20 U/m^2/dose IV, IM, SC (0.25–0.5 U/kg) 1–2 × wk in combination regimens.	*Cautions:* Reduce dose in renal dysfunction *Adverse events:* Interstitial pneumonitis, pulmonary fibrosis, nonproductive cough, phlebitis, leukopenia, thrombocytopenia, stomatitis, vomiting, alopecia, hyperkeratosis of hands and nails, desquamation, Raynaud phenomenon; avoid oxygen use.
Bretylium Antiarrhythmic agent, class III. Bretylol. Injection: 50 mg/mL (10, 20 mL); 100 mg/mL. Injection, premixed in D5W: 1 mg/mL (500 mL); 2 mg/mL (250 mL); 4 mg/mL (250, 500 mL).	**Treatment of serious or life-threatening arrhythmias (inhibits release of norepinephrine at postganglionic nerve endings).** *Children:* 2–5 mg/kg IV or IM, may repeat q 10–20 min (max: 30 mg/kg). *Adults:* Initial dose or 5 mg/kg, then 10 mg/kg q 15–30 min (max: 35 mg/kg). *Note:* Cardioversion/defibrillation must be attempted before and after each dose of bretylium.	*Adverse events:* Hypotension, increased premature ventricular contractions, bradycardia, nasal congestion, sweating, hiccups. *Monitoring:* ECG, blood pressure.
Brompheniramine Antihistamine. Bromarest; Bromphen Elixir; Chlorphed; Cophene-B Injection; Dehist Injection; Dimetane Oral, Nasahist B injection; ND-Stat Injection; Oraminic II Injection; Sinusol-B injection; Veltane. Tablet. Elixir: 2 mg/5 mL with alcohol 3% (120, 480, 4,000 mL). Injection: 10 mg/mL (10 mL). Tablet: 4, 8, 12 mg. Tablet, sustained-release: 8, 12 mg.	**Treatment of allergic symptoms (e.g., rhinitis, urticaria) [competes with histamine for H_1 receptor sites].** *Children:* *<6 yr:* 0.125 mg/kg/dose q 6 hr (max: 8 mg/24 hr) PO. *6–12 yr:* 2–4 mg/dose q 6–8 hr (max: 16 mg/24 hr) PO. *Adults:* 4–8 mg/dose q 4–6 hr (max: 24 mg/24 hr) PO. IV, IM, SC: *<12 yr:* 0.5 mg/kg/24 hr divided q 6 hr. *>12 yr:* 10 mg/dose divided q 6–12 hr (max: 40 mg/24 hr).	*Adverse events:* Sedation, dry mouth.
Budesonide Adrenal corticosteroid; anti-inflammatory agent; corticosteroid, nasal; glucocorticoid. Rhinocort. Aerosol: 50 µg released/actuation to deliver ≈ 32 µg via nasal adapter (200 metered doses) [7 g]. Pulmicort Turbohaler (dry powder inhaler). Inhalation powder: 200 µg/inhalation.	**Treatment of chronic rhinitis or asthma (suppresses inflammation).** *Children > 6 yr and adults:* Rhinocort nasal spray 2 puffs in each nostril bid or 4 puffs in each nostril once daily. *Children > 6 yr:* Pulmicort Turbohaler 1–2 inhalations bid. *Adults:* 1–4 inhalations bid.	*Adverse events:* Oral thrush, dysphonia (minimize by rinsing mouth after dose).

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Bumetanide Antihypertensive: diuretic, loop. Bumex. Injection: 0.25 mg/mL (2, 4, 10 mL). Tablet: 0.5, 1, 2 mg.	**Management of edema or fluid overload states (prevents sodium and chloride reabsorption at the ascending loop of Henle and proximal tubule).** PO, IV, IM: *Neonates:* 0.01–0.05 mg/kg/dose q 24–48 hr. *Infants and children:* 0.015–0.1 mg/kg/dose q 6–24 hr (max: 10 mg/24 hr). *Adults:* 0.5–2 mg/dose (max: 10 mg/24 hr).	*Adverse events:* Electrolyte depletion, dehydration.
Bupivacaine Local anesthetic, injectable. Marcaine; Sensorcaine; Sensorcaine-MPF Bupivacaine. Injection; preservative-free: 0.25% (2.5 mg/mL); 0.5% (5 mg/mL), 0.75% (7.5 mg/mL). With preservative: 0.25% (2.5 mg/mL); 0.5% (5 mg/mL). Bupivacaine and epinephrine (2 : 2 million) injection, preservative-free: 0.25% (2.5 mg/mL); 0.5% (5 mg/mL); 0.75% (7.5 mg/mL). With preservative: 0.25% (2.5 mg/mL); 0.5% (5 mg/mL). Bupivacaine in dextrose: 8.25%. Injection (spinal), preservative-free: 0.75% (7.5 mg/mL).	**Local anesthetic (blocks initiation and conduction of nerve impulses by decreasing permeability of neuron to sodium ions).** Caudal block: *Children:* 1–3.7 mg/kg. *Adults:* 15–30 mL of 0.25% or 0.5%. Epidural block: *Children:* 1.25 mg/kg/dose. *Adults:* 10–20 mL of 0.25% or 0.5% Peripheral nerve block: 5 mL dose of 0.25% (12.5 mg) or 0.5% (25 mg) (max: 400 mg/24 hr). Sympathetic nerve block: 20–50 mL of 0.25% (no epinephrine).	*Cautions:* Excess doses may result in seizures, bradyarrhythmias, metabolic acidosis, apnea, and methemoglobinemia. Avoid epinephrine for nerve block near end artery because of risk of necrosis.
Bupropion Antidepressant. Wellbutrin. Tablet: 75, 100 mg.	**Depression, attention deficit disorder, smoking cessation (blocks serotonin activity and norepinephrine reuptake)** *Children:* Anecdotal experience showed benefits at 75–100 mg 2–3 times/24 hr. *Adults:* Begin 100 mg bid and may gradually increase (max: 450 mg/24 hr).	*Adverse events:* Agitation, insomnia, headache, psychosis, confusion, anxiety, seizures, akathisia, fever, chills, dry mouth, constipation, nausea, vomiting.
Busulfan Antineoplastic agent; alkylating agent. Myleran. Tablet: 2 mg.	**Treatment of chronic myelogenous leukemia (CML) or as part of marrow ablation conditioning before bone marrow transplant (interferes with DNA alkylation).** *Children:* (for CML remission) 0.06–0.12 mg/kg/24 hr; titrate dose to keep leukocyte count > 40,000/mm^3; (for bone marrow transplant conditioning) 1 mg/kg/dose q 6 hr for 16 doses. *Adults:* (for CML remission) 0.06 mg/kg/24 hr.	*Adverse events:* Severe pancytopenia, leukopenia, thrombocytopenia, bone marrow suppression (onset, 7–10 days; nadir, 14–21 days; recovery, 28 days). *Monitoring:* Complete blood count with differential and platelet count (discontinue if WBC < 20,000/mm^3). Hemoglobin, liver function tests.
Caffeine, citrated Central nervous system stimulant, nonamphetamine; respiratory stimulant. Tablet: 65 mg (anhydrous caffeine 32.5 mg), caffeine citrates, caffeine benzoate.	**Treatment of apnea of prematurity (stimulates central inspiratory drive and sensitivity to carbon dioxide).** *Neonates:* PO or IV (citrate or benzoate). Does as caffeine base: Loading dose of 10 mg/kg. Maintenance dose of 5–10 mg/kg/24 hr as 1 or 2 doses/24 hr.	*Cautions:* Sodium benzoate displaces bilirubin from binding and should be avoided in neonates with elevated indirect bilirubin. *Adverse events:* Tachycardia, agitation, irritability, gastric irritation. *Monitoring:* Caffeine concentrations: therapeutic >10 μg/mL; toxic >50 μg/mL.
Calcifediol 25-hydroxycholecalciferol; 25-hydroxyvitamin D_3; vitamin D analog. Calderol. Capsule: 20, 50 μg.	**Treatment of metabolic bone disease associated with chronic renal failure (regulates serum calcium homeostasis as a vitamin D analog).** *Infants:* 5–7 μg/kg/24 hr. *Children and adults:* 20–100 μg/kg daily of other day titrated to obtain normal serum calcium and phosphate levels.	*Cautions:* Avoid in hypercalcemia, hypervitaminosis D, malabsorption states. Ensure adequate calcium intake during use. *Adverse events:* Hypercalcemia, gastrointestinal intolerance.
Calcitriol Vitamin D analog; 1,25-dihydroxycholecalciferol, vitamin, fat-soluble. Calcijex; Rocaltrol. Capsule: 0.25, 0.5 μg. Injection: 1 μg/mL (1 mL); 2 μg/mL (1 mL).	**Treatment of hypocalcemia and metabolic bone disease; reduces elevated parathyroid hormone levels and decreases severity of psoriatic lesions in psoriatic vulgaris (regulate is serum calcium homeostasis and increases calcium absorption).** *Premature infants* (hypocalcemia): 0.05 μg/kg/24 hr IV or 1 μg/24 hr PO. *Children:* 0.01–0.08 μg/kg/24 hr. *Adults:* 0.25–1 μg/24 hr.	*Adverse events:* Hypercalcemia, vitamin D toxicity.
Calcium salts (PO and IV) Calcium carbonate. (Elemental calcium listed in parentheses.) Antacid; calcium salt; electrolyte supplement. Oral Alka–Mints; Cal-Plus; Mylanta; Os-Cal; Tums Capsule: 1,500 mg (600 mg). Liquid: 1,000 mg/5 mL (360 mL). Cardiac arrest Lozenge: 600 mg (240 mg). Powder: 6.5 g/packet. Suspension, oral: 1,250 mg/5 mL (500 mg). Tablet: 650 mg (260 mg); 1,500 mg (600 mg). Tablet, chewable.	**Hypocalcemic tetany and cardiac disturbances of hyperkalemia (moderate nerve and muscle performance).** Hypocalcemic tetany. *Neonates:* 2.4 mEq/kg/24 hr in divided doses (if due to citrated blood transfusion, give 0.45 mEq/dL transfused blood). *Infants and children:* 10 mg/kg over 5–10 min (may repeat in 6–8 hr), followed by infusion with maximum of 200 mg/kg/24 hr. *Adults:* 4.5–16 mEq repeated until response. *Infants and children:* 20 mg/kg IV and may repeat in 10 min. *Adults:* 2–4 mg/kg repeated of 10 min as needed.	*Caution:* Make sure of IV access site to avoid severe IV burns; bradycardia. *Adverse events:* Constipation, hypercalcemia, milk-alkali syndrome. *Monitoring:* Continuous ECG; serum calcium, potassium, and magnesium levels.
Calcium chloride Calcium salt; electrolyte supplement, parenteral. Cal Plus. (Elemental calcium listed in parentheses.) Injection: 10% = 100 mg/mL (27.2 mg/mL) [10 mL] (1.4 mEq calcium/mL).	**Prevention of calcium depletion and relief of acid indigestion (source of calcium and neutralizes acid).** *Children:* *<6 mo:* 400 mg/24 hr. *6–12 mo:* 600 mg/24 hr. *1–5 yr:* 800 mg/24 hr. *6–10 yr:* 800–1,200 mg/24 hr. *>10 yr and adult:* 1,000–1,500 mg/24 hr.	
Calcium glubionate Calcium salt; electrolyte supplement, oral. Neo-Calglucon. Syrup: 1.8 g/5 mL (115 mg/5 mL) [480 mL] (1.2 mEq calcium/mL).		

Calcium Content of Salts

Salt	Mg of Calcium/g of Salt (elemental)	mEq Ca^{2+}/g of Salt
Ca carbonate	400	20
Ca chloride	270	13.5
Ca glubionate	64	3.2
Ca gluceptate	82	4.1
Ca gluconate	90	4.5
Ca lactate	130	6.5
Ca phosphate	390	19.3

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Calfactant Infasurf. Intratracheal suspension of calf lung surfactant (35 mg phospholipids, 0.65 mg proteins, 0.26 mg SP-B/mL).	**Prophylaxis or treatment of respiratory distress syndrome and treatment of persistent pulmonary hypertension.** *Neonates:* 3 mL/kg/dose 1–4 times q 12 hr. *Children and adults:* Not indicated.	*Caution:* Monitor ventilator status closely; may require rapid weaning within minutes of dose. *Adverse events:* Bradycardia, airway obstruction, cyanosis.
Capsaicin Analgesic, topical; topical skin product. R-Gel; Zostrix-HP topical, Zostrix Topical. Cream: 0.025% (45, 90 g); 0.075% (30, 60 g). Gel: 0.025% (15, 30 mL).	**Topical treatment of pain associated with postherpetic neuralgia, rheumatoid arthritis, osteoarthritis, diabetic neuropathy, and postsurgical pain (induces release of substance P, depleting peripheral nerves and preventing reaccumulation).** *Children >2 yr and adults:* Apply to affected area at least tid–qid.	*Adverse events:* Local itching, stinging, burning, erythema.
Captopril Angiotensin-converting enzyme (ACE) inhibitor; antihypertensive. Capoten. Tablet: 12.5, 25, 50, 100 mg.	**Management of hypertension and treatment of heart failure.** *Premature newborns:* 0.01 mg/kg q 8–12 hr. *Neonates:* Initial dose of 0.05–0.1 mg/kg/dose q 8–24 hr, titrated upward to response (max: 0.5 mg/kg/dose q 6–24 hr). *Infants:* Initial dose of 0.15–0.3 mg/kg/dose, titrated upward (max: 6 mg/kg/24 hr in 1–4 divided doses). *Children:* Initial dose of 0.3–0.5 mg/kg/dose, titrated upward (max: 6 mg/kg/24 hr divided into 2–4 doses). *Older children:* Initial dose of 6.25–12.5 mg/kg/dose q 12–24 hr, titrated (max: 6 mg/kg/24 hr in 2–4 doses). *Adolescents and adults:* Initial dose of 12.5–25 mg/dose, titrated (max: 450 mg/24 hr).	*Cautions:* Use with caution in renal artery stenosis or in patients with volume depletion. *Adverse events:* Cough, angioedema, oliguria, hyperkalemia.
Carbamazepine Anticonvulsant, miscellaneous. Epitol; Tegretol. Suspension, oral (citrus-vanilla flavor): 100 mg/5 mL (450 mL). Tablet: 200 mg. Tablet, chewable: 100 mg. Sustained-release tablet: Tegretol XR: 100, 200, 400 mg.	**Treatment of generalized tonic-clonic and partial seizures, pain relief in trigeminal neuralgia and diabetic neuropathy, and treatment of bipolar disorder (limits influx of sodium ions across cell membranes or other unknown mechanisms).** *Children:* <*6 yr:* Initial dose of 5 mg/kg/24 hr in 2–4 divided doses; may increase q 5–7 days by 5 mg/kg, based on effect or toxicity and serum concentration. *6–12 yr:* Initial dose of 10 mg/kg/24 hr in 2–4 divided doses; increase by 100 mg or 5 mg/kg/24 hr at weekly intervals until therapeutic levels are achieved (usual dose: 800–1,200 mg/24 hr). *Adults:* Initial dose of 200 mg bid; increase by 200 mg at weekly intervals until therapeutic levels are achieved (usual dose: 1.6–2.4 g/24 hr in 3–4 divided doses).	*Caution:* Avoid in patients with bone marrow depression; may cross react in patients with tricyclic antidepressant hypersensitivity. *Adverse events:* Sedation, dizziness, fatigue, ataxia, confusion, nausea, vomiting, blurred vision, nystagmus, bone marrow depression, leukopenia, neutropenia, thrombocytopenia, pancytopenia, aplastic anemia, hepatitis, hypersensitivity reactions. *Monitoring:* Serum concentrations correlate with clinical response (6–12 μg/mL), and neurologic and visual toxicity (> 8 μg/mL, but particularly > 12 μg/mL). Drug dosing requirements will increase over first 4 wk because of hepatic enzyme induction by carbamazepine. Monitor serum concentrations to increase doses appropriately.
Carbamide peroxide Otic agent, cerumenolytic. Auro Ear Drops; Gly-Oxide Oral; Murine Ear Drop; Proxigel Oral. Gel, oral: 11% (36 g). Solution, oral: 10% in glycerin (15, 22.5, 30, 60 mL). Otic: 6.5% in glycerin (15, 30 mL).	**Relief of minor inflammation of oral mucosa, including gums and lips, and removal of ear wax (release of hydrogen peroxide, which inhibits bacteria and softens ear wax).** *Children and adults:* Gel: Gently massage on affected area qid. Oral solution: Apply several drops to affected area qid for up to 7 days. (expectorate 2–3 min after each use). Otic solution: Tilt head sideways and instill 5–10 drops bid for up to 4 days. Keep drops in ear canal for several minutes by tilting head and placing cotton in ear.	*Adverse events:* Local irritation.
Carbinoxamine and Pseudoephedrine Antihistamine/decongestant combination. Carbiset Tablet; Carbodec Syrup; Rondec Drops. Drops: Carbinoxamine maleate 2 mg and pseudoephedrine hydrochloride 25 mg/mL (30 mL with dropper). Syrup: Carbinoxamine maleate 4 mg and pseudoephedrine hydrochloride 60 mg/5 mL (120, 480 mL). Tablet, film-coated: Carbinoxamine maleate 4 mg and pseudoephedrine hydrochloride 60 mg. Tablets sustained-release: Carbinoxamine maleate 8 mg and pseudoephedrine hydrochloride 120 mg.	**Temporary relief of nasal congestion, runny nose, sneezing, and allergy symptoms (antihistamine as H_1 blocker, and decongestant as α- and β-receptor stimulant).** *Children:* Give qid: *1–3 mo:* 1/4 dropper (0.25 mL). *3–6 mo:* 1/2 dropper (0.5 mL). *6–9 mo:* 3/4 dropper (0.75 mL). *9–18 mo:* 1 dropper (1.0 mL). *18 mo–6 yr:* 2.5 mL syrup. *6–12 yr:* 5 mL syrup or 1 tablet. *Children > 12 yr and adults:* 1 tablet qid or 1 sustained-release tablet bid.	*Cautions:* Avoid in narrow-angle glaucoma, coronary artery disease, gastrointestinal or genitourinary obstruction, or monoamine oxidase inhibitor therapy. *Adverse events:* Hypertension, tachycardia, drowsiness, sedation, thickening of bronchial secretions.
Carboplatin Antineoplastic agent; alkylating agent. Paraplatin powder for injection, lyophilized: 50, 150, 450 mg.	**Treatment of multiple tumors, including pediatric brain tumor and neuroblastoma (platination of DNA interferes with DNA function).** *Children:* Solid tumor: 300–600 mg/m² IV 1 × q 4 wk Brain tumor: 175 mg/m² IV 1 × wk for 4 wk (2 wk recovery period between courses). *Adults:* 360 mg/m² IV 1 × q 4 wk.	*Adverse events:* Neutropenia, leukopenia, thrombocytopenia, peripheral neuropathy, ototoxicity, abnormal liver and renal function, alopecia, nausea, vomiting. *Monitoring:* Neutrophil and platelet counts affect dose selection as follows: platelets < 50,000/mm³ or neutrophils < 500/mm³: give 75% of recommended dose (nadir: 14–21 days post dose).
Carmustine Antineoplastic agent; alkylating agent (nitrosourea). BiCNU power for injection: 100 mg/vial packaged with 3 mL of absolute alcohol for use as a sterile diluent.	**Treatment of cancers, including brain tumor, Hodgkin disease, non-Hodgkin lymphoma, and multiple myeloma (inhibits key enzymatic reactions involved in DNA synthesis).** *Children:* 200–250 mg/m² IV q 4–6 wk as a single dose. *Adults:* 150–200 mg/m² IV q 6 wk as a single dose.	*Adverse events:* Nausea, vomiting, myelosuppression (nadir 4–6 wk post dose), alopecia, stomatitis, anorexia, diarrhea, dizziness, ataxia, pulmonary fibrosis, hepatic and renal dysfunction, retinitis, optic neuritis.
Carnitine Dietary supplement. Carnitor; Vitacarn. Capsule: 250 mg. Injection: 1 g/5 mL (5 mL). Liquid (cherry flavor): 100 mg/mL (10 mL). Tablet: 330 mg.	**Treatment of carnitine deficiency; improves use of IV fat emulsions by premature infants (facilitates long-chain fatty acid entry into the mitochondria and required in energy metabolism).** *Premature infants:* 8–16 mg/kg/24 hr IV infusion. *Children:* 50–100 mg/kg/24 hr in 2–3 divided doses PO, 50 mg/kg/dose q 4–6 hr IV (max: 300 mg/kg/24 hr). *Adults:* 0.33–1 g/dose bid–tid, PO, 50 mg/kg/dose q 4–6 hr (max: 300 mg/kg/24 hr).	*Adverse events:* Nausea, vomiting, abdominal cramps, body odor.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Carvedilol Coreg. Tablet: 3.125, 6.25, 12.5, 25 mg.	**β-Receptor blocker with vasodilator activity, used to treat congestive heart failure or hypertension.** *Children:* Initial dose of 0.08 mg/kg, gradually increased over 2–3 mo, based on response (max: 0.5 mg/kg/24 hr divied q 12 hr).	*Caution:* May cause AV block, arrhythmias, bradycardia, or worsen asthma or heart failure. *Drug interactions:* May cause excessive hypotension when used with other antihypertensives.
Cascara sagrada Laxative; stimulant. Liquid, aromatic fluid extract: 5, 120 mL. Tablet: 325 mg.	**Temporary relief of constipation (direct chemical irritation of gastrointestinal mucosa).** *Infants:* 1.25 mL once daily. *Children 2–11 yr:* 2.5 mL once daily. *>12 yr and adults:* 5 mL once daily.	*Cautions:* Fecal impaction, gastrointestinal obstruction, gastrointestinal bleeding. Onset of effect 6–10 hr, so give at bedtime. *Adverse events:* Gastrointestinal cramps, urine discolored red or brown.
Castor oil Laxative; stimulant. Alphamul; Emulsoil; Fleet; Purge. Emulsion, oral; liquid, oral: 100% (60, 120, 480 mL).	**Bowel or rectal evacuation for surgery (stimulates peristalsis).** *Infants < 2 yr:* 1–5 mL single dose. *Children 2–11 yr:* 5–15 mL. *Children > 12 yr and adults:* 15–60 mL.	*Adverse events:* Electrolyte disturbances, abdominal cramps.
Charcoal Adsorbent, antidote. Actidose-Aqua; Actidose with Sorbitol; Charcocaps.	**Emergency treatment of poisoning by certain drugs and chemicals; gastrointestinal dialysis to promote elimination of certain drugs and toxins; treatment of diarrhea (adsorbs toxic substance; interferes with enterohepatic recycling of certain drugs).** *Children and adults:* 1–2 g/kg or 5–10 × the weight of the ingested poison (limit sorbitol to 1–2 × daily); may repeat doses q 2–6 hr.	*Adverse events:* Constipation, black stools.
Chloral hydrate Hypnotic; sedative. Noctec. Capsules: 250, 500 mg. Syrup: 250, 500 mg/5 mL. Suppository: 324, 500, 648 mg.	**Short-term sedative/hypnotic (mechanism unknown).** *Neonates:* 25 mg/kg/dose. *Infants and children:* 25–100 mg/kg/dose. *Adults:* 250–1,000 mg/dose. Doses may be repeated q 6–8 hr. Lower-end doses cause sedation; higher-end doses cause hypnosis.	*Cautions:* Repeat doses in neonates may cause accumulation of active metabolite trichloroethanol, which can cause hepatic toxicity and bilirubin displacement.
Chlorambucil Antineoplastic alkylating agent. Leukeran. Tablet: 2 mg.	**Management of various cancers, including Hodgkin disease, non-Hodgkin lymphoma, and chronic lymphocytic leukemia, and nephrotic syndrome (alkylation interferes with DNA replication and RNA transcription).** *Children and adults:* 0.1–0.2 mg/kg/24 hr for 3–6 wk. Longer treatment doses are adjusted based on blood counts.	*Adverse events:* Bone marrow suppression (onset, 7 days; nadir, 10–14 days; recovery, 28 days); rashes, hyperuricemia, nausea, vomiting, diarrhea, oral ulceration, pulmonary fibrosis, hepatic necrosis, peripheral neuropathy.
Chlorothiazide Diuretic. Generic. Tablet: 250, 500 mg. Suspension: 250 mg/5 mL. Powder for injection: 500 mg.	**Treatment of fluid overload states and hypertension (inhibits sodium reabsorption in distal tubule).** *Neonates and infants < 6 mo:* PO: 20–40 mg/kg/24 hr divided q 12 hr; IV: 2–8 mg/kg/24 hr divided q 12 hr. *Infants > 6 mo and children:* PO: 20 mg/kg/24 hr in 2 divided doses; IV: 4 mg/kg/24 hr. *Adults:* PO: 500 mg–2 g/24 hr in 1–2 doses; IV: 500–1,000 mg/24 hr.	*Adverse events:* Hypokalemia, hypochloremic alkalosis, hyperglycemia, hyperlipidemia, hypercalcemia, hyperuricemia, leukopenia, prerenal azotemia.
Chlorpheniramine maleate Antihistamine. Generic. Capsule: 12 mg. Capsule, timed-release: 6, 8, 12 mg. Syrup: 2 mg/5 mL. Tablet: 4, 8, 12 mg. Tablet; chewable: 2 mg. Tablet; timed-release: 8, 12 mg.	**Treatment of allergic symptoms (competes with histamine for H_1 receptor sites).** *Children:* *2–6 yr:* 1 mg q 4–6 hr. *6–12 yr:* 2 mg q 2–6 hr, or sustained-release form, 8 mg at bedtime. *>12 yr and adults:* 4 mg q 4–6 hr, or sustained-release form, 12 mg at bedtime.	*Adverse events:* Drowsiness, excitation or hyperactivity (in children), dry mouth, blurred vision.
Chlorpromazine Phenothiazine. Thorazine. Capsule: 30, 75, 150, 200, 300 mg. Oral concentrate: 30, 100 mg/mL. Suppository: 25, 100 mg. Syrup: 10 mg/5 mL. Tablet: 10, 25, 50, 100, 200 mg. Injection: 25 mg/mL.	**Treatment of psychosis, mania, Tourette syndrome, behavioral problems, nausea, and vomiting (blocks postsynaptic mesolimbic dopaminergic receptors in the brain, strong α-adrenergic blocking effect).** *Children > 6 mo:* PO: 0.5–1 mg/kg/dose q 4–6 hr. Rectal: 1 mg/kg/dose q 6–8 hr. IM or IV: 0.5–1 mg/kg/dose q 6–8 hr. *Adults:* Psychosis: PO: 30–800 mg/24 hr in 1–4 divided doses (start low and titrate up to effect). IV or IM: 25 mg initial dose, titrated up to effect (max: 400 mg/dose q 4–6 hr). Nausea or vomiting: PO: 10–25 mg q 4–6 hr. IM or IV: 25–50 mg q 4–6 hr. Rectal: 50–100 mg q 6–8 hr.	*Adverse events:* Hypotension, tachycardia, arrhythmias, pseudoparkinsonism, tardive dyskinesia, akathisia, dystonias, constipation, nasal congestion, dry mouth, malignant hyperpyrexia. *Monitoring:* Chlorpromazine concentrations: therapeutic 50–300 ng/mL; toxic > 750 ng/mL.
Chlorpropamide Sulfonylurea. Diabinese. Tablet: 100, 250 mg.	**Control blood sugar in non–insulin-dependent diabetes mellitus (type II)** [stimulates insulin release from pancreatic islet cells]. *Adults:* Initial 250 mg once daily, may increase to response by 125 mg q 3–5 days to response (max: 750 mg/24 hr).	*Adverse events:* Gastrointestinal problems, photosensitivity, hepatotoxicity, hyponatremia, syndrome of inappropriate antidiuretic hormone.
Chlorthalidone Thiazide diuretic. Hygroton. Tablet: 20, 25, 100 mg.	**Treatment of fluid overload and mild hypertension (inhibits sodium and chloride reabsorption in the cortical-diluting segment of the ascending loop of Henle).** *Children:* 1–2 mg/kg once daily. *Adults:* 25–100 mg once daily.	*Adverse events:* Photosensitivity, fluid and electrolyte imbalance, hypokalemia.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Chlorzoxazone Skeletal muscle relaxant. Paraflex; Parafon Forte. Tablet: 250, 500 mg.	**Symptomatic relief of muscle spasm and pain (depresses polysynaptic reflexes at spinal cord and subcortical levels).** *Children:* 20 mg/kg/24 hr in 3–4 divided doses. *Adults:* 250–500 mg tid–qid.	*Adverse events:* Drowsiness.
Cholestyramine resin Antilipemic agent. Questran. Powder: 4 g resin/9 g powder.	**Management of elevated cholesterol (forms nonabsorbable complex with bile salts and low-density lipoprotein cholesterol).** *Children:* 240 mg/kg/24 hr in 3 divided doses. *Adults:* 4 g/dose 1–6 × daily.	*Adverse events:* Hyperchloremic acidosis, constipation, nausea, vomiting, abdominal pain and distention, malabsorption of fat-soluble vitamins.
Choline magnesium trisalicylate Nonsteroidal anti-inflammatory agent. Trilisate. Liquid: 500 mg salicylate/5 mL. Tablet: 500, 750, 1,000 mg.	**Management of arthritis disorders (inhibits prostaglandin synthesis).** *Children:* 30–60 mg/kg/24 hr in 3–4 divided doses. *Adults:* 500–1,500 mg/dose 1–3 × daily.	*Cautions:* Avoid in patients with suspected influenza or varicella infection due to risk of Reye syndrome; avoid in those with asthma and others at risk for serious hypersensitivity reactions. *Adverse events:* Gastrointestinal intolerance, tinnitus, hepatotoxicity, pulmonary edema. *Monitoring:* Salicylate concentrations: anti-inflammatory 150–300 μg/mL; analgesic or antipyretic effect 30–50 μg/mL.
Chorionic gonadotropin Gonadotropin; ovulation stimulator. Chorex, Choron, Pregnyl. Powder for injection: 200, 500, 1,000, 2,000 U/mL (10 mL).	**Treatment of hypogonadotropic hypogonadism and cryptorchidism; induces ovulation (stimulates production of gonadal steroid hormones; substitutes for luteinizing hormone to stimulate ovulation).** *Children:* Prepubertal cryptorchidism: 1,000–2,000 units/m^2/dose 3 × wk for 3 wk or 500 units 3 ×/wk for 4–6 wk. Hypogonadotropic hypogonadism: 500–1,000 U/dose 3 ×/wk for 3 wk; or 4,000 U 3 ×/wk for 6–9 mo, then taper to 2,000 units 3 ×/wk for 3 mo. *Adults* (menotropin dose): 5,000 units 3 ×/wk for 4–6 mo.	*Adverse events:* Mental depression, tiredness, precocious puberty, premature closure of epiphyses.
Cimetidine Histamine$_2$ antagonist. Cimetidine. Tablet: 200, 300, 400, 800 mg. Liquid: 300 mg/5 mL. Injection: 150 mg/mL.	**Short-term treatment and long-term prophylaxis of gastroesophageal reflux disease, gastrointestinal ulcers, and hyperacidity (competitive inhibition of histamine at H_2 receptors).** *Neonates:* PO, IV, IM: 5–10 mg/kg/24 hr divided q 8–12 hr. *Children:* PO, IV, IM: 20–40 mg/kg/24 hr divided q 6 hr. *Adults:* 300 mg q 6 hr (prolong dosing interval for creatinine clearance of <40 mL/min).	*Cautions:* Potent enzyme inhibitor that may cause toxic accumulation of drugs that are metabolized (e.g., antidepressants, anticonvulsants, theophylline, warfarin, cisapride). *Adverse events:* Dizziness, drowsiness, bradycardia. *Monitoring:* Target gastric pH ≥ 5.
Cisapride Prokinetic gastrointestinal agent. Propulsid. Tablet: 10 mg.	**Treatment of gastroesophageal reflux, gastroparesis, and refractory constipation (enhances release of acetylcholine at myenteric plexus).** *Neonates–Children:* 0.15–0.3 mg/kg/dose tid–qid. *Adults:* 10–20 mg qid. Give dose 15–30 min before meals.	*Cautions:* High doses or combination with enzyme inhibitors (e.g., erythromycin, cimetidine) may cause Q-T-interval prolongation, predisposing to torsades de pointes. *Adverse events:* Tachycardia, prolonged Q-T interval, headache, anxiety, insomnia gastrointestinal cramping, flatulence, diarrhea. *Monitoring:* Baseline ECG and early treatment.
Cisplatin Antineoplastic agent; alkylating agent. Platinol. Injection, aqueous: 1 mg/mL. Powder for injection: 10, 50 mg.	**Treatment of multiple tumor types (inhibits DNA synthesis).** *Children and adults:* 37–75 mg/m^2 once q 2–3 wk or 50–120 mg/m^2 once q 21–28 days (administer over 4–6 hr). Adjust dose in renal impairment: CrCl 10–50 mL/min = 75% of dose; CrCl < 10 mL/min = 50% of dose.	*Adverse events:* Nausea, vomiting (lasts up to 1 wk post dose), myelosuppression (onset, 10 days; nadir, 14–23 days; recovery, 21–39 days), acute renal failure, chronic nephropathy (sodium, magnesium, and water wasting; hyperuricemia), peripheral neuropathy (irreversible), ototoxicity (high-frequency hearing loss), extravasation injury, elevated liver enzymes, alopecia, optic neuritis, arrhythmias.
Citrate solutions Alkalinizing agent. Bicitra (sodium citrate 500 mg and citric acid 334 mg/5 mL = 1 mEq sodium + 1 mEq bicarbonate equivalent/mL). Polycitra (sodium citrate 500 mg and citric acid 334 mg and potassium citrate 550 mg/5 mL = 1 mEq sodium + 1 mEq potassium + 2 mEq bicarbonate equivalent/mL).	**Treatment of chronic metabolic acidosis (citrate salts are oxidized in the body to form bicarbonate).** *Neonates, infants, and children:* 2–3 mEq/kg/24 hr in 3–4 divided doses with water after meals. *Adults:* 15–30 mL with water after meals and at bedtime.	*Adverse events:* Hypernatremia, hyperkalemia, metabolic alkalosis.
Clomipramine Antidepressant. Anafranil. Capsule: 25, 50, 75 mg.	**Treatment of obsessive-compulsive disorder and panic attacks (affects serotonin and norepinephrine uptake).** *Children:* Starting dose of 25 mg/24 hr, gradually increased to response (max: 200 mg/24 hr). *Adults:* Starting dose or 25 mg/24 hr, increased to response (max: 250 mg/24 hr).	*Adverse events:* Dizziness, drowsiness, dry mouth, constipation, nausea, weight gain, nervousness, anxiety, seizures, hypotension, arrhythmias, parkinsonian syndrome, insomnia.
Clonazepam Benzodiazepine. Klonopin. Tablet: 0.5, 1, 2 mg.	**Prophylaxis of seizure types: absence, Lennox-Gastaut, akinetic, myoclonic (depresses nerve transmission in motor cortex).** *Children:* 0.01–0.3 mg/kg/24 hr in 2–3 divided doses, increased by 0.5 mg/24 hr q 3–5 days to response (max: 0.3 mg/kg/24 hr). *Adults:* Initial dose of 0.1 mg bid; then 0.2–2.4 mg/24 hr in 2–4 divided doses.	*Adverse events:* Tachycardia, chest pain, drowsiness, fatigue, impaired memory and coordination, depression, blurred vision, nausea, vomiting, dry mouth, hypersalivation, anorexia, bronchial hypersecretion, respiratory depression, physical and psychological dependence. *Monitoring:* Clonazepam concentrations: therapeutic 20–80 ng/mL; toxic > 80 ng/mL; loss of efficacy with prolonged use (tachyphylaxis).
Clonidine α-Adrenergic agonist. Catapres. Tablet: 0.1, 0.2, 0.3 mg. Transdermal patch: 0.1, 0.2, 0.3 mg/24 hr.	**Treatment of hypertension, attention deficit disorder (ADD), and narcotic withdrawal; aids in diagnosis of pheochromocytoma and growth hormone deficiency (stimulates α_2 adrenoreceptors in the brainstem).** *Neonates:* Narcotic withdrawal: 1 μg/kg q 6–8 hr to start and may titrate to targeted abstinence score (max: 2 μg/kg/dose q 4 hr).	*Cautions:* Taper doses gradually to avoid sympathetic overactivity symptoms. *Adverse events:* Drowsiness, dizziness, dry mouth, constipation, hypotension.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
	Children: ADD: initial dose of 0.05 mg/24 hr, increased q 3–7 days by 0.05 mg/24 hr given in 3–4 divided doses to response (max: 0.4 mg/24 hr). Hypertension: 5–10 μg/kg/24 hr in 2–4 divided doses (max: 0.9 mg/24 hr). Clonidine tolerance test for growth hormone release: 4 μg/kg × 1 dose. *Adults:* Hypertension: Oral: 0.2–2.4 mg/24 hr in 2–4 doses titrated to response. Transdermal: 0.1–0.3 mg/24 hr titrated to effect.	
Clorazepate Benzodiazepine. Tranxene. Tablet: 3.75, 7.5, 15 mg.	**Anxiety and panic disorders; adjunct in management of partial seizures (facilitates transmission of inhibitory neurotransmitter, γ-aminobutyric acid).** *Children:* *9–12 yr:* 3.75–7.5 mg/dose bid (max: 60 mg/24 hr). *>12 yr and adults:* 7.5 mg/dose bid–tid (max: 90 mg/24 hr). *Adults:* 7.5–15 mg/dose bid–qid.	*Adverse events:* Drowsiness, confusion, depression, blurred vision.
Clozapine Clozaril; generic. Tablet: 25, 100 mg.	**Atypical antipsychotic, dibenzepin chemical group.** *Children:* Starting dose of 6.25 mg bid, increased by 6.25 mg/24 hr weekly as needed. Typical dose: 50–300 mg/24 hr. *Adults:* Starting dose of 25 mg q 24 hr, titrated up by 25–50 mg/24 hr to 450–500 mg/24 hr divided tid at 2 wk. Further dose increases should not exceed 100 mg/wk (max: 900 mg/24 hr).	*Caution:* Agranulocytosis, sometimes fatal, has been reported in 1.3% of patients. Thus, WBC counts must be done at baseline and every wk for the first 6 mo of treatment, then every other wk. WBC counts must be checked q other week thereafter. If clozapine is discontinued, check WBC weekly for the next 4 wk. *Adverse events:* Seizures, orthostatic hypotension, extrapyramidal symptoms (less often than typical antipsychotics), hyperglycemia, dizziness, drowsiness, headache, tremor, excessive salivation (especially during sleep). *Drug interactions:* Clozapine levels may increase with concurrent use of enzyme inhibitors. Clozapine is highly protein-bound and may displace other highly protein-bound drugs (e.g., warfarin).
Codeine Narcotic analgesic. Generic; combination products. Injection. Tablet.	**Treatment of mild to moderate pain and cough (inhibition of ascending pain pathways; central action in medulla to suppress cough).** *Children:* Pain: 0.5–1 mg/kg/dose q 4–6 hr (max: 60 mg/dose). Cough: 1–1.5 mg/kg/24 hr divided q 4–6 hr. *Adults:* Pain: 15–60 mg/dose q 4–6 hr as needed. Cough: 10–20 mg/dose q 4–6 hr (max: 120 mg/24 hr).	*Adverse events:* Drowsiness, constipation, nausea, anorexia, vomiting, sedation, dizziness.
Colchicine Anti-inflammatory/antigout agent. Generic. Injection: 0.5 mg/mL. Tablet: 0.5, 0.6 mg.	**Management of familial Mediterranean fever and acute and chronic gouty arthritis (decreases leukocyte motility and phagocytosis in joints).** *Children:* Prophylaxis of familial Mediterranean fever: <*5 yr:* 0.5 mg/24 hr >*5 yr:* 1–1.5 mg/24 hr in 2–3 divided doses. *Adults:* Gouty arthritis: PO: 0.5–0.6 mg q 2 hr to symptom relief or gastrointestinal toxicity (max: 8 mg/24 hr). IV: Loading dose of 1–3 mg, then 0.5 mg/dose q 6 hr until response (max: 4 mg/24 hr).	*Caution:* Reduce dose by 50% if CrCl < 10 mL/min. *Adverse events:* Nausea, vomiting, diarrhea, abdominal pain.
Colfosceril palmitate Lung surfactant. Exosurf. Intratracheal suspension: 108 mg/10 mL.	**Neonatal respiratory distress syndrome (RDS) [replaces deficient surfactant, lowers surface tension at air-fluid interface in alveoli].** *Neonates:* 5 mL/kg/dose as prophylaxis or rescue therapy for RDS (max: 4 doses, although no proven benefit for >2 doses).	*Caution:* Administer via side port using special endotracheal tube adaptor with 1/2 dose with head and torso tilted to left and 1/2 dose with head and torso tilted to right; give each 1/2 over 1–2 min. *Adverse events:* Pulmonary hemorrhage, overventilation (causing hyperoxia and hypocarbia), Patcut ductus arteriosus.
Corticotropin, ACTH Adrenal corticosteroid. Acthar. Injection, repository: 40, 80 u/mL. Tablet: 5, 10, 25 mg.	**Infantile spasms, diagnostic agent in adrenocortical insufficiency, acute exacerbations of multiple sclerosis, severe muscle weakness in myasthenia gravis (stimulates adrenal cortex to release adrenal steroids, androgenic substances, and a small amount of aldosterone).** *Children:* Inflammation or immunosuppression: IV, IM, SC (aqueous): 1.6 u/kg/24 hr or 50 u/m^2 divided q 6–8 hr. IM (gel): 0.8 u/kg/24 hr or 25 u/m^2 day divided q 12–24 hr. Infantile spasms: 5–160 u/kg/24 hr has been used for 1 wk–12 mo as IM gel (prednisone 2 mg/kg/24 hr has equal efficacy). *Adults:* Acute exacerbations of MS: 80–120 u/24 hr for 2–3 wk.	*Caution:* May mask signs of infection; do not administer live vaccines; may exacerbate heart failure or hypertension. *Adverse events:* Insomnia, nervousness, increased appetite, indigestion, diabetes mellitus, joint pain, epistaxis, mood swings, pancreatitis, esophagitis, muscle wasting, bone growth suppression, opportunistic infections.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Cortisone acetate Adrenal corticosteroid. Cortone. Injection: 50 mg/mL. Tablet: 5, 10, 25 mg.	**Management of adrenocortical insufficiency (replacement).** *Children:* PO: 0.5–0.75 mg/kg/24 hr divided q 8 hr. IM: 0.25–0.35 mg/kg/24 hr. *Adults:* PO, IM: 20–300 mg/24 hr in 1–2 doses.	*Cautions:* Avoid in active fungal infection and most other serious infections except shock or meningitis. *Adverse events:* Insomnia, nervousness, pseudotumor cerebri, headache, increased appetite, peptic ulcer, diabetes mellitus, edema, hypertension, cataracts, glaucoma, hypokalemia. *Comment:* See comparison of corticosteroids under *Hydrocortisone.*
Cosyntropin Adrenal corticosteroid. Cortrosyn. Powder for injection: 0.25 mg.	**Diagnosis of primary vs secondary adrenocortical deficiency (stimulates adrenal cortex to release adrenal steroids).** *Neonates:* 0.015 mg/kg/dose. *Children <2 yr:* 0.125 mg. *Children >2 yr and adults:* 0.25 mg. Give dose in early morning.	*Adverse events:* Flushing, mild fever, pruritus, pancreatitis. *Monitoring:* Measure plasma cortisol before and exactly 30 min after dose. Normal response is serum cortisol increase >7 μg/dL (>193 nmol/L) or peak response increase >18 μg/dL (497 nmol/L).
Cromolyn sodium Mast cell stabilizer. Crolom; Intal; Gastrocrom; Nasalcrom. Ophthalmic solution. Capsule (oral): 100 mg. Inhalation: 20 mg. Metered-dose inhaler (MDI): 800 μg/spray. Nebulizer solution: 10 mg/mL (2 mL). Nasal solution: 40 mg/mL. Opthalmic solution: 4%.	**Prevention of chronic symptoms of asthma, rhinitis, conjunctivitis, systemic mastocytosis, food allergy, and inflammatory bowel disease (prevents mast cell release of histamine and leukotrienes).** *Children and adults:* Asthma: 1–2 puffs (MDI) or 2 mL (nebulizer solution) 3–4 tid–qid. Rhinitis: 1 spray each nostril tid–qid. Conjunctivitis: 1–2 drops 4–6 times daily. Mastocytosis, food allergy: *Children:* 100 mg/dose qid (max: 40 mg/kg/24 hr). *Adults:* 200 mg/dose qid (max: 400 mg/dose qid).	*Adverse events:* Hoarseness and coughing (mainly with powder for inhalation), burning and stinging at administration site.
Crotamiton Scabicidal. Eurax. Cream: 10%. Lotion: 10%.	**Treatment of scabies (mechanism unknown).** *Infants, children, and adults:* Wash area thoroughly, towel dry, apply a thin layer, and massage drug into skin. Repeat application in 24 hr. Take a cleansing bath 48 hr after final application. May repeat in 7 days if needed.	*Adverse events:* Local irritation.
Cyanocobalamin, vitamin B_{12} Nutritional supplement. Generic. Injection: 100, 1,000 μg/mL. Tablet: 25, 50, 100, 250, 500, 1,000 μg.	**Pernicious anemia, vitamin B_{12} deficiency (coenzyme for various metabolic functions).** Pernicious anemia: *Children:* 30–50 μg/24 hr to total dose of 1,000–5,000 μg, and then follow with 100 μg/mo. *Adults:* 100 μg/24 hr for 6–7 days, then 100 μg/mo. Vitamin B_{12} deficiency: *Children:* 100 μg/24 hr for 10–15 days, then 1–2×/wk for several mo. *Adults:* 30 μg/24 hr for 5–10 days then 100–200 μg/mo.	*Monitoring:* Serum B_{12} levels (normal: 150–750 pg/mL). Some reports of neuropsychiatric problems have been reported with levels <300 pg/mL.
Cyclizine Antinauseant. Marezine. Injection: 50 mg/mL. Tablet: 50 mg.	**Prevent and treat motion-related nausea, vomiting, and vertigo; control postoperative nausea and vomiting (mechanism unknown).** *Children 6–12 yr:* PO: 25 mg/dose up to 3×/24 hr as needed. *Adults:* PO: 50 mg up to q 4–6 hr (30 min before travel) [max: 200 mg/24 hr]; IM 50 mg q 4–6 hr as needed.	*Adverse events:* Drowsiness, dry mouth, headache, diplopia urinary retention.
Cyclopentolate Mydriatic. Cyclogyl, AK-Pentolate. Ophthalmic solution: 0.5%, 1%, 2%.	**Diagnostic procedures requiring mydriasis and cycloplegia (prevents muscles of ciliary body and iris from responding to cholinergic stimulation).** *Infants:* 1 drop 0.5% into each eye 5–10 min before examination. *Children and adults:* 1 drop 0.5% or 1% in eye 40–50 min before procedure (may repeat 1 drop in 5 min if necessary); may use 2% if heavily pigmented iris.	*Caution:* Avoid in narrow-angle glaucoma. *Adverse events.* Tachycardia, CNS stimulation, psychosis, agitation, local burning. *Monitoring:* Cycloplegia and mydriasis begin in 15–60 min and last up to 24 hr (reduce to 3–6 hr with pilocarpine).
Cyclophosphamide Antineoplastic alkylating agent. Cytoxan; Neosar. Powder for injection: 0.1, 0.2, 0.5, 1.0, 2.0 g. Tablet: 25, 50 mg.	**Management of various cancers, including Hodgkin disease, malignant lymphomas, and leukemias; nephrotic syndrome; systemic lupus erythematosus; rheumatoid arthritis; rheumatoid vasculitis (interferes with normal function of DNA by alkylation).** *Children and adults with no hematologic problems:* Induction: IV: 40–50 mg/kg (1.5–1.8 g/m^2) in divided doses over 2–5 days. PO: 1–5 mg/kg/24 hr. Maintenance: IV: 10–15 mg/kg (350–550 mg/m^2) q 7–10 days or 3–5 mg/kg 2×/wk. PO: *Children:* 2–5 mg/kg 2×/wk. *Adults:* 1–5 mg/kg/24 hr. *Children:* SLE: 500–750 mg/m^2/mo. Juvenile RA/vasculitis: IV 10 mg/kg q 2 wk. Bone marrow transplant conditioning: IV 50 mg/kg/24 hr for 3–4 days. Nephrotic syndrome: PO: 2–3 mg/kg/24 hr (when steroids fail, use for up to 12 wk). Adjust doses for:	*Adverse events:* Cardiotoxicity with high doses, pericardial effusion, congestive heart failure, alopecia, nausea, vomiting, taste distortion, stomatitis, anorexia, hemorrhagic cystitis, leukopenia (onset: 7 days; nadir: 8–15 days; recovery: 21 days), thrombocytopenia, hepatotoxicity, jaundice, renal toxicity, secondary malignancy. *Cautions:* Maintain high fluid intake to avoid hemorrhagic cystitis, and consider administration of mesna.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
	Renal function: CrCl 25–50 mL/min: Decrease 50%. CrCl < 25 mL/min: Avoid use. Decreased bone marrow function: Reduce dose 33–50%.	
Cyproheptadine hydrochloride Antihistamine. Periactin; generic. Syrup: 2 mg/5 mL. Tablet: 4 mg.	**Treatment of allergic symptoms (H_1-receptor and serotonin antagonist).** *Children:* *2–6 yr:* 2 mg/dose q 8–12 hr (max: 12 mg/24 h). *>7 yr–adults:* 4 mg/dose q 8–12 hr (max: 0.5 mg/kg/24 hr).	*Adverse events:* Drowsiness, sedation, thickened bronchial secretions, bronchospasm, appetite stimulation, photosensitivity.
Cysteine Nutritional supplement. Generic. Injection: 50 mg/mL.	**Supplement to crystalline amino acid solutions to meet amino acid nutritional requirements during parenteral nutrition (replaces deficiency; also enhances solubility of calcium and phosphate in total parenteral nutrition solutions).** *Neonates and infants:* Add 40 mg cysteine to 1 g of amino acids (typically results in 20–100 mg/kg/24 hr of cysteine).	*Adverse events:* Metabolic acidosis, azotemia, elevated blood urea nitrogen, nausea.
Cytarabine HCl, Ara-C Antineoplastic; antimetabolite. Cytosar-US Tarabine PFS. Powder for injection: 0.1, 0.5, 1, 2 g. Injection: 20 mg/mL.	**Used in combination therapy to treat leukemias and lymphomas (inhibits DNA polymerase to inhibit DNA synthesis, works in S-phase of cell division).** *Children and adults:* Doses depend on individual protocols. Typical dose: Induction: IV: 100–200 mg/m^2/24 hr for 5–10 days or until remission. Maintenance: IV: 70–200 mg/m^2/24 hr for 2–5 days at monthly intervals. IM, SC: 1–1.5 mg/kg single dose at 1–4 wk intervals. Intrathecal: 5–75 mg/m^2 q 2–7 days until CNS findings normalize (concentration should not exceed 100 mg/mL).	*Adverse events:* Fever, rash, oral/anal ulcerations, nausea, vomiting, diarrhea, mucositis, liver dysfunction, bleeding, myelosuppression (onset, 4–7 days; nadir, 14–18 days; recovery 21–28 days), alopecia, conjunctivitis (administer corticosteroid eyedrops around the clock before, during, and after high-dose Ara-C), dizziness, headache, neuritis (prevent CNS toxicity with pyridoxine administration on days of high-dose Ara-C administration).
Dacarbazine Antineoplastic agent. DTIC-Dome; generic. Injection: 100, 200, 500 mg.	**Treatment of various tumors (alkylating agent and possibly some antimetabolite activity).** *Children:* Solid tumors: 200–470 mg/m^2/24 hr over 5 days q 21–28 days. Neuroblastoma: 800–900 mg/m^2 on day 1 of combination therapy q 3–4 wk. Hodgkin disease: 375 mg/m^2 on days 1 and 15 of combination treatment; repeat q 28 days. *Adults:* Hodgkin disease: 150 mg/m^2/24 hr for 5 days; repeat q 4 wk.	*Adverse events:* Pain and burning at infusion site, nausea and vomiting, leukopenia (onset: 7 days; nadir: 10–14 days; recovery: 21–28 days), weakness, polyneuropathy, paresthesias, elevated liver enzymes, sinus congestion, alopecia, metallic taste.
Dactinomycin Antineoplastic agent. Actinomycin D; Cosmegen. Powder for injection: 0.5 mg.	**Treatment of various tumor types (binds to guanine portion of DNA, blocking replication and transcription of DNA template).** *Children > 6 mo and adults:* 15 μg/kg/24 hr or 400–600 μg/m^2/24 hr for 5 days; may repeat every 3–6 wk.	*Adverse events:* Myelosuppression (onset: 7 days; nadir: 14–21 days; recovery: 21–28 days), fatigue, malaise, fever, alopecia, skin eruptions, acne, severe nausea and vomiting, diarrhea, mucositis, stomatitis, hypocalcemia, hyperuricemia.
Danaparoid Orgaran. Antithrombotic agent. Injection: 750 anti-Xa units in 0.6 mL.	**Acts by inhibiting anti-Xa and anti-IIa effects (anti Xa/anti-IIa activity > 22). Low molecular weight heparinoid, consisting mainly of heparan sulfate. Use for heparin-induced thrombocytopenia (cross-reactivity with heparin antibodies is < 10%, compared with > 90% for low molecular weight heparin).** *Children:* Loading dose: 30 U/kg. Maintenance dose: 1.2–2.0 U/kg/hr. *Adults:* Treatment: Loading dose: <50 kg: 1,500 U; 50–90 kg: 2,250 U; >90 kg: 3,000 U. Follow loading dose with 400 U/hr for 4 hr, then 300 U/hr for 4 hr, then maintenance dose of 150–200 U/hr. Prophylaxis: <50 kg: 750 U q 12 hr; 50–90 kg: 1,500 U q 8 hr; >90 kg: 1,500 U q 12 hr.	*Monitoring:* Check plasma anti-Xa levels; target 0.5–0.8 U/mL for treatment; target 0.2–0.4 U/mL for prophylaxis. Monitoring traditional clotting studies (e.g., prothrombin time, activated partial thromboplastin time, activated clotting time) is not beneficial; no effect is seen. *Adverse events:* Bleeding (risk is lower than with unfractionated heparin).
Dantrolene sodium Skeletal muscle relaxant. Dantrium. Capsule: 25, 50, 100 mg. Powder for injection: 20 mg.	**Treatment of spasticity associated with upper motor neuron disorders, such as spinal cord injury, stroke, cerebral palsy, or multiple sclerosis; also used to treat malignant hyperthermia (interferes with release of calcium ion from sarcoplasmic reticulum).** Spasticity: *Children:* 0.5 mg/kg/dose bid; increase frequency q 4–7 days to tid–qid; then increase dose by 0.5 mg/kg (max: 3 mg/kg/dose bid–qid). *Adults:* Starting dose of 25 mg/24 hr, increasing by 25 mg or frequency q 4–7 days (max: 100 mg bid–qid). Hyperthermia: *Children and adults:* Oral: 4–8 mg/kg/24 hr in 4 divided doses given 1–2 days before surgery (prophylaxis), or for 1–3 days post surgery (post-crisis follow-up). IV: 2.5 mg/kg starting 1.5 hr before surgery and run over 1 hr (prophylaxis) or 1 mg/kg/dose and repeated as needed (crisis) (max: 10 mg/kg).	*Cautions:* Should not be used where spasticity is used to maintain posture or balance; avoid in patients with active liver disease. *Adverse events:* Drowsiness, fatigue, dizziness, confusion, blurred vision, seizures, diarrhea, stomach cramps, nausea, vomiting, pleural effusion with pericarditis, hepatitis.
Daunorubicin hydrochloride Antineoplastic. Cerubidine. Powder for injection: 20 mg.	**Treatment of acute nonlymphocytic leukemia (ANLL) and myeloblastic leukemia (inhibition of DNA and RNA synthesis).** *Children:* Remission induction for acute lymphocytic leukemia (combination therapy): 25–45 mg/m^2 on day 1 q wk for 4 cycles (max: total, 300 mg/m^2).	*Caution:* Avoid in patients with heart failure or arrhythmias. Irreversible cardiotoxicity may occur if total dose exposure exceeds 550 mg/m^2 in adults, 400 mg/m^2 if chest irradiation, 300 mg/m^2 in children > 2 yr, 10 mg/kg in children < 2 yr.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
	Adults: 30–60 mg/m^2/24 hr for 3–5 days; repeat dose in 3–4 wk; total cumulative dose should not exceed 400–600 mg/m^2 (lower end if history of cardiotoxic drugs or chest irradiation).	*Adverse events:* Alopecia, red discoloration of urine, nausea, vomiting, diarrhea, gastrointestinal ulceration, stomatitis, myelosuppression (onset, 7 days; nadir, 14 days; recovery, 21–28 days), extravasation-related tissue ulceration and necrosis, congestive heart failure, hyperuricemia, hepatotoxicity. *Monitoring:* Serum bilirubin and aspartate aminotransferase (AST) (to adjust doses for hepatic impairment): bilirubin 1.2–3 mg/dL or AST 60–180 IU: reduce dose to 75%; bilirubin 3.1–5 mg/dL or AST >180 IU: reduce dose to 50%; bilirubin > 5 mg/dL: omit use.
Deferoxamine mesylate Chelating agent. Desferal. Powder for injection: 500 mg.	**Treatment of acute iron intoxication or secondary chronic iron overload (forms complex with iron to form ferrioxamine, which is removed by kidneys).** *Children:* Acute iron intoxication: IM: 90 mg/kg/dose q 8 hr. IV: 15 mg/kg/hr (max: 6 g/24 hr). Chronic iron overload: IV: 15 mg/kg/hr (max: 12 g/24 hr). SC: 20–40 mg/kg/24 hr over 8–12 hr via portable infusion device. *Adults:* Acute iron intoxication: IM: 1 g STAT, then 0.5 g q 4 hr (max: 6 g/24 hr). IV: 15 mg/kg/hr (max: 6 g/24 hr). Chronic iron overload: IM: 0.5–1 g/24 hr. SC: infuse 1–2 g/24 hr over 8–24 hr.	*Caution:* Contraindicated in patients with primary hemochromatosis. *Adverse events:* Local pain and induration, flushing, hypotension, tachycardia, fever, hearing loss, blurred vision, cataracts. *Monitoring:* Serum ferritin, iron, total iron-binding capacity. Audiometry and eye examination with chronic use.
Desipramine hydrochloride Antidepressant, tricyclic. Norpramin; Pertofrane. Tablet: 10, 25, 50, 75, 100, 150 mg. Capsule: 25, 50 mg.	**Treatment of depression, attention deficit disorder, neuropathic pain (increases synaptic concentrations or serotonin and norepinephrine by inhibiting reuptake).** *Children 6–12 yr:* 1–3 mg/kg/24 hr (max: 5 mg/kg/24 hr). *Adolescents:* Initial dose or 25–50 mg/24 hr, increased gradually (max: 150 mg/24 hr). *Adults:* Initial dose of 75 mg/24 hr, increased gradually (max: 300 mg/24 hr).	*Cautions:* Abrupt discontinuation can result in withdrawal symptoms; tablets contain tartrazine (may be a problem for asthmatics), contraindicated in narrow-angle glaucoma. *Adverse events:* Dizziness, drowsiness, headache, blurred vision, dry mouth, constipation, increased appetite, cardiac arrhythmias, hypotension. *Monitoring:* Desipramine concentrations: therapeutic 100–300 ng/mL, toxic > 300 ng/mL; check ECG.
Desmopressin acetate Vasopressin analog. DDAVP; Stimate. Injection: 4 μg/mL. Nasal solution: 0.1 mg/mL.	**Treatment of diabetes insipidus, control of bleeding in certain types of hemophilia, primary nocturnal enuresis (enhances reabsorption of water in kidneys, dose-dependent increase in factor VIII and plasminogen activator).** *Children:* Diabetes insipidus: *3 mo–12 yr:* PO: 0.05 mg initially, then titrate to response. IV: 5 μg/24 hr in 1–2 doses. Hemophilia: *>3 mo:* IV: 0.3 μg/kg, may repeat dose if needed, use 30 min before procedure. Nocturnal enuresis: *>6 yr:* 20 μg at bedtime. *Children > 12 yr and adults:* Diabetes insipidus: PO: 0.05 mg bid, then titrate to response. IV, SC: 2–4 μg/24 hr. Intranasal: 5–40 μg/24 hr in 1–3 doses. Hemophilia: IV: 0.3 μg/kg. Intranasal: <50 kg: 150 μg, >50 kg: 300 μg. Enuresis: PO: 0.2–0.4 mg at bedtime.	*Cautions:* Avoid using in patients with type IIB or platelet-type von Willebrand disease, hemophilia A with factor VII levels < 5%, or hemophilia B. *Adverse events:* Facial flushing, headache, dizziness, increased blood pressure, hyponatremia, water intoxication. *Monitoring:* Serum electrolytes, plasma and urine osmolality, urine output, factor VIII antigen levels, activated partial thromboplastin time, factor VII activity level.
Dexamethasone Adrenal corticosteroid. Decadron. Aerosol: Oral 84 μg/activation, nasal 84 μg/spray. Cream: 0.1%, 0.04%. Injection: 4, 8, 10, 16, 20, 24 mg/mL. Ophthalmic ointment: 0.05%. Ophthalmic suspension: 0.1, 0.5%. Oral solution: 0.5 mg/5 mL. Tablet: 0.25, 0.5, 0.75, 1, 1.5, 2, 4, 6 mg. Elixir: 0.5 mg/5 mL.	**Systemically and locally for acute and chronic inflammation; allergic, neoplastic and autoimmune diseases; cerebral edema, septic shock, *Haemophilus influenzae* meningitis; diagnostic agent (decreases inflammation and suppresses normal immune response).** *Neonates:* Airway edema or extubation: IV: 0.25 mg/kg q 12 hr for 3–4 doses (start > 4 hr before scheduled extubation). Bronchopulmonary dysplasia: IV, PO: 0.25 mg/kg/dose q 12 hr for 6 dose, then taper over 1–6 wk (regimens may begin as early as day 1). *Children:* Airway edema or extubation: PO, IM, IV: 0.5–2 mg/kg/24 hr divided q 6 hr (begin 24 hr before extubation and continue for 4–6 doses postextubation). Antiemetic (chemotherapy-induced): IV: 10 mg/m^2 first dose, then 5 mg/m^2/dose q 6 hr as needed (start before chemotherapy). Anti-inflammatory: PO, IM, IV: 0.08–0.3 mg/kg/24 hr divided q 6–12 hr. Bacterial meningitis: IV: 0.6 mg/kg/24 hr divided q 6 hr for days 1–4 of antibiotics.	*Caution:* Dexamethasone use for neonates with bronchopulmonary dysplasia has been associated with increased incidence of cerebral palsy, and this risk should be weighed against potential benefits. *Adverse events:* Insomnia, nervousness, increased appetite hypertension, hyperglycemia, gastrointestinal hyperacidity (stress ulcer risk), cataracts, adrenal suppression, poor growth. *Comment:* See comparison of corticosteroids under *Hydrocortisone.*

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
	Cerebral edema: PO, IM, IV: Loading dose of 1–2 mg/kg, then 1–1.5 mg/kg/24 hr divided q 4–6 hr, tapered over 1–6 wk. Inhalation: 2 puffs tid–qid. Nasal spray: 1–2 sprays in each nostril bid. Physiologic replacement: PO, IM, IV: 0.03–0.15 mg/kg/24 hr divided q 6–12 hr. *Adults:* Anti-inflammatory: PO, IM, IV: 0.5–9 mg/24 hr divided q 6–12 hr. Antiemetic: Same as for children. Cerebral edema: IV: 10 mg STAT, then 4 mg q 6 hr. Cushing syndrome: 1 mg at 11 P.M.; draw plasma cortisol at 8 A.M. the following day. Shock: IV: 1–6 mg/kg (max: 40 mg; may repeat q 2–6 hr. *Children and adults:* Ophthalmic: Ointment: Apply thin coating q 3–4 hr to conjunctival sac. Suspension: Instill 2 drops into conjunctival sac q hr during day and q other hr at night. Gradually taper doses when inflammation resolves. Topical: Apply 1–4 × daily.	
Dextran Plasma volume expander. Dextran 40 (low molecular weight): Gentran; LMD. Dextran 70 (high molecular weight): Gentran; Macro Dex.	**Blood volume expander in shock or impending shock (similar to albumin).** *Children:* up to 20 mL/kg on day 1, then 10 mL/kg/24 hr for not more than 5 days. *Adults:* 500–1,000 mL at a rate of 20–40 mL/min (max: 10 mL/kg/24 hr for 5 days).	*Adverse events:* Primarily associated with excessive doses—pulmonary edema, bleeding due to impaired platelet function.
Dextroamphetamine CNS stimulant. Adderall; Dexedrine; generic. Tablet: 5, 10 mg. Capsule, sustained-release: 5, 10, 15 mg.	**Treatment of attention deficit disorder, narcolepsy, and exogenous obesity (blocks reuptake of dopamine and norepinephrine from the synapse).** *Children 6–12 yr:* Narcolepsy and attention deficit disorder: Initial dose of 5 mg/24 hr; may increase by 5 mg/24 hr at weekly intervals to response (max: 60 mg/24 hr). *>12 yr and adults:* Initial dose of 20 mg/24 hr; may increase by 10 mg increments weekly (max: 60 mg/24 hr).	*Caution:* Avoid concurrent use of monoamine oxidase inhibitors. *Adverse events:* Hypertension, tachycardia, palpitations, arrhythmias, insomnia, agitation, irritability, nervousness, headache, depression, tremor, exacerbation of tics and movement disorders, mydriasis, physical and psychologic dependence, anorexia, nausea, diarrhea, abdominal cramps, growth suppression. *Monitoring:* Blood pressure, growth, CNS activity.
Dextromethorphan Antitussive. Robitussin; generic. Liquid: 7.5 mg/5 mL. Lozenge: 5 mg.	**Symptomatic relief of cough, best when cough is nonproductive (depresses medullary cough center).** *Children 2–6 yr:* 2.5–7.5 mg q 4–8 hr or extended-release, 15 mg q 12 hr (max: 30 mg/24 hr). *6–12 yr:* 10–15 mg q 4–8 hr, or extended-release, 30 mg bid (max: 60 mg/24 hr). *>12 yr and adults:* 10–30 mg q 4–8 hr, or extended-release, 60 mg bid (max: 120 mg/24 hr).	*Adverse events:* Mainly with overdose—drowsiness, dizziness, respiratory depression, blurred vision, nausea, gastrointestinal upset, constipation.
Diazepam Benzodiazepine. Valium; generic. Tablet: 2, 5, 10 mg. Oral solution: 5 mg/mL. Injection: 5 mg/mL.	**Treatment of anxiety, panic disorder, status epilepticus, alcohol withdrawal; provides sedation; skeletal muscle relaxant (thought to increase neuroinhibitory action of γ-aminobutyric acid).** *Infants and children:* Status epilepticus: IV: 0.05–0.3 mg/kg/dose given over 2–3 min; may repeat q 30 min to maximum total dose of 5–10 mg. Rectal: 0.5 mg/kg, then 0.25 mg/kg in 10 min if needed. Sedation: PO: 0.2–0.3 mg/kg (max: 10 mg). IM, IV: 0.04–0.3mg/kg (max: 0.6 mg/kg/8 hr). *Adults:* Status epilepticus: IV: 5–10 mg q 30 min (max: 30 mg/8 hr). Anxiety, sedation, muscle relaxant: PO, IM, IV: 2–10 mg bid–qid.	*Adverse events:* Hypotension, bradycardia, cardiac arrest (with IV dose), drowsiness, ataxia, fatigue, confusion, impaired coordination, paradoxical excitement, amnesia, blurred vision, diplopia, sweating, dry mouth, constipation or diarrhea, increased or decreased appetite, hiccups, physical and psychologic dependence. *Monitoring:* Desired clinical end-points and toxic end-points should be monitored; doses to achieve effects vary considerably between patients.
Diazoxide Antihypertensive. Hyperstat, injection: 15 mg/mL. Proglycem, oral suspension: 50 mg/mL. Capsule: 50 mg.	**Emergency lowering of blood pressure, treatment of hyperinsulinemic hypoglycemia related to islet cell tumors or nesidioblastosis (smooth muscle relaxation, inhibits insulin release from pancreas).** Hypertension: *Children and adults:* 1–3 mg/kg; may repeat in 5–15 min; dose every 4–24 hr. Hyperinsulinemic hypoglycemia: *Newborns and infants:* PO: 8–15 mg/kg/24 hr divided q 8–12 hr (start at low end). *Children and adults:* PO: 3–8 mg/kg/24 hr divided q 8–12 hr (start at low end).	*Adverse events:* Hypotension, dizziness, weakness, nausea, vomiting.
Dibucaine Local anesthetic. Nupercainal. Cream: 0.5%. Ointment: 1%.	**Temporary relief of pain and itching due to hemorrhoids and minor skin irritation or damage (blocks initiation and conduction of nerve impulses).** *Children and adults:* Topical: Apply gently to affected area (children, 7.5 g/24 hr; adults, 30 g/24 hr). Rectal: Insert with rectal applicator morning, evening, and after each bowel movement.	*Adverse events:* Local irritation, contact dermatitis.
Diclofenac sodium Nonsteroidal anti-inflammatory agent. Cataflam, tablet: 50 mg. Voltaren, tablet: 25, 50, 75 mg. Ophthalmic solution: 0.1%.	**Treatment of mild to moderate acute or chronic pain; postoperative inflammation after cataract extraction (inhibit's prostaglandin synthesis).** PO: *Children:* 2–3 mg/kg/24 hr in 2–4 divided doses. *Adults:* 100–200 mg/24 hr in 2–4 divided doses. Ophthalmic: 1 drop in affected eye qid for 2 wk, to begin 24 hr after cataract surgery.	*Adverse events:* Dizziness, headache, fluid retention, indigestion, abdominal pain, peptic ulcer, gastrointestinal bleeding, renal impairment.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Dicyclomine Anticholinergic agent. Antispas; Bentyl; generic. Capsule: 10, 20 mg. Tablet: 20 mg. Syrup: 10 mg/5 mL. Injection: 10 mg/mL.	**Treatment of functional disturbances of gastrointestinal motility (e.g., irritable bowel syndrome) [blocks actions of acetylcholine].** *Infants > 6 mo:* PO: 5 mg/dose tid–qid. *Children:* 10 mg tid–qid. *Adults:* 40 mg qid (start at 1/2 dose and gradually increase). IM: *Adults:* 20 mg qid. *Cautions:* Avoid in narrow-angle glaucoma, gastrointestinal obstruction, urinary tract obstruction, and myasthenia gravis.	*Adverse events:* Tachycardia, palpitations, nervousness, irritability, confusion, muscle hypotonia, blurred vision, photophobia, urinary retention, nausea, vomiting, constipation, dry mouth, urticaria, pruritus.
Digoxin Cardiac glycoside. Lanoxin; generic. Capsule: 50, 100, 200 μg. Elixir: 50 μg/mL. Tablet: 125, 250, 500 μg. Injection: 100, 250 μg/mL.	**Treatment of systolic heart failure and supraventricular tachyarrhythmias (increases intracellular calcium through inhibition of sodium/potassium adenosine triphosphetase pump; suppression of AV node conduction).** *Neonate:* Loading dose of 10–30 μg/kg IV, then 5–10 μg/kg/24 hr maintenance dose. *1 mo–2 yr:* Loading dose of 30 μg/kg, then 10–15 μg/kg/24 hr maintenance dose. *2–10 yr:* Loading dose of 30 μg/kg, then 5–10 μg/kg/24 hr maintenance dose. *Child >10 yr:* Loading dose of 10 μg/kg, then 2–5 μg/kg/24 hr maintenance dose. *Adult:* Loading dose of 10–15 μg/kg, then 0.1–0.5 mg/24 hr maintenance dose. Adjust doses for reduced renal function: CrCl 10–15 mL/min: Reduce dose to 25–75% of normal. CrCl <10 mL/min: Reduce dose to 10–25% of normal.	*Cautions:* Contraindicated in AV block, idiopathic hypertrophic subaortic stenosis, or constrictive pericarditis. *Adverse events:* Anorexia, nausea, vomiting, diarrhea, feeding intolerance, bradycardia, arrhythmias, lethargy, depression, vertigo, blurred vision, diplopia, photophobia, yellow or green vision. *Monitoring:* Efficacy and toxicity are closely related to serum concentrations, and dosing should be guided by measuring serum digoxin concentrations: therapeutic: 0.8–2 ng/mL; toxic: >2–2.5 ng/mL. Digoxin-like immune substances (DLISs) may falsely elevate digoxin levels in neonates and children, so pretreatment digoxin levels can be obtained and subtracted from treatment levels or samples can be run through a free-level filter to remove DLISs before assay. Check postdistribution levels (drawn at least 6–8 hr post dose) at steady-state (2–4 wk) or if there are ECG or clinical signs of toxicity. Check ECG, serum electrolytes, calcium, and magnesium. Check heart rate.
Digoxin Immune Fab Digoxin antidote. Digibind. Powder for injection: 38 mg.	**Treatment of digitalis intoxication from digoxin or digitoxin (binds with molecules of unbound digoxin or digitoxin and is renally cleared).** *Infants, children, and adults:* Dose based on amount of digoxin or digitoxin ingested or estimated total body load (TBL) based on postdistributive serum concentration: TBL digoxin = concentration (ng/mL) × 5.6 × weight (kg)/1,000. TBL digoxin = mg ingested × 0.8. TBL digitoxin = concentration (ng/mL) × 0.56 × wt (kg)/1,000. TBL digitoxin = mg ingested. Dose of digoxin immune Fab (mg) = TBL digoxin × 76. Dose of digoxin immune Fab (no. of vials) = TBL/0.5.	*Adverse events:* Worsening of heart failure or atrial fibrillation, hypokalemia, facial swelling, redness. *Monitoring:* ECG; digoxin serum concentrations will greatly increase with digoxin immune Fab and do not reflect body stores or correlate with clinical toxicity.
Digydrotachysterol Vitamin D analog. Hytakerol, generic. Capsule: 0.125 mg. Tablet: 0.125 mg. Solution: 0.2 mg/mL, 0.2 mg/5 mL.	**Treatment of hypocalcemia associated with hypoparathyroidism and renal osteodystrophy (stimulates calcium and phosphate intestinal absorption).** *Neonates:* 0.05–0.1 mg/24 hr. *Infants and young children:* 1–5 mg/24 hr for 4 days, then 0.5–1.5 mg/24 hr. *Older children and adults:* 0.75–2.5 mg/24 hr for 4 days, then 0.2–1 mg/24 hr (max: 1.5 mg/24 hr). Renal osteodystrophy: 0.1–0.6 mg/24 hr.	*Adverse events:* Hypercalcemia, hypercalciuria, elevated serum creatinine.
Diltiazem Calcium channel blocker. Cardizem; Dilacor. Tablet: 30, 60, 90, 120 mg. Capsule, sustained-release,: 60, 90, 120, 180, 240, 300 mg. Injection: 5 mg/mL.	**Treatment of hypertension and atrial tachyarrhythmias (inhibits calcium ions from entering the "slow channels" during depolarization).** *Children:* PO: 1.5–2 mg/kg/24 hr in 3–4 divided doses. *Adolescents and adults:* PO: 90–480 mg/24 hr in 3–4 divided doses as tablets or 1–2 doses as sustained-release capsules. IV: Loading dose of 0.25 mg/kg, then 5–15 mg/hr continuous infusion.	*Cautions:* Diltiazem is a hepatic enzyme inhibitor and may cause accumulation and toxicity for concurrently used drugs that are metabolized. *Adverse events:* Hypotension, bradycardia, edema, AV block, dizziness, nausea, vomiting.
Dimenhydrinate Antihistamine. Dramamine; generic. Capsule: 50 mg. Injection: 50 mg/mL. Tablet: 50 mg. Liquid: 12.5 mg/4 mL.	**Treatment of nausea, vomiting, and vertigo associated with motion sickness (competes with histamine for H_1 receptor).** *Children:* *2–5 yr:* 12.5–25 mg q 6–8 hr (max: 75 mg/24 hr). *6–12 yr:* 25–50 mg q 6–8 hr (max: 150 mg/24 hr). *Adults:* 50–100 mg q 4–6 hr (max: 400 mg/24 hr).	*Adverse events:* Drowsiness, dizziness, hypotension, tachycardia.
Dimercaprol BAL. Injection: 100 mg/mL.	**Antidote to gold, arsenic, and mercury poisoning and adjunct to edetate calcium disodium in lead poisoning (chelates with heavy metals to form nontoxic stable compounds).** *Children and adults:* Mild arsenic and gold poisoning: 2.5 mg/kg/dose IM q 6 hr for 2 days, then q 12 hr on day 3, then q 24 hr for 10 days. Severe arsenic or gold poisoning: 3 mg/kg/dose q 4 hr for 2 days, then q 6 hr on day 3, then q 12 hr for 10 days. Mercury poisoning: Loading dose of 5 mg/kg, then 2.5 mg/kg/dose 1–2 × daily for 10 days. Lead poisoning: Mild: Loading dose of 4 mg/kg, then 3 mg/kg/dose q 4 hr for 2–7 days. Severe: Loading dose of 4 mg/kg/dose q 4 hr for 2–7 days.	*Adverse events:* Hypertension, tachycardia, convulsions, nausea, vomiting, fever, headache, nervousness, blepharospasm, nephrotoxicity. *Monitoring:* Specific heavy metal levels; urine pH should be kept alkaline
Diphenhydramine Benadryl; generic. Capsule or tablet: 25, 50 mg. Injection: 10, 50 mg/mL. Syrup or elixir: 12.5 mg/5 mL. Cream or lotion: 1%	**Antihistamine (competitive inhibitor of H_{1pe} receptor).** *Children:* IM, IV, PO: 5 mg/kg/24 hr divided q 6 hr as needed (max: 300 mg/24 hr). *Adults:* 10–50 mg/dose q 4 hr as needed (max: 400 mg/24 hr). *Topical:* Apply tid–qid daily.	*Adverse events:* Hypotension, tachycardia, drowsiness, paradoxical excitement, thickened bronchial secretions, dry mouth.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Diphenoxylate and Atropine Lomotil. Tablet, oral solution.	**Antidiarrheal (diphenoxylate inhibits excessive gastrointestinal motility; atropine is used to prevent abuse).** *Children:* *2–5 yr:* 4 mL (2 mg diphenoxylate) tid. *5–8 yr:* 4 mL qid. *8–12 yr:* 4 mL 5× daily. *Adults:* 15–20 mg/24 hr in 3–4 divided doses.	*Adverse events:* Nervousness, dizziness, drowsiness, headache, dry mouth, urinary retention, blurred vision, paralytic ileus.
Disopyramide Norpace. Capsule: 100, 150 mg.	**Treatment of ventricular arrhythmias and atrial tachyarrhythmias (antiarrhythmic class 1a, decreases myocardial excitability and conduction velocity).** *Children:* *<1 yr:* 10–30 mg/kg/24 hr divided q 6 hr. *1–4 yr:* 10–20 mg/kg/24 hr divided q 6 hr. *4–12 yr:* 10–15 mg/kg/24 hr divided q 6 hr. *12–18 yr:* 6–15 mg/kg/24 hr divided q 6 hr. *Adults:* 100–200 mg q 6 hr.	*Cautions:* Avoid in 2nd- or 3rd-degree AV block; will worsen heart failure, urinary retention, glaucoma, and some arrhythmias. *Adverse events:* Urinary retention or hesitancy, dry mouth, fatigue, malaise, constipation, cholestasis, elevated liver enzymes. *Monitoring:* Creatinine clearance (decrease dose to q 8 hr if 30–40 mL/min, q 12-hr if 15–30 mL/min, q 24 hr if <15 mL/min), ECG, blood pressure, signs of heart failure, blood levels (therapeutic range: atrial arrhythmias 2.8–3.2 μg/mL, ventricular arrhythmias 3.3–7.5 μg/mL).
Dobutamine Dobutrex. Injection.	**Treatment of hypotension (stimulates β_1-adrenergic receptors).** *Neonates:* 2–20 μg/kg/min. *Children and adults:* 2.5–40 μg/kg/min constant infusion.	*Cautions:* Avoid in patients with hypertrophic cardiomyopathy, atrial fibrillation or flutter, or sulfite sensitivity. *Adverse events:* Tachycardia, ectopic heartbeats, angina, palpitations, tachyarrhythmias, tingling sensation, paresthesias, leg cramps.
Docusate Colace; Surfak; generic. Capsule, liquid, syrup (may be combined with casanthrol).	**Stool softener, laxative (reduces surface tension of oil-water interface of stool).** *<3 yr:* 10–40 mg/24 hr in 1–4 doses. *3–6 yr:* 20–60 mg/24 hr in 1–4 doses. *6–12 yr:* 40–150 mg/24 hr. *>12 yr and adults:* 50–400 mg/24 hr.	*Adverse events:* Diarrhea, abdominal cramping.
Dolasetron mesylate Anzemet. Tablet: 50, 100 mg. Injection.	**Prevention and treatment of chemotherapy and postoperative nausea and vomiting (5-HT_3 receptor antagonist).** *Children >2 yr and adults:* IV, PO: 1.8 mg/kg (max: 100 mg) as single dose 30 min before chemotherapy; 0.35 mg/kg (max: 12.5 mg) given 15 min before stopping anesthesia for postoperative nausea.	*Adverse events:* Hypotension, headache, tachycardia, dizziness.
Dopamine Intropin. Injection.	**Treatment of hypotension and shock (stimulates dopaminergic receptors and adrenergic receptors).** *Neonates, children, and adults:* 1–20 μg/kg/min IV infusion rate (mL/hr) = 6 × weight (kg) × desired dose (μg/kg/min)/mg drug/100 mL of IV fluid.	*Cautions:* Contains sulfites. *Adverse events:* Tachycardia, ectopic beats, ventricular arrhythmias, tissue necrosis with extravasation, vasoconstriction, gangrene of extremities, excess urine output (doses <5 μg/kg/min), oliguria (doses >10 μg/kg/min).
Dornase alpha Pulmozyme. Inhalation solution: 1 mg/mL.	**Management of cystic fibrosis to improve pulmonary function (DNA enzyme that reduces viscosity of mucus).** *Neonates, children, and adults:* 2.5 mL 1–2 times daily, nebulized with Pulmo-Aide or Pari-Proneb compressor.	*Adverse events:* Pharyngitis, voice alteration, cough, rhinitis, hemoptysis.
Doxacurium Nuromax. Injection: 1 mg/mL.	**Skeletal muscle paralysis (provides neuromuscular blockade by competing with acetylcholine for neuromuscular receptor).** *Children 2–12 yr:* Initial dose of 30–50 μg/kg, then 5–10 μg/kg/dose every 1–2 hr. *Adults:* Initial dose of 50 μg/kg, then 5–10 μg/kg/dose every 1–2 hr.	*Adverse events:* Skeletal muscle weakness, hypotension. *Monitoring:* Peripheral nerve stimulator.
Doxapram Dopram. Injection: 20 mg/mL.	**Treatment of apnea of prematurity refractory to methylxanthines (respiratory and CNS stimulant).** *Neonates:* Initial dose of 2.5–3 mg/kg followed by infusion of 1 mg/kg/hr (max: 2.5 mg/kg/hr). *Caution:* Contains benzyl alcohol (recommended doses deliver 5.4–27 mg/kg/24 hr).	*Adverse events:* Hypertension, tachycardia, arrhythmias, CNS stimulation, irritability, seizures, hyperpyrexia, vomiting, increased gastric residuals, hyperglycemia.
Doxepin Adapin; Sinequan. Tricyclic antidepressant. Capsule: 10, 25, 50, 75, 100, 150 mg. Oral concentrate: 10 mg/mL. Cream: 5%.	**Treatment of depression; analgesic for neuropathic pain (increases synaptic concentrations of serotonin and norepinephrine).** *Children:* 1–3 mg/kg/24 hr. *Adolescent:* Starting dose of 25–50 mg/24 hr (max: 100 mg/24 hr). *Adults:* Starting dose of 30–150 mg/24 hr (max: 300 mg/24 hr; single dose max: 150 mg).	*Caution:* Contraindicated in narrow-angle glaucoma. *Adverse events:* Sedation, drowsiness, dizziness, headache, dry mouth, constipation, increased appetite, weight gain, urinary retention, difficult urination, blurred vision, hypotension, arrhythmias. *Monitoring:* ECG, doxepin concentrations: therapeutic 30–150 ng/mL, toxic >500 ng/mL.
Doxorubicin hydrochloride Adriamycin; Rubex. Powder for injection. Injection: 2 mg/mL.	**Antineoplastic used for various tumor types (inhibits DNA and RNA synthesis).** *Children:* 35–75 mg/m^2/dose, repeated q 21 days, or 20–30 mg/m^2, repeated q/wk, or 60–90 mg/m^2 given as continuous infusion over 96 hr q 3–4 wk. *Adults:* 60–75 mg/m^2/dose q 21 days. Liver disease: Reduce dose: bilirubin 1.2–3 (reduce by 50%), bilirubin >3 (reduce by 75%).	*Caution:* Contraindicated if patient has congestive heart failure, cardiomyopathy, or has received a total dose of 550 mg/m^2 (400 mg/m^2 if prior or concurrent daunorubicin, idarubicin, mitoxantrone, cyclophosphamide, irradiation to cardiac area). *Adverse events:* Cardiotoxicity, alopecia, hyperpigmentation of nail beds, hyperuricemia, stomatitis, esophagitis, mucositis, nausea, vomiting, thrombocytopenia (onset, 7 days; nadir, 10–14 days; recovery, 21–28 days), lacrimation, extravasation tissue necrosis, phlebitis.
Dronabinol, tetrahydrocannabinol Marinol. Capsule: 2.5, 5, 10 mg.	**Antiemetic for cancer chemotherapy (inhibits vomiting center).** *Children and adults:* 5 mg/m^2/dose q 2–4 hr starting 1–3 hr before chemotherapy (max: 15 mg/m^2/dose).	*Adverse events:* Drowsiness, difficulty concentrating, mood change, hallucinations. *Monitoring:* Monitor for abuse.
Droperidol Inapsine. Injection: 2.5 mg/mL.	**Antiemetic, antipsychotic (alters action of dopamine in CNS and has α-adrenergic blockade).** *Children 2–12 yr:* IV, IM: 0.05–0.06 mg/kg/dose q 4–6 hr as needed for nausea. *Adults:* IV, IM: 2.5–5 mg/dose q 3–4 hr as needed.	*Adverse events:* Hypotension, tachycardia, extrapyramidal reactions, confusion, memory loss.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
D-Xylose Xylo-pfan. Powder for oral solution.	**Diagnostic agent used to evaluate intestinal disorders due to disease or injury (mechanism not understood).** *Children:* 500 mg/kg as 5–10% solution (max: 25 g). *Adults:* 5–25 g as 10% solution, followed by 200–400 mL of water.	*Adverse events:* Nausea, vomiting, cramping, intestinal bloating. *Monitoring:* Blood and urinary D-Xylose concentrations.
Edetate calcium disodium Calcium Disodium Versenate. Injection: 200 mg/mL.	**Antidote for acute and chronic lead poisoning (chelating agent).** *Children and adults:* 500 mg/m^2/dose once daily.	*Cautions:* Contraindicated in severe renal failure and patients with active tuberculosis or healed calcified tubercular lesions. *Adverse events:* Arrhythmias, hypotension, seizures, headache, chills, skin eruptions, hypomagnesemia, hypokalemia, hypocalcemia, hyperuricemia, vomiting, diarrhea, abdominal cramps, back pain, muscle cramps, paresthesia, tetany, nephrotoxicity, respiratory arrest. *Monitoring:* 24 hr urine collection after first dose for ratio of lead excretion/mg calcium EDTA (positive test >0.5–0.6); blood lead level.
Edetate disodium Chealamide; Disotate; generic. Injection: 150 mg/mL.	**Emergency treatment of hypercalcemia and digitalis-induced ventricular dysrhythmias (chelating agent).** *Children:* 40–70 mg/kg/24 hr slow infusion over 3–4 hr; administer for 5 days, then 5 days off drug. *Adults:* 50 mg/kg/dose for 5 days, then 2 days off, then restart for a total of 15 doses. Digitalis arrhythmias (children and adults): 15 mg/kg/hr continuous infusion (max: 60 mg/kg/24 hr).	*Cautions:* Contraindicated in severe renal failure and tuberculosis. *Adverse events:* Arrhythmias, hypotension, seizures, headache, chills, hypokalemia, hypocalcemia, hypomagnesemia, hyperuricemia, vomiting, diarrhea, abdominal cramps, dysuria, back pain, nephrotoxicity.
Edrophonium chloride Enlon, Reversol; Tensilon. Injection: 10 mg/mL.	**Diagnosis of myasthenia gravis, differentiation of cholinergic crisis from myasthenia crisis, reversal of nondepolarizing neuromuscular blockers, treatment of paroxysmal atrial tachycardia (inhibits destruction of acetylcholine by acetylcholinesterase).** *Infants:* IM: 0.5–1 mg. IV: 0.1 mg, followed by 0.4 mg (if no response). *Children:* Diagnosis (initial). IM: <34 kg: 1 mg; >34 kg: 5 mg. IV: 0.04 mg/kg over 1 min, followed by 0.16 mg/kg given within 45 sec (if no response) (max: 10 mg total). Titration of oral anticholinesterase therapy: IV 0.04 mg/kg given 1 hr after oral intake of treatment drug; if strength improves, increase dose of neostigmine or pyridostigmine. *Adults:* Diagnosis: IM: Initially, 10 mg; if cholinergic reaction occurs, give 2 mg in 30 min to rule out false-negative reaction. IV: 2 mg given over 15 sec, 8 mg given 45 sec later (if no response). Titration of oral anticholinesterase therapy: IV 1–2 mg given 1 hr after an oral dose. Increase oral dose if strength improves.	*Adverse events:* Arrhythmias, hypotension, nausea, vomiting diarrhea, stomach cramps, excess sweating, urinary frequency, lacrimation, diplopia, miosis, laryngospasm, bronchospasm, respiratory paralysis.
Enalapril/Enalaprilat Vasotec. Oral (enalapril): 2.5, 5, 10, 20 mg. Injection (enalaprilat): 1.25 mg/mL. Extemporaneous formulation.	**Treatment of hypertension and congestive heart failure (angiotensin-converting enzyme inhibition).** *Neonate:* PO: 0.1 mg/kg/24 hr in 1–2 doses (may increase to 0.4 mg/kg/24 hr for congestive heart failure or adequate hypertension response). IV: 5–10 μg/kg/dose q 8–24 hr. *Infants and children:* PO: 0.1–0.5 mg/kg/24 hr in 1–2 doses. IV: 5–10 μg/kg/dose q 8–24 hr. *Adolescents and adults:* PO: 2.5–5 mg/24 hr and titrate (max: 40 mg/24 hr in 2 doses). IV: 0.625–1.25 mg/dose q 6 hr (max: 20 mg/24 hr). *Caution:* Avoid or adjust dose in patients with renal impairment (CrCl 10–50 mL/min, give 75% of dose; CrCl < 10 mL/min, give 50% of dose).	*Adverse events:* Hypotension, tachycardia, syncope, fatigue, dizziness, headache, cough, hyperkalemia, hypoglycemia. *Comments:* Lower doses if concurrent diuretics or reduced renal function; concurrent indomethacin may blunt response.
Enoxaparin sodium Lovenox. Injection: 30 mg/0.3 mL.	**Prophylaxis and treatment of venous thromboembolism (low molecular weight heparin with activity against factors IIa and Xa).** *Neonates and children:* SC: 1 g/kg q 8–12 hr. *Adults:* SC: 30 mg bid or 1 mg/kg bid (depends on indication).	*Adverse events:* Thrombocytopenia and hemorrhage (<unfractionated heparin). *Monitoring:* Dose to heparin plasma level (anti-factor Xa assay) mid-interval 0.5–1.0 U/mL, or trough 0.3–0.7 U/mL.
Epinephrine Adrenalin. Injection: 0.01, 0.1, 1 mg/mL. Suspension: 5 mg/mL. Aerosol metered-dose inhaler, inhalation solution, ophthalmic solution, topical solution.	**Treatment of cardiac arrest, bronchospasm, anaphylactic reactions, open-angle glaucoma (stimulates α, β_1, and β_2 receptors).** *Neonates:* IV, intratracheal: 0.01–0.03 mg/kg (0.1–0.3 mL/kg of 1:10,000 solution) q 3–5 min. *Infants and children:* SC: 0.01 mg/kg (0.01 mL/kg/dose of 1:1,000 solution, or 0.005 mL/kg/dose of suspension). IV: 0.01 mg/kg (0.1 mL/kg of 1:10,000 solution) [max: 1 mg]. IT: 0.1 mg/kg/dose (0.1 mL/kg of 1:1,000 solution) [max: 0.2 mL/kg]. Continuous infusion: 0.1–1 μg/kg/min per response. Nebulization: 0.25–0.5 mL of 2.25% racemic epinephrine diluted in 3 mL normal saline. Ophthalmic: Instill 1–2 drops in eye(s) 1–2 times daily.	*Adverse events:* Tachycardia, hypertension, nervousness, restlessness, irritability, headache, tremor, weakness, nausea, vomiting, acute urinary retention.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
	Adults: IV: 1–5 mg q 3–5 min. IT: 1 mg initially (max: 12.5 mg/dose). IM, SC: 0.1–0.5 mg q 10–15 min. Continuous infusion: 1–10 µg/min. Ophthalmic: Instill 1–2 drops in eye(s) 1–2 times daily.	
Epoetin alfa, erythropoietin, EPO Epogen; Procrit. Injection, Preservative-free vial: 2,000, 3,000, 4,000, 10,000 U/mL. Preserved: 10,000 U/mL.	**Anemia associated with prematurity; end-stage renal disease; zidovudine-treated, HIV-infected patients; cancer patients receiving chemotherapy (induces erythropoiesis).** Administer IV, SC. *Neonates:* 100–500 u/kg/dose q 1–2 days for 10–21 days. *Children and adults:* Cancer patients: 150 u/kg/dose 3×/wk (may increase to 300 u/kg/dose). Hemodialysis patients: 50–100 u 3×/wk. Zidovudine-treated patients: 100 u/dose 3×/wk.	*Caution:* Uncontrolled hypertension, neutropenia in newborns must have adequate iron stores and may require oral or IV iron supplement. *Adverse events:* Hypertension, edema, headache, fever, rash, arthralgias, hypersensitivity. *Monitoring:* Serum iron, reticulocyte count, hematocrit (reduce dose or stop EPO if hematocrit >40), blood pressure.
Ergocalciferol Calciferol; Drisdol; generic. Tablet, capsule: 50,000 units. Liquid: 8,000 u/mL. Injection: 500,000 u/mL (1 µg = 4 u).	**Treatment of refractory rickets, hypophosphatemia, hypoparathyroidism (vitamin D analog stimulates calcium and phosphate absorption).** *Premature infants:* 10–20 µg/24 hr. Renal failure: *Children:* 100–1,000 µg/24 hr. *Adults:* 500 µg/24 hr. Hypoparathyroidism: *Children:* 1.25–5 mg/24 hr. *Adults:* 0.625–5 mg/24 hr. Rickets: *Children:* 75–125 µg/24 hr. *Adults:* 0.25–1.5 mg/24 hr.	*Adverse events:* Hypercalcemia, weakness, lethargy, hypertension, arrhythmias, mild acidosis, hypercholesterolemia, nausea, vomiting, constipation, nephrocalcinosis, photophobia. *Monitoring:* Serum calcium and phosphorus, alkaline phosphatase, bone radiography.
Ergotamine Cafatine; Cafergot. Tablet: 1, 2 mg. Aerosol: 9 mg/mL. Suppository: 2 mg.	**Prevents or aborts vascular headaches (e.g., migraine or cluster headache) [ergot alkaloid α-adrenergic blocker].** *Older children and adolescents:* 1 mg sublingually or PO at onset of attack and q 30 min to relief (max: 3 mg/attack). *Adults:* 1–2 mg sublingually or PO, may repeat q 30 min to maximum of 6 mg (maximum dose/wk: 10 mg).	*Caution:* Reduce dose by 50% if patient is taking chronic methysergide. *Adverse events:* Tachypnea, vasospasm, nausea, vomiting, diarrhea, leg cramps, muscle weakness, paresthesias.
Esmolol Brevibloc. Injection: 10 mg/mL.	**Antiarrhythmic, antihypertensive (β blocker, class II antiarrhythmic).** *Children:* 100–500 µg/kg over 1 min, then continuous infusion of 200–1,000 µg/kg/min. *Adults:* 500 µg/kg over 1 min, then 50–200 µg/kg/min.	*Caution:* Contraindicated in sinus bradycardia, heart block, uncompensated heart failure. *Adverse events:* Hypotension, bradycardia, Raynaud phenomenon, dizziness, confusion, lethargy, bronchoconstriction.
Ethacrynic acid Edecrin. Tablet: 25, 50 mg. Injection.	**Diuretic (acts at ascending loop of Henle).** *Children:* PO: 1–3 mg/kg/24 hr. IV: 0.5–1 mg/kg/dose q 8–24 hr. *Adults:* PO: 25–400 mg/24 hr. IV: 0.5–1 mg/kg/dose q 8–24 hr.	*Adverse events:* Hypotension, fluid and electrolyte depletion, hyperuricemia, ototoxicity, tinnitus.
Ethosuximide Zarontin. Capsule: 250 mg. Syrup: 250 mg/5 mL.	**Anticonvulsant for treatment of absence, myoclonic, and akinetic epilepsy (increased seizure threshold).** *Children:* <6 yr: Start 15 mg/kg/24 hr in 2 doses; increase q 4–7 days to therapeutic level, usually 15–40 mg/kg/24 hr in 2 doses (max: 1.5 g/24 hr). >6 yr and adults: Start 250 mg bid; increase by 250 mg/24 hr q 4–7 days up to therapeutic level or 1.5 g/24 hr.	*Adverse events:* Sedation, lethargy, nausea, vomiting, anorexia, abdominal pain, leukopenia, thrombocytopenia, aplastic anemia. *Monitoring:* Ethosuximide concentrations: therapeutic 40–100 µg/mL; toxic 150 µg/mL.
Etoposide, VP-16 VePesid. Capsule: 50 mg. Injection: 20 mg/mL.	**Antineoplastic for treatment of various cancers (inhibits mitotic activity).** *Children:* IV: 150 mg/m^2/24 hr for 3 days for 2–3 cycles for acute myelocytic leukemia remission or brain tumor; 160 mg/m^2/24 hr for 4 days for bone marrow transplant conditioning. *Adults:* IV: 50–100 mg/m^2/24 hr for 3–5 days/course. PO: IV dose ×2 to nearest 50 mg.	*Adverse events:* Hypotension, tachycardia, fever, headache, chills, alopecia, rash, urticaria, nausea, vomiting, diarrhea, mucositis, myelosuppression, anemia (nadir, 7–14 days), thrombocytopenia (nadir, 9–16 days), peripheral neuropathy, bronchospasm.
Factor IX complex (human) Konyne 80; Profilnine; Proplex. Injection.	**Antihemophilic agent to control bleeding in patients with factor IX deficiency (i.e., hemophilia B or Christmas disease), or with inhibitors to factor VIII (i.e., hemophilia A) [replacement of deficient factor].** *Children and adults:* 20–25 u/kg/dose up to q 24 hr; factor VIII deficiency: 75–100 u/kg/dose up to q 6 hr.	*Adverse events:* Flushing, fever, headache, chills, urticaria, thrombosis (with high doses), tingling, tightness of head and neck.
Famotidine Pepcid. Tablet: 20, 40 mg. Injection.	**Treatment of gastric and duodenal ulcer and control of gastric pH in critically ill patients (blocks H_2 receptors).** *Infants and children:* PO, IV: 1–12 mg/kg/24 hr in 1–2 doses (max: 40 mg/24 hr). *Adults:* PO: 40 mg/24 hr at bedtime. IV: 20 mg q 12 hr.	*Cautions:* Reduce dose for renal function: CrCl 30–50 mL/min: give 50% of dose; CrCl < 30 mL/min: give 25% of dose. *Adverse events:* Gastrointestinal discomfort, thrombocytopenia, increased liver enzymes.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Fat emulsion Intralipid; Liposyn. Injection: 10%, 20%.	**Source of essential fatty acids and calories (nutritional supplement with parenteral nutrition).** *Premature infants:* Start 0.5 g/kg/24 hr and increase by 0.5 g/kg/24 hr as tolerated (max: 3 g/kg/24 hr). *Infants and children:* Start 0.5–1 g/kg/24 hr and increase by 0.5 g/kg/24 hr as tolerated (max: 3–4 g/kg/24 hr). *Adolescents and adults:* 1 g/kg/24 hr and increase as tolerated (max: 2.5 g/kg/24 hr).	*Cautions:* Fat calories should not exceed 60% of total daily calories. Contraindicated in patients with severe egg or soybean allergies. *Adverse events:* Hyperlipidemia, hepatomegaly, dyspnea, and hypoxemia may occur if infused too quickly or with excessive dose. *Monitoring:* Serum triglycerides.
Felbamate Felbatol. Tablet: 400, 600 mg. Oral suspension: 600 mg/5 mL.	**Adjunctive therapy primarily used for refractory generalized and partial seizures associated with Lennox-Gastaut syndrome (anticonvulsant with unknown mechanism of action).** *Children: 2–14 yr:* Start 15 mg/kg/24 hr in 3–4 doses; increase weekly by 15 mg/kg/24 hr (max: 45 mg/kg/24 hr or 3,600 mg, whichever is less). *>14 yr:* Start 1,200 mg/24 hr in 3–4 doses; increase weekly by 1,200 mg/24 hr (max: 3,600 mg/24 hr).	*Caution:* Over 30 cases each of hepatic failure and aplastic anemia with multiple fatalities have been reported. *Adverse events:* Headache, insomnia, somnolence, fatigue, behavioral changes, depression, ataxia, anorexia, nausea, vomiting, diarrhea, thrombocytopenia, granulocytopenia, leukopenia, agranulocytosis, aplastic anemia, hepatitis, acute liver failure. *Monitoring:* Interacts with phenytoin, carbamazepine, and valproate; monitor drug levels if felbamate added.
Fentanyl citrate Duragesic; Sublimaze. Injection, transdermal, oral lozenge.	**Relief of pain, sedation, preoperative medication, anesthesia adjunct (narcotic analgesic, binds to opium receptors).** *Neonates and infants:* IV: 1–4 μg/kg/dose; may repeat q 2–4 hr or continuous infusion of 0.5–5 μg/kg/hr. *Children 1–2 yr:* Pain: IM, IV: 1–3 μg/kg/dose, may repeat q 30–60 min; continuous infusion of 1–5 μg/kg/hr; Oralet 5–15 μg/kg. *Children > 12 yr and adults:* Pain: IV, IM: 0.5–1 μg/kg/dose; may repeat in 30–60 min. Transdermal: 25–100 μg/hr as needed for relief. PO: 5 μg/kg or 400 μg, whichever is less. Anesthesia: IV, IM: 2–50 μg/kg.	*Cautions:* Rapid IV infusion may result in skeletal muscle and chest wall rigidity, with impaired ventilation and respiratory distress; physical dependence may occur in 3–5 days. *Adverse events:* Hypotension, bradycardia, CNS depression, constipation, biliary tract spasm, nausea, vomiting, urinary tract spasm, respiratory depression.
Fexofenadine Allegra. Capsule: 60 mg. Tablet: 30, 60, 180 mg.	**Antihistamine with selective peripheral H_1 receptor activity. Treatment of seasonal allergic rhinitis and chronic idiopathic urticaria.** *Children < 12 yr:* 30 mg bid. *Children > 12 yr and adults:* 60 mg bid, or 180 mg q 24 hr.	*Adverse events:* Very good safety profile; toxicity is rare, even with overdose (mainly dizziness, drowsiness, and dry mouth).
Filgrastim Granulocyte colony-stimulating factor. Neupogen. Injection: 300 μg/mL	**Reduces duration of neutropenia (stimulates production, maturation, and activation of neutrophils).** *Neonates:* 5 μg/kg/dose daily for 3–6 doses. *Children and adults:* 5–10 μg/kg/dose daily for up to 14 days; may discontinue if absolute neutrophil count remains > 1,000/mm^3 for 3 consecutive days.	*Cautions:* Malignancy with myeloid characteristics. *Adverse events:* Hypotension, vasculitis, fever, exacerbation of pre-existing skin disorders, increased uric acid, thrombocytopenia, medullary pain (dose-related and mostly located in lower back, iliac crest, and sternum), hematuria, proteinuria.
Flecainide Tambocor. Tablet: 50, 100, 150 mg. Extemporaneous formulations can be prepared.	**Treatment of supraventricular tachycardia and ventricular arrhythmias (antiarrhythmic class 1c; slows conduction in cardiac tissue).** *Children:* Initially, 1–3 mg/kg/24 hr in 3 divided doses; may increase up to 12 mg/kg/24 hr. *Adults:* Initially 100 mg q 12 hr; may increase by 100 mg/24 hr q 4 days (max: 400 mg/24 hr).	*Caution:* Decrease dose by 25–50% in renal failure; avoid in 2nd- or 3rd-degree heart block. *Adverse events:* Bradycardia, heart block, worsening arrhythmias, congestive heart failure, dizziness, visual disturbances, headache, fatigue, asthenia, nausea, constipation, abdominal pain, elevated liver enzymes, paresthesias, tremor. *Monitoring:* Serum trough concentrations (therapeutic 0.2–1 μg/mL).
Fludarabine Antineoplastic; antimetabolite. Fludara. Injection powder.	**Treatment of B-cell chronic lymphocytic leukemia and acute lymphocytic leukemia unresponsive to previous therapy.** *Children:* 10 mg/m^2 over 15 min, followed by 30.5 mg/m^2/24 hr by continuous infusion for 5 days. *Adults:* 20–25 mg/m^2 over 30 min for 5 days.	*Adverse events:* Neurotoxicity (primarily progressive demyelinating encephalopathy with mental status deterioration), somnolence, weakness, seizures, metabolic acidosis, hyperuricemia, hyperphosphatemia, hyperkalemia, hypocalcemia, nausea, vomiting, diarrhea, stomatitis, metallic taste, myelosuppression (WBC nadir, 8 days; platelet nadir, 16 days; recovery, 5–7 wk), pneumonitis, dyspnea, nonproductive cough, interstitial pneumonitis, hearing loss, reversible hepatotoxicity.
Fludrocortisone acetate Florinef. Tablet: 0.1 mg.	**Partial replacement therapy for adrenal insufficiency (mineralocorticoid with glucocorticoid activity).** *Infants and children:* 0.05–0.1 mg/24 hr. *Adults:* 0.05–0.2 mg/24 hr.	*Adverse events:* Hypertension, edema, congestive heart failure, convulsions, headache, acne, rash, bruising, hypokalemia, HPA axis (adrenal) suppression, peptic ulcer, muscle weakness.
Flumazenil Romazicon. Injection.	**Benzodiazepine antagonist to reverse sedative effects (antagonizes benzodiazepine effects on γ-aminobutyric acid/benzodiazepine receptor complex).** *Children:* Loading dose of 0.005–0.01 mg/kg, then continuous infusion of 0.005–0.01 mg/kg/hr (maximum cumulative dose: 1 mg).	*Caution:* Avoid if benzodiazepine is used to manage potentially life-threatening conditions (e.g., status epilepticus, increased intracranial pressure). *Adverse events:* Arrhythmias, hypotension or hypertension, seizures, acute withdrawal symptoms (if patient is dependent on benzodiazepine or tricyclic antidepressant).
Flunisolide Inhaled steroid; anti-inflammatory. AeroBid; Nasalide. Metered-dose inhaler: 250 μg/puff. Nasal spray: 25 μg/actuation.	**Treatment of asthma and rhinitis.** *Children and adults:* Oral inhalation: 2–4 puffs bid. Nasal spray: 1–2 sprays in each nostril bid–tid.	*Adverse events:* Candidal infections of nose and throat, dysphonia, sore throat, bitter taste, nasal irritation, headache, dizziness, short-term growth retardation.
Fluocinolone acetonide Topical adrenocorticosteroid; anti-inflammatory. Fluonid; Synalar; generic. Topical cream, ointment, shampoo, solution, oil: 0.01–0.025%	**Inflammation and corticosteroid-responsive dermatoses** *Children and adults:* Apply a thin layer bid–qid.	*Adverse events:* Acne, hypopigmentation, allergic dermatitis, skin atrophy, folliculitis, secondary infection, HPA axis suppression, growth retardation.
Fluocinonide Topical adrenocorticosteroid; anti-inflammatory. Fluonex, Lidex; generic. Cream, gel, ointment, solution: 0.05%	**Inflammation and corticosteroid-responsive dermatoses** *Children and adults:* Apply a thin layer bid–qid.	*Adverse events:* Acne, hypopigmentation, allergic dermatitis, skin atrophy, folliculitis, secondary infection, HPA axis suppression, growth retardation.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Fluoride Generic. Oral drops, topical gel, lozenge, tablet, topical rinse, oral solution.	**Prevention of dental caries (promotes remineralization, increases resistance to acid dissolution).** Dental rinse or gel: *Children:* 5–10 mL after brushing. *Adults:* 10 mL after brushing.	*Adverse events:* Gastrointestinal upset if swallowed; stannous fluoride may stain teeth.
Fluorometholone Ophthalmic glucocorticoid; anti-inflammatory. Flarex; FML. Ophthalmic ointment: 0.1%. Ophthalmic suspension: 0.1%, 0.25%	**Inflammatory conditions of the eye.** *Children >2 yr and adults:* Ointment: Apply tid in mild to moderate cases and q 4 hr in severe cases. Drops: Instill 1–2 drops into conjunctival sac q hr while awake and q 2 hr at night until response, then q 4–8 hr.	*Adverse events:* Local stinging and burning, increased intraocular pressure.
Fluorouracil Adrucil; Efudex; Fluoroplex. Injection, topical solution, cream.	**Cancer chemotherapy (antineoplastic antimetabolite that inhibits thymidylate synthase, leading to thymidine depletion).** *Children and adults:* IV: 12 mg/kg/24 hr (max: 800 mg/24 hr) for 4–5 days, then 6 mg/kg q other day for 4 doses. Repeat in 4 wk. Cream or solution 5%: Apply to entire affected area bid.	*Adverse events:* Arrhythmias, hypotension, heart failure, cerebellar ataxia, somnolence, alopecia, skin pigmentation, pruritic maculopapular rash, photosensitivity, erythrodysesthesia of hands and feet, loss of nails, hyperpigmentation of nail beds, nausea, vomiting, diarrhea, gastrointestinal hemorrhage, esophagitis, stomatitis, hepatotoxicity, conjunctivitis, myelosuppression (WBC and platelets: onset, 7–10 days; nadir, 9–14 days; recovery, 21 days).
Fluoxetine hydrochloride Prozac. Capsule: 10, 20 mg. Liquid: 20 mg/5 mL.	**Treatment of depression and obsessive-compulsive disorders (antidepressant, inhibits CNS serotonin uptake).** *Children 5–18 yr:* Initially, 5–10 mg/24 hr, then titrate slowly to effect (max: 20 mg/24 hr). *Adults:* Initially, 20 mg/24 hr, then slowly increase daily dose in 20 mg increments to effect.	*Caution:* Avoid in patients taking monoamine oxidase inhibitors. *Adverse events:* Headache, nervousness, insomnia, anxiety, mania, suicidal ideation, tremor, nausea, anorexia, diarrhea, constipation, dry mouth, weight loss. *Monitoring:* Serum concentrations of fluoxetine (therapeutic: 100–800 ng/mL), norfluoxetine (therapeutic: 100–600 ng/mL).
Fluticasone Inhaled corticosteroid. Flonase; Flovent. Nasal solution: 50 μg/spray. Metered-dose inhaler (MDI): 44, 110, 220 μg/spray. Rotadisk: 50, 100, 250 μg/dose.	**Treatment of allergic rhinitis and chronic asthma.** *Children and adults:* Nasal spray: 1–2 sprays in each nostril once daily. MDI: 88–880 μg bid (depending on asthma severity and need for systemic corticosteroids). Rotadisk: 50–1,000 μg bid (depending on asthma severity and need for systemic corticosteroids).	*Adverse events:* Dysphonia, oral thrush, adrenal suppression, growth suppression, cataracts.
Fluvoxamine Luvox; generic. Tablet: 25, 50, 100 mg.	**Serotonin reuptake inhibitor; treatment of depression, obsessive-compulsive disorder.** *Children <12 yr:* Start 25 mg/hr, increase by 25 mg/24 hr q 4–7 days to effect (max: 200 mg/24 hr). Divide into 2 daily doses if >50 mg/24 hr needed. *Children >12 yr:* Start 25 mg/24 hr; increase by 25 mg/24 hr q 4–7 days to effect (max: 300 mg/24 hr). Divide into 2 daily doses if >50 mg/24 hr needed. *Adults:* Start 50 mg/24 hr; increase by 50 mg/24 hr q 4–7 days to effect (max: 300 mg/24 hr). If >100 mg/24 hr needed, divide into 2 doses/24 hr.	*Caution:* Do not abruptly discontinue doses or withdrawal syndrome may occur over several days. Taper dose by 25–50 mg/24 hr q 5–7 days. *Adverse events:* Somnolence, headache, dry mouth, nausea, constipation. *Drug interactions:* Inhibits cytochrome 2D6 liver enzymes; drugs such as methadone and phenothiazines may have increased levels when used concurrently.
Folic acid Generic. Injection. Tablet: 0.4, 0.8, 1 mg. Extemporaneous formulations can be prepared.	**Treatment of folate deficiency anemias (i.e., megaloblastic, macrocytic) [cofactor for normal erythropoiesis].** *Neonates–6 mo:* PO: 25–35 μg/24 hr. *6 mo–3 yr:* 50 μg/24 hr. *4–6 yr:* 75 μg/24 hr. *7–10 yr:* 100 μg/24 hr. *11–14 yr:* 150 μg/24 hr. *>15 yr and adults:* 200 μg/24 hr. Folate deficiency: 1 mg/24 hr.	*Caution:* Large folate doses may mask hematologic effects of vitamin B_{12} deficiency while allowing neurologic consequences to progress.
Fosphenytoin Cerebyx. Injection: 10 mL vials contain 750 mg fosphenytoin (500 mg phenytoin); 2 mL vials contain 150 mg fosphenytoin.	**Treatment of acute seizures (may substitute for IV phenytoin).** *Children and adults:* Loading dose of 15–20 mg/kg phenytoin dosing equivalents (max: 150 mg/min). May substitute IV or IM for phenytoin maintenance doses. Each 1.5 mg fosphenytoin = 1 mg phenytoin dosing equivalent.	*Cautions:* Same as phenytoin. *Drug interactions:* Same as phenytoin.
Furosemide Lasix; generic. Injection: 10 mg/mL. Oral solution: 10 mg/mL, 40 mg/mL. Tablet: 20, 40, 80 mg.	**Diuretic (inhibits sodium and chloride reabsorption at the ascending loop of Henle and distal tubule).** *Premature infants:* 0.5–2 mg/kg IV or 1–4 mg/kg PO q 12–48 hr (dose to response). *Infants and children:* 1–2 mg/kg IV or 1–4 mg/kg PO q 6–24 hr or continuous infusion (start at 0.05 mg/kg/hr and adjust dose to response). *Adults:* 10–600 mg/24 hr in 1–4 divided doses, or continuous infusion or 0.05 mg/kg/hr.	*Adverse events:* Dehydration, electrolyte loss, hyperuricemia, photosensitivity, ischemic hepatitis, hypercalciuria, renal stones, ototoxicity (IV infusion rate >4 mL/min), gastrointestinal intolerance.
Gabapentin Neurontin. Capsule: 100, 300, 400 mg.	**Adjunct to treatment of partial and secondarily generalized seizures; treatment of neuropathic pain (mechanism not certain).** *Children 2–12 yr:* 15–35 mg/kg/24 hr in 3 divided doses (max: 50 mg/kg/24 hr). *Children >12 yr and adults:* Start 300 mg daily, then increase by 300 mg daily to 900–3,600 mg/24 hr in 3 divided doses.	*Adverse events:* Somnolence, dizziness, fatigue, depression, hyperactivity, aggression, dyspepsia, constipation, nausea, weight gain, diplopia.
Gamma globulin See Immune globulin, intravenous.		
Gentian violet Generic. Topical solution: 1%, 2%.	**Treatment of cutaneous and mucocutaneous infections (kills Candida, staphylococcal species, and some vegetative gram-positive bacteria).** *Infants:* Apply 3–4 drops of 0.5% solution under tongue or on lesion after feedings. *Children and adults:* Apply 0.5–2% with cotton to lesion bid–tid for 3 days.	*Caution:* Do not swallow. *Adverse events:* Burning, local irritation, or sensitivity reactions.
Glucagon Powder for injection.	**Treatment of hypoglycemia (stimulates hepatic glycolysis and gluconeogenesis).** *Neonates:* IV, IM, SC: 0.3 mg/kg/dose (max: 1 mg). *Children:* 0.025–0.1 mg/kg/dose (max: 1 mg); may repeat in 20 min SC, IM, IV. *Adults:* 0.5–1 mg; may repeat in 20 min as needed, SC, IM, IV.	*Adverse events:* Nausea, vomiting, hypersensitivity reactions.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Glycopyrrolate Robinul; generic. Injection: 0.2 mg/mL. Tablet: 1 mg.	**Inhibits salivation and excessive secretions of the respiratory tract; bronchodilator; adjunct to treatment of peptic ulcer; reverses muscarinic effects on cholinergic agents (anticholinergic).** *Children:* Control of secretions: PO: 40–100 μg/kg/dose tid–qid. IM, IV: 4–10 μg/kg/dose q 3–4 hr. Preoperative IM: 4.4–8.8 μg/kg/dose 30–60 min before procedure.	*Adverse events:* Tachycardia, nervousness, headache, insomnia, drowsiness, dry mouth, constipation, nausea, urinary retention, blurred vision.
Gold sodium thiomalate Myochrysine, generic. Injection: 25 mg/mL.	**Treatment of rheumatoid arthritis (mechanism unknown).** *Children:* Test dose: 10 mg IM, followed by 1 mg/kg IM q wk for 20 wk, then 1 mg/kg/dose q 2–4 wk (max: 50 mg/dose). *Adults:* Test dose: 10 mg IM, then 25–50 mg/wk, then 25–50 mg IM q 2–4 wk once response is noted.	*Cautions:* Patient should be sitting or lying for 10 min after the dose; avoid in patients with systemic lupus erythematosus or blood dyscrasias. *Adverse events:* Headache, flushing, seizures, exfoliative dermatitis, erythema nodosum, hives, alopecia, loss of nails, stomatitis, gingivitis, glossitis, conjunctivitis, eosinophilia, leukopenia, thrombocytopenia, hematuria, proteinuria, nephrotic syndrome, pulmonary fibrosis and interstitial pneumonitis, hepatotoxicity, peripheral neuropathy. *Monitoring:* Gold serum concentrations (therapeutic 1–3 μg/mL).
Gonadorelin Factrel; Lutrepulse. Injection.	**Evaluate gonadotropin regulation in precocious or delayed puberty; treat primary hypothalamic amenorrhea (stimulates release of luteinizing hormone).** *Children:* IV (HCl salt) 100 μg. *Children >12 yr and adults:* IV, SC: 100 μg during days 1–7 of menstrual cycle.	*Adverse events:* Flushing, lightheadedness, headache, abdominal discomfort. *Monitoring:* Plasma-luteinizing hormone and follicle-stimulating hormone.
Granisetron Kytril. Injection: 1 mg/mL. Tablet: 1 mg.	**Antiemetic (selective 5-HT_3 antagonist).** *Children >2 yr and adults:* IV 10–20 μg/kg 15–30 min before chemotherapy; may repeat 2–3 doses in 24 hr. PO: 1 mg bid starting 1 hr before chemotherapy.	*Adverse events:* Arrhythmias, bradycardia, transient blood pressure changes, agitation, anxiety, liver enzyme elevations.
Guaifenesin, Glycerol Guaiacolate Expectorant Generic. With or without codeine, dextromethorphan, phenylpropanolamine, or phenylephrine. Syrup, tablet, capsule, liquid.	**Temporary control of cough.** *Children < 2 yr:* 12 mg/kg/24 hr in 6 divided doses. *2–5 yr:* 50–100 mg q 4 hr (max: 600 mg/24 hr). *6–11 yr:* 100–200 mg q 4 hr (max: 1,200 mg/24 hr). *>12 yr and adults:* 200–400 mg q 4 hr (max: 2.4 g/24 hr).	*Caution:* Monitor doses and toxicities of other drugs in combination products.
Guanethidine Ismelin. Tablet: 10, 25 mg.	**Treatment of moderate to severe hypertension (acts as false neurotransmitter).** *Children:* 0.2 mg/kg/24 hr; may increase by 0.2 mg/kg/24 hr every wk (max: 3 mg/kg/24 hr). *Adults:* Initial 10 mg/24 hr; increase weekly (max: 25–50 mg/24 hr).	*Adverse events:* Palpitations, chest pain, peripheral edema, fatigue, headache, drowsiness, confusion, constipation, anorexia, urinary frequency, nocturia, paresthesias, visual disturbances, orthostatic hypotension.
Guanfacine HCL Tenex. Tablet: 1 mg.	**Treatment of hypertension and attention deficit disorder (ADD) [stimulate α_2 receptors in the brainstem].** *Children:* ADD: 1 mg/24 hr. *Adults:* 1 mg/24 hr; may increase q 4 wk (max: 3 mg/24 hr).	*Adverse events:* Somnolence, dizziness, dry mouth, constipation, gastrointestinal upset.
Haloperidol Haldol, generic. Oral concentrate: 2 mg/mL. Tablet: 0.5, 1, 2, 5, 10, 20 mg. Injection.	**Treatment of severe behavioral problems, including psychoses and Tourette disorder (competitive blocker of dopamine receptors).** *Children 3–12 yr:* PO: Start 0.25–0.5 mg/24 hr in 2–3 divided doses, then increase weekly by 0.25–0.5 mg daily based on response (max: 0.15 mg/kg/24 hr). *6–12 yr:* IM: 1–3 mg/dose q 4–8 hr (max: 0.15 mg/kg/24 hr). *Adults:* PO: 0.5–5 mg bid–tid daily. IM: 2–5 mg q 4–8 hr.	*Adverse events:* Drowsiness, restlessness, anxiety, extrapyramidal symptoms, dystonia, akathisia, pseudoparkinsonism, tardive dyskinesia, neuroleptic malignant syndrome, seizures, constipation, weight gain, swelling of breasts, hypotension, tachycardia, arrhythmias, unrinary retention, blurred vision, retinal pigmentation, cholestatic liver disease, agranulocytosis, leukopenia. *Monitoring:* Plasma concentrations (therapeutic 5–15 ng/mL, toxic > 42 ng/mL).
Heparin (unfractionated) Generic. Injection.	**Prophylaxis and treatment of thromboembolism (potentiates actions of antithrombin III).** *Neonates, infants, and children:* Thrombosis and extracorporeal membrane oxygenation: Loading dose of 50 U/kg IV bolus, 15–35 U/kg/hr continuous IV infusion maintenance dose (adjust to target activated partial thromboplastin time [APTT] or heparin level). Catheter patency: 0.5–1 U/mL. *Adults:* IV: Loading dose of 70–100 U/kg IV push, 15–25 U/kg/hr continuous infusion (target APTT or heparin level). SC: 5,000 units q 8–12 hr for prophylaxis.	*Caution:* Avoid if severe thrombocytopenia, intracranial hemorrhage, bacterial endocarditis. *Adverse events:* Bleeding from various sites (e.g., urine, gums, nose); bruising, thrombocytopenia, thrombosis. *Monitoring:* APTT (therapeutic, 1.5–2.5× baseline; toxic > 2.5× baseline); plasma heparin concentration (anti-factor X assay: therapeutic 0.3–0.7 U/mL).
Histrelin Gonadotropin-releasing hormone analog. Supprelin. Injection.	**Central idiopathic precocious puberty.** *Children:* SC. 10 μg/kg once daily. *Adult female:* 100 μg/24 hr for endometriosis.	*Adverse events:* Anxiety, depression, irritability, insomnia, headaches.
Homatropine hydrobromide Anticholinergic. Isopto Homatropine; generic. Ophthalmic solution. 2%, 5%.	**Produces cycloplegia and mydriasis for refraction; treatment of uveitis.** *Children:* For mydriasis: 1 drop of 2% solution before procedure; may repeat q 10 min as needed. Uveitis: 1 drop 2% solution bid–tid. *Adults:* Mydriasis. 1–2 drops of 2% or 5% solution before procedure; may repeat q 10 min. Uveitis: 1–2 drops of 2% or 5% solution bid–tid.	*Adverse events:* Blurred vision, photophobia, local stinging, respiratory congestion.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Human growth hormone Humatrope, Nutropin; Protropin. Injection.	**Treatment of growth failure due to inadequate growth hormone secretion (replacement therapy).** *Children:* Humatrope: 0.06 mg/kg (0.15 IU/kg) 3×/wk. Nutropin: 0.043 mg/kg/24 hr. Protropin: 0.1 mg/kg (0.26 IU/kg) 3×/wk.	*Adverse events:* Local lipoatrophy, hypothyroidism, pain in hip or knee.
Hyaluronidase Wydase. Injection: 150 U/mL.	**Treatment of extravasation; enhance is absorption of fluids administered by hypodermoclysis (hydrolysis of hyaluronic acid to modify permeability of connective tissue).** *Neonates, infants, children:* Inject using 25–26 g needle (total 1 mL, 150 U), SC, or intradermally at 5 sites (0.2 mL to each) at leading edge of extravasation.	*Adverse events:* Tachycardia, hypotension, erythema.
Hydralazine Generic. Injection: 20 mg/mL. Tablet. Extemporaneous formulations may be prepared.	**Treatment of hypertension; adjunct treatment of congestive heart failure with nitrates (direct vasodilation of arterioles).** *Neonates:* IV: 0.1–0.5 mg/kg/dose q 6–8 hr. PO: 0.25–1 mg/kg/dose q 6–8 hr. *Infants and children:* IM, IV: Start 0.1–0.2 mg/kg/dose q 4–6 hr and titrate to effect (max: 3.5 mg/kg/24 hr). PO: 0.75–1 mg/kg/24 hr in 2–4 divided doses (max: 7.5 mg/kg/24 hr). *Adults:* IM, IV: 10–20 mg/dose q 4–6 hr (max: 40 mg/dose). PO: 10–25 mg/dose qid, and titrate to effect (max: 300 mg/24 hr).	*Adverse events:* Palpitations, flushing, tachycardia, headache, nausea, vomiting, anorexia, diarrhea, lupus-like syndrome, arthralgias, peripheral neuropathy (related to pyridoxine deficiency).
Hydrochlorothiazide Generic. Oral solution: 50 mg/5 mL. Tablet: 25, 50, 100 mg Combination products (e.g., with spironolactone).	**Treatment of hypertension and fluid overload (edema) states (e.g., bronchopulmonary dysplasia, congestive heart failure, prevention of recurrent renal calcium stones) [diuretic inhibits sodium reabsorption in distal tubule].** *Neonates and infants:* 2–4 mg/kg/24 hr in divided doses. *Infants > 6 mo and children:* 2 mg/kg/24 hr in 2 divided doses. *Adults:* 12.5–100 mg/24 hr.	*Adverse events:* Hypokalemia, hypochloremia, hypomagnesemia, hyperglycemia, hyperuricemia, hyperlipidemia, pancreatitis, leukopenia, thrombocytopenia, aplastic anemia, hepatitis, intrahepatic cholestasis, prerenal azotemia.
Hydrocortisone Generic. Cream, ointment, gel, lotion, injection, oral suspension, rectal foam.	**Treatment of adrenal insufficiency, congenital adrenal hyperplasia, shock, corticosteroid-responsive dermatoses, adjunctive treatment of ulcerative colitis (anti-inflammatory, glucocorticoid).** *Neonates, infants, and young children:* Adrenal insufficiency: 1–2 mg/kg IV bolus, then 25–150 mg/24 hr divided q 6 hr. Congenital adrenal hyperplasia: IV: Start 0.5–0.7 mg/kg/24 hr, then 0.3–0.4 mg/kg/24 hr maintenance therapy; give doses as 1/4 in A.M., 1/4 at noon, and 1/2 at night. Shock: IV: 35–50 mg/kg, then 50–150 mg/kg/24 hr divided q 6 hr for 48–72 hr. *Infants and older children:* Adrenal insufficiency: 1–2 mg/kg IV bolus, then 150–250 mg/24 hr divided q 6–8 hr. Anti-inflammatory: IV, IM: 1–5 mg/kg/24 hr in 1–2 doses. PO: 2.5–10 mg/kg/24 hr divided q 6–8 hr Shock: IV: 50 mg/kg/dose q 4 hr. Status asthmaticus: IV: 1–2 mg/kg/dose q 6 hr. *Adults:* Anti-inflammatory: IV, IM, PO: 15–240 mg/dose q 12 hr Shock: IV: 0.5–2 g q 2–6 hr. Rectal: Apply 1–2 times/24 hr for 2–3 wk. Topical: Apply 3–4 times/24 hr.	*Caution:* Abrupt withdrawal may cause acute adrenal insufficiency. *Adverse events:* Hypertension, hyperglycemia, hypokalemia, euphoria, insomnia, headache, Cushing syndrome, peptic ulcer, cataracts, immunosuppression, skin and muscle atrophy, acne, edema. **Relative Potency of Corticosteroids** Drug / Anti-inflammatory Effect (mg) / Sodium-Retaining Effect (mg) Hydrocortisone 100 100 Cortisone 80 80 Prednisolone 20 100 Prednisone 20 100 Methylprednisolone 16 0 Triamcinolone 16 0 Dexamethasone 2 0 Desoxycorticosterone 0 2
Hydromorphone Dilaudid; generic. Injection. Tablet: 2, 4 mg. Syrup: 1 mg/5 mL. Suppository: 3 mg.	**Analgesic, antitussive (narcotic).** *Children 6–12 yr:* Cough: PO: 0.5 mg q 3–4 hr as needed. Pain: PO: 0.03–0.08 mg/kg/dose q 4–6 hr as needed. IV: 0.015 mg/kg/dose q 4–6 hr as needed. *Children > 12 yr and adults:* Cough: PO: 1 mg q 3–4 hr as needed. Pain. PO, IV, IM, SC: 1–4 mg/dose q 4–6 hr as needed.	*Caution:* Tablet and syrup contain tartrazine, which may exacerbate asthma; do not discontinue abruptly after continuous use. *Adverse events:* Sedation, drowsiness, confusion, restlessness, headache, tachycardia, hypotension, physical and psychological addiction, nausea, vomiting, constipation, stomach cramps, decreased urination, ureteral spasm, respiratory depression, shortness of breath, miosis, antidiuretic hormone release, sensitivity reactions (due to histamine release). *Comment:* IV, IM hydromorphone 1.5 mg = morphine 10 mg; oral hydromorphone 7.5 mg = morphine 30 mg (acute) or 60 mg (chronic).
Hydroxocobalamin, vitamin B_{12} Codroxomin, Hybalamin, others. Injection.	**Treatment of pernicious anemia, vitamin B_{12} deficiency, increased vitamin B_{12} requirements (replacemnt therapy).** *Children:* 100 μg/24 hr IM to total 1 mg over 2 wk, then 30–50 μg/mo. *Adults:* 30 μg/24 hr for 5–10 days, then 100–200 μg/mo.	*Comment:* May require co-administration of folate.
Hydroxychloroquine Plaquenil sulfate. Tablet: 200 mg. Extemporaneous formulations may be prepared.	**Suppression or chemoprophylaxis of malaria; treatment of systemic lupus erythematosus and rheumatoid arthritis (interferes with digestive vacuole function within sensitive malarial parasites, impairs complement-dependent antigen-antibody reactions).** *Children:* Chemoprophylaxis of malaria: 5 mg/kg 1×/wk (begin 1–2 wk before exposure and continue for 4 wk after leaving high-risk area). Acute malaria attack: 10 mg/kg initial dose followed by 5 mg/kg in 6–8 hr on day 1,400 mg once on days 2 and 3.	*Caution:* Avoid in porphyria or psoriasis. *Adverse events:* Headache, confusion, agitation, insomnia, nightmares, psychosis, visual field defects, retinitis, blindness, bone marrow suppression, thrombocytopenia, liver failure, anorexia, nausea, vomiting, diarrhea, lichenoid dermatitis, bleaching of hair, itching, ototoxicity. *Monitoring:* Ophthalmologic examinations for visual field changes.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
	Adults: Malaria prophylaxis: 400 mg 1×/wk (timing as in children). Acute malaria attack: day 1: 800 mg, then 400 mg in 6–8 hr; days 2 and 3: 400 mg once. Rheumatoid arthritis and lupus erythematosus: 400 mg once daily, may increase by 200 mg if inadequate response in 4–12 wk, reduce to 200–400 mg/24 hr once response occurs and long-term maintenance is needed.	
Hydroxyurea Hydrea; Mylocel; generic. Tablet: 1,000 mg. Capsule: 500 mg.	**Cancer chemotherapy, sickle cell anemia (interferes with DNA synthesis during S-phase of cell division).** *Children:* 1,500–3,000 mg/m^2 q 4–6 wk. *Adults:* Cancer chemotherapy: 80 mg/kg every 3rd day, or 20–30 mg/kg/24 hr. Sickle cell anemia: 10–20 mg/kg/24 hr.	*Adverse events:* Drowsiness, headache, hallucinations, seizures, nausea, vomiting, mucositis, stomatitis, myelosuppression (onset, day 7; nadir, day 10; recovery, day 21), alopecia, maculopapular rash, dry skin, erythema of face and hands, hepatitis, increased blood urea nitrogen and creatinine, hyperuricemia.
Hydroxyzine Generic. Injection, syrup, tablet, capsule.	**Treatment of allergy, itching, anxiety, and nausea and adjunct for chronic pain management (H_1-receptor blocker).** PO, IM: *Children:* 0.6 mg/kg/dose q 6 hr. *Adults:* 10–100 mg/dose tid–qid.	*Caution:* May worsen narrow-angle glaucoma, prostatic hypertrophy, bladder neck obstruction, asthma, and chronic obstructive pulmonary disease. *Adverse events:* Hypotension, drowsiness, dizziness, headache, dry mouth, urinary retention, pain at injection site.
Hyoscyamine (with atropine, scopolamine, and phenobarbital) Donnatal; generic. Capsule, elixir, tablet.	**Treatment of irritable bowel, spastic colon, spastic bladder, and renal colic (anticholinergic).** *Children:* Donnatal 0.1 mL/kg/dose q 4 hr (max: 5 mL) *Adults:* 1–2 tablets (or 5–10 mL) tid–qid.	*Adverse events:* Tachycardia, palpitations, headache, drowsiness, nervousness, dry mouth, constipation, dysphagia, paralytic ileus, blurred vision, nasal congestion. *Caution:* Contraindicated in narrow-angle glaucoma, myasthenia gravis, and gastrointestinal and genitourinary obstruction.
Ibuprofen Nonsteroidal anti-inflammatory agent. Generic. Suspension: 100 mg/5 mL. Tablet: 200, 300, 400, 600, 800 mg.	**Treatment of pain, fever, rheumatoid arthritis (inhibits prostaglandin synthesis).** *Children:* Pain, fever: 5–10 mg/kg/dose q 6–8 hr. Juvenile rheumatoid arthritis: 30–50 mg/kg/24 hr in 4 divided doses. *Adults:* 400–800 mg/dose tid–qid (max: 3.2 g/24 hr).	*Adverse events:* Abdominal cramps, heartburn, nausea, gastrointestinal bleeding and perforation, fluid retention, edema, hypertension, tachycardia, acute renal failure.
Idarubicin Idamycin. Injection.	**Combination chemotherapy for acute myelocytic and lymphocytic leukemia (AML and ALL) [inhibits DNA and RNA synthesis].** *Children:* ALL: 10–12 mg/m^2 IV once daily for 3 days/treatment course. *Adults:* AML: 8–12 mg/m^2 IV daily for 3 days/treatment course.	*Adverse events:* Headache, infection, hemorrhage, mucositis, stomatitis, alopecia, rash, urticaria, nausea, vomiting, diarrhea, leukopenia (nadir, 8–19 days), thrombocytopenia (nadir, 10–15 days), myocardial toxicity (arrhythmias, cardiomyopathy, heart failure, ECG changes). *Monitoring:* Maximal lifetime dose = 137.5 mg/m^2. Lower dose by 25% if severe mucositis present or serum creatinine >2 mg/dL; lower dose by 50% if bilirubin >2.5 mg/dL; do not give dose if bilirubin >5 mg/dL.
Ifosfamide Alkylating agent. Ifex. Injection.	**Cancer chemotherapy.** *Children:* IV: 1,200–1,800 mg/m^2 24 hr for 5 days q 21–28 days, or 5 g/m^2 as single IV infusion. *Adults:* 700–2,000 mg/m^2 24 hr for 5 days q 21–28 days, or 5 g/m^2 as single IV infusion.	*Adverse events:* Alopecia, nausea, vomiting, stomatitis, hemorrhagic cystitis (administer mesna for uroprotection), hematuria, renal damage, somnolence, confusion, hallucinations, coma, polyneuropathy, depressive psychosis, elevated liver enzymes, myelosuppression (onset, day 7; nadir, 10–14 days), pulmonary fibrosis, nasal stuffiness, cardiotoxicity.
Imipramine Tofranil; generic. Injection, capsule, tablet.	**Treatment of depression, enuresis, pain (tricyclic antidepressant, increases synaptic concentrations of norepinephrine and serotonin).** *Children:* Depression: Start 1.5 mg/kg/24 hr; may increase by 1 mg/kg/24 hr q 3–4 days (max: 5 mg/kg/24 hr). Enuresis: >6 yr: 10–25 mg at bedtime. Cancer pain: 0.2–0.4 mg/kg at bedtime; may increase dose 50% q 3–4 days (max: 3 mg/kg). *Adolescents:* PO: Start 25–50 mg/24 hr; may gradually increase (max: 200 mg/24 hr). *Adults:* PO: 25 mg tid–qid; may increase dose gradually (max: 300 mg/24 hr). IM: Initially, give up to 100 mg in divided doses.	*Adverse events:* Arrhythmias, postural hypotension, drowsiness, sedation, confusion, headache, dry mouth, constipation, urinary retention, increased liver enzymes, seizures, urinary retention. *Monitoring:* Imipramine concentrations (therapeutic: imipramine and desipramine 150–250 ng/mL, toxic >1,000 ng/mL).
Immune globulin, intravenous Gamimune; Sandoglobulin; generic. Injection.	**Immunodeficiency syndrome, idiopathic thrombocytopenic purpura, acute bacterial or viral infections in immunocompromised or neutropenic patients, Kawasaki disease, Guillain-Barré syndrome, demyelinating polyneuropathy (replacement therapy or interference with Fc receptors in the reticuloendothelial system for autoimmune diseases).** *Neonates:* 500–750 mg/kg once. *Children and adults:* Immunodeficiency syndrome: 100–400 mg/kg/dose q 2–4 wk. Chronic lymphocytic leukemia: 400 mg/kg/dose q 3 wk. Idiopathic thrombocytopenic purpura: 1,000 mg/kg/dose for 2–5 consecutive days, then q 3–6 wk. Kawasaki disease: 2 g/kg single dose. Cytomegalovirus infection: 500 mg/kg/dose eq other day for 7 doses. Severe systemic infection: 500–1,000 mg/kg/wk. Polyneuropathy: 1 g/kg24 hr for 2 consecutive days q mo.	*Caution:* Doses should be based on ideal body weight (not total body weight). *Adverse events:* Flushing, tachycardia, chills, nausea, dyspnea, fever, hypersensitivity reactions, headache, aseptic meningitis.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Indomethacin Indocin; generic (oral forms). Capsule: 25, 50 mg. Suspension: 25 mg/5 mL. Injection.	**Closure of patent ductus arteriosus in neonates, treatment of rheumatoid disorders, acute gouty arthritis, pain (nonsteroidal anti-inflammatory drug, prostaglandin inhibition), hereditary hypokalemic salt-losing renal tubulopathies.** *Neonates:* IV: 0.10–0.25 mg/kg/dose q 12 hr for 3–6 doses. Inflammatory rheumatoid disorders: *Children:* 1–2 mg/kg/24 hr in 2–4 doses (max: 4 mg/kg/24 hr). *Adults:* 25–50 mg/dose bid–tid (max: 200 mg/24 hr).	*Caution:* Avoid in premature neonates with necrotizing enterocolitis, poor renal function, or active bleeding, and all patients with active gastrointestinal bleeding. *Adverse events:* Confusion, dizziness, headache, nausea, vomiting, abdominal pain, gastrointestinal bleeding, ulcers, gastrointestinal perforation, bone marrow suppression, impaired platelet aggregation, oliguria, renal failure, hypertension, edema, hyperkalemia. *Monitoring:* Indomethacin (concentrations in patent ductus arteriosus closure): therapeutic 1–3 μg/mL.
Insulin **Rapid-acting:** Lispro, Regular, Semilente. **Intermediate-acting:** NPH, Lente. **Long-acting:** Ultralente. **Combination products** (e.g., Novolin 70/30, contains Lente 70 units, Regular 30 units). Humulin; Novolin (human insulin, preferred form); beef insulin, pork insulin. Injection.	**Treatment of insulin-dependent diabetes mellitus and non–insulin-dependent diabetes not adequately controlled with oral hypoglycemic agents (replacement therapy).** *Neonates:* Regular insulin 0.01–0.1 u/kg/hr by continuous infusion, or SC 0.1–0.2 u/kg 6–12 hr. *Children and adults:* 0.5–1 u/kg/24 hr. Adjust doses to blood glucose and hemoglobin A_{1c} results. *Adolescents (during growth spurt):* 0.8–1.2 u/kg/24 hr. Diabetic ketoacidosis: Continuous infusion IV: 0.1 u/kg/hr adjusted to serum glucose. Hyperkalemia: Give calcium gluconate and $NaHCO_3$ first, then dextrose 50% 0.5–1 mL/kg and regular insulin 1 u/4–5 g dextrose.	*Caution:* Check for drugs that increase or decrease insulin effect. Do not change insulin types or brands once patient is regulated because dosing requirements will then change; start new patients on human insulin if possible. *Adverse events:* Hypoglycemia (and associated symptoms of dizziness, weakness, paresthesias, numbness of mouth, fatigue, mental confusion, hunger, nausea, visual problems), hypokalemia. *Monitoring:* Blood glucose (teach patient to monitor at home and make insulin dosing corrections per results), hemoglobin A_{1c}, urine glucose, and acetone.
Interferon alfa-2a Roferon-A. Injection.	**In children, treatment of hemangiomas of infancy and pulmonary hemangiomas (inhibits cellular growth, alters cellular differentiation).** *Infants and children:* SC: 1–3 million u/m^2/dose. *Adults:* 3–20 million u/m^2/dose/dose to 3×/wk, depending on indication.	*Adverse events:* Tachycardia, arrhythmias, hypotension, edema, CNS depression, confusion, fatigue, dizziness, and flu-like symptoms (begin 2–6 hr after dose and last up to 24 hr).
Ipecac syrup Generic. Syrup: 70 mg/mL.	**Induces vomiting to treat certain toxic ingestions (stimulates medullary chemoreceptor trigger zone).** *Children:* May repeat dose in 20 min 1×. *6–12 mo:* 5–10 mL, followed by 20 mL/kg of water. *1–12 yr:* 15 mL, followed by 20 mL/kg of water. *>12 yr and adults:* 30 mL, followed by 300 mL of water.	*Cautions:* Do not use if patient is unconscious, has absent gag reflex, or has seizures, or after ingestion of strong bases or acids or volatile oils. Do not confuse with ipecac fluid extract, which is 14 times more potent. *Adverse events:* Lethargy, persistent vomiting, diarrhea.
Ipratropium Anticholinergic. Atrovent. Nebulization solution: 0.02%. Metered-dose inhaler (MDI): 18 μg/puff. Nasal spray: 0.3%, 0.6%.	**Bronchodilator, treatment of rhinitis).** *Neonates:* Nebulized 100 μg/dose or MDI 1–2 puffs tid–qid. *Infants and children:* Nebulized 125–250 μg or MDI 1–2 puffs 3–6 times/24 hr. *Adults:* Nebulized 500 μg or MDI 2 puffs tid–qid. Nasal spray for rhinitis: 1–2 sprays in each nostril bid–tid.	*Adverse events:* Dry mouth, nervousness, dizziness, headache, blurred vision, urinary retention.
Iron Iron dextran complex (injection). Ferrous sulfate, gluconate, etc. Oral.	**Treatment of iron-deficiency, hypochromic, or microcytic anemia (replacement therapy).** Injection: IM, IV: Give 0.25–0.5 mL test dose 1 hr before starting iron dextran therapy. Dose (mL/kg) = Hgb (normal − actual) × 0.0476 + 1 mL/5 kg (max <5 kg = 25 mg; 5–10 kg = 50 mg, >10 kg = 100 mg). PO (mg iron): *Children:* Prophylaxis: 1–2 mg/kg/24 hr. Deficiency: 3–6 mg/kg/24 hr in 1–3 divided doses. *Adults:* Prophylaxis: 60 mg/24 hr. Deficiency: 60 mg bid–qid.	*Adverse events:* (oral) Gastrointestinal irritation, nausea, constipation, dark stools: (IV, IM) hypotension, flushing, dizziness, fever, headache, metallic taste, arthralgia, anaphylaxis. *Monitoring:* Hemoglobin (normal <15 kg = 12 mg/dL, >15 kg = 14.8 mg/dL), reticulocyte count, serum ferritin.
Isoetharine Generic. Metered-dose inhaler (MDI), inhalation solution.	**Bronchodilator (β-agonist stimulation).** *Children:* Nebulize 0.01 mL/kg of 1% solution. *Adults:* Nebulize 0.5–1 mL of 0.5–1% solution; MDI 1–2 puffs q 4 hr as needed.	*Adverse events:* Tachycardia, headache, tremor, excitement, restlessness, nausea.
Isoproterenol Generic. Injection, sublingual tablets, nebulizer solution, metered-dose inhaler (MDI).	**Asthma or chronic obstructive pulmonary disease, ventricular arrhythmias due to AV node block, low-output shock states (stimulates β_1 and β_2 receptors).** *Neonates, infants, and children:* IV: Infuse 0.05–2 μg/kg/min. *Children:* MDI: 1–2 puffs eq 4 hr as needed; nebulize 0.01 mL of 1% solution; sublingual tablets: 5–10 mg eq 3–4 hr (max: 30 mg/24 hr). *Adults:* MDI: 1–2 puffs 4–6 times/24 hr; nebulize 0.25–0.5 mL of 1% solution; sublingual tablets: 10–20 mg q 3–4 hr (max: 60 mg/24 hr); IV infusion 2–20 μg/min.	*Adverse events:* Tachycardia, palpitations, chest pain, nervousness, restlessness, anxiety, headache, insomnia, tremor, gastrointestinal distress, nausea, paradoxical bronchospasm.
Kaolin and pectin Generic. Oral suspension.	**Treatment of uncomplicated diarrhea (absorbent action).** *Children:* *3–6 yr:* 15–30 mL/dose. *6–12 yr:* 30–60 mL/dose. *>12 yr:* 60–120 mL/dose.	*Cautions:* Some products contain bismuth subsalicylate and may cause bleeding disorders. Avoid in dysentery, toxigenic diarrheas.
Ketamine Ketalar. Injection: 10, 100 mg/mL.	**Anesthesia for short procedures (direct action on cortex and limbic system to produce dissociative anesthesia).** *Children:* Give 30 min before procedure. PO: 6–10 mg/kg. IM: 3–7 mg/kg. IV: 0.5–2 mg/kg. *Adults:* 3–8 mg/kg IV. IV: 1–4.5 mg/kg (supplemental doses 1/3 of initial dose).	*Adverse events:* Hypertension, tachycardia, hypotension, bradycardia, increased cerebral blood flow and intracranial pressure, hallucinations, delirium, tonic-clonic movements, increased metabolic rate, hypersalivation, nausea, vomiting, respiratory depression, apnea, increased airway resistance, cough, emergence reactions.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Ketorolac Nonsteroidal anti-inflammatory drug. Acular. Ophthalmic. Toradol. Tablet, injection.	**Treatment of pain; ocular itching with conjunctivitis (inhibits prostaglandin).** *Children 2–16 yr:* IM, IV: 0.4–1 mg/kg/dose. PO: 1 mg/kg/dose q 6 hr as needed. *Adults:* IM: 60 mg. IV: 30 mg up to q 6 hr as needed. Ophthalmic: 1 drop in eye qid for up to 7 days.	*Adverse events:* Edema, somnolence, dizziness, headache, dyspepsia, nausea, diarrhea, gastrointestinal pain, gastrointestinal bleeding, peptic ulcer, impaired platelet aggregation, oliguria, acute renal failure, dyspnea, wheezing, pain at injection site.
Labetalol Normodyne; Trandate. Injection: 5 mg/mL. Tablet: 100, 200, 300 mg.	**Treatment of mild to severe hypertension (blocks α- and β-adrenergic receptors).** *Children:* PO: Start 4 mg/kg/24 hr in 2 doses, then gradually increase (max: 40 mg/kg/24 hr). IV: Start 0.2–1 mg/kg/dose (max: 20 mg/dose), continuous IV infusion of 0.4–1 mg/kg/hr (max: 3 mg/kg/hr). *Adults:* PO: 100 mg bid; may increase every 2–3 days (max: 2.4 g/24 hr). IV: Start 20 mg, repeat boluses 40 mg q 10 min (max: total dose 300 mg), continuous IV infusion of 2 mg/min and titrate to response.	*Adverse events:* Orthostatic hypotension, congestive heart failure, conduction disturbance, bradycardia, drowsiness fatigue, headache, dry mouth, nasal congestion, bronchospasm.
Lactulose Generic. Syrup: 10 g/15 mL.	**Treatment of constipation, hepatic encephalopathy (osmotic effect on stool in colon; acidification of stool promotes NH_4^+ elimination).** *Infants:* 2.5–10 mL/24 hr in 3–4 doses. *Children:* 40–90 mL/24 hr in 3–4 doses. *Adults:* 30–45 mL/dose 3–4 times/24 hr.	*Adverse events:* Flatulence, abdominal discomfort, diarrhea, nausea, vomiting. *Monitoring:* Target 2–3 soft stools/day; serum ammonia.
Lamotrigine Lamictal. Tablet: 25, 100, 150, 200 mg. Tablet, chewable, dispersible: 2, 5, 25 mg.	**Treatment of partial seizures (blocks sodium channels and inhibits presynaptic release of glutamate and aspartate).** *Children 2–12 yr:* 0.6 mg/kg/24 hr in 1–2 doses for 2 wk, then 1.2 mg/kg/24 hr in 2 doses for 2 wk, then 5–15 mg/kg/24 hr in 2 doses per response (max: 400 mg/24 hr). Patients taking valproate: 0.15 mg/kg/24 hr in 1–2 doses for 2 wk, then 0.3 mg/kg/24 hr in 2 doses for 2 wk, then 1–5 mg/kg/24 hr in 2 doses (max: 200 mg/24 hr). *Adults:* Start 50 mg/24 hr for 2 wk, then 100 mg/24 hr, then increases by 100 mg/24 hr at weekly intervals to response (max: 500 mg/24 hr). Patients taking valproate: 25 mg q other day for 2 wk, then 25 mg/24 hr for 2 wk, then increase by 25 mg/24 hr q wk to response (max: 150 mg/24 hr).	*Caution:* Serious rashes (potentially fatal) can occur and are particularly common in children, especially if doses are increased too quickly. Slow increase in dosing is especially important for patients taking valproic acid. *Adverse events:* Dizziness, sedation, headache, agitation, exacerbation of seizures, rashes (maculopapular or erythematous eruptions), angioedema, photosensitivity, nystagmus, amblyopia, nausea, vomiting.
Lansoprazole Prevacid. Proton pump inhibitor. Capsule: 15, 30 mg. Packet: Powder for oral suspension 5 mg, 30 mg.	**Treatment of gastric or duodenal ulcer.** *Children:* 15–30 mg/24 hr. *Adults:* 15–30 mg/24 hr.	
Leucovorin Wellcovorin; generic. Tablet: 5, 15 mg. Injection.	**Antidote for folic acid antagonists (e.g., methotrexate), treatment of folate-deficient megaloblastic anemias of infancy, nutritional folate deficiency when oral folate cannot be used (reduced form of folic acid, so conversion is not necessary, replacement therapy).** *Children and adults:* Methotrexate rescue: IV: 10 mg/m^2 to start, then 10 mg/m^2 PO q 6 hr for 72 hr; increase dose to 100 mg/m^2 q 3 hr if 24 hr after methotrexate dose, serum creatinine is increased by >50%, or methotrexate serum level is $>5 \times 10^{-6}$ M (continue until level is $<1 \times 10^{-8}$ M). High-dose methotrexate rescue: IV: 100–1,000 mg/m^2 dose. Intrathecal methotrexate: IV: 12 mg/m^2 as single dose. Megaloblastic anemia of infancy: IM 3–6 mg/24 hr.	*Adverse events:* Rash, itching erythema. *Monitoring:* Plasma methotrexate levels; a leukovorin dosing nomogram is available based on methotrexate levels at various times after the dose.
Leuprolide Lupron. Injection.	**Treatment of precocious puberty, prostate cancer (decreases levels of luteinizing hormone and follicle-stimulating hormone).** 0.15–0.3 mg/kg/dose q 28 days (min: 7.5 mg) IM. SC: 20–45 μg/kg/24 hr. *Adults:* Prostate cancer: IM: 7.5 mg/dose/mo. SC: 1 mg/24 hr.	*Adverse events:* Weight gain, hot flashes, depression, nausea, vomiting, gastrointestinal bleeding, myalgia, bone pain, weakness, blurred vision, estrogenic effects.
Levothyroxine Synthroid; generic. Injection, tablet.	**Thyroid replacement therapy.** PO: *0–6 mo:* 8–10 μg/kg/24 hr. *6–12 mo:* 6–8 μg/kg/24 hr. *1–5 yr:* 5–6 μg/kg/24 hr. *6–12 yr:* 4–5 μg/kg/24 hr. *>12 yr:* 2–3 μg/kg/24 hr. *Adults:* 12.5–50 μg/24 hr (max: 200 μg/24 hr). IV, IM: 50–75% of PO dose. Myxedema coma: 200–500 μg for 1 dose. Thyroid suppression therapy: 2–6 μg/kg/24 hr for 7–10 days.	*Adverse events:* Tachycardia, cardiac arrhythmias, hypertension, nervousness, headache, insomnia, hair loss, increased appetite, weight loss, tremor, sweating.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Lidocaine Generic. Injection. Topical (alone or in combination with prilocaine [EMLA]).	**Treatment of ventricular arrhythmias, local anesthetic (class 1B antiarrhythmic, blocks initiation and conduction of impulses).** *Children and adults:* Topical: Apply to affected area (max: 3 mg/kg/dose) at least 2 hr apart. Local anesthetic injection: Doses as needed (max: 4.5 mg/kg), not closer than 2 hr apart. Arrhythmias: *Children:* Loading dose of 1 mg/kg (may repeat q 5–10 min (max: 3 mg/kg). IV: continuous infusion: 20–50 μg/kg/min (1/2 dose for liver disease or poor cardiac output). *Adults:* Loading dose of 1–1.5 mg/kg, may repeat (max: 3 mg/kg). IV: continuous infusion: 2–4 mg/min (1/2 dose for liver disease or heart failure). ET route. 2–2.5 × IV dose. Prehospital post–myocardial infarction: 300 mg IM.	*Caution:* Avoid lidocaine with epinephrine preparations for arrhythmias. *Adverse events:* Arrhythmias, heart block, lethargy, coma, seizures, nausea, vomiting, paresthesias, blurred vision, diplopia, local skin irritation or rash. *Monitoring:* Lidocaine serum levels (therapeutic 1–5 μg/mL toxic >6 μg/mL).
Liothyronine Cytomel (oral); Triostat (injection); generic.	**Replacement theraphy in hypothyroidism.** *Neonates, infants, and children <3 yr:* Congenital hypothyroidism (cretinism): PO: 5 μg/24 hr initially, then may increase 5 μg q 3 days (max: 20 μg/24 hr [50 μg/24 hr for children age 1–3 yr]). Hypothyroidism: *Children:* 5 μg/24 hr; increase by 5 μg q 1–2 wk (usual, 15–20 μg/24 hr). *Adults:* Start 5 μg/24 hr; increase by 5 μg/24 hr q 1–2 wk to 25 μg, then by 12.5–25 μg q 1–2 wk (max: 100 μg/24 hr).	*Adverse events:* Palpitations, tachycardia, hypertension, nervousness, insomnia, headache, hair loss, diarrhea, abdominal cramps, tremor, sweating. *Monitoring:* Thyroid function, T_3, thyroid-stimulating hormone.
Lithium Generic. Syrup: 300 mg/5 mL. Tablet: 300 mg. Capsule: 150, 300, 600 mg.	**Management of acute mania, bipolar disorder, and depression (alters cation exchange across cell membranes).** *Children:* 15–60 mg/kg/24 hr in 3–4 doses (start low and increase at weekly intervals). *Adolescents:* 600–1,800 mg/24 hr in 3–4 doses at regular intervals. *Adults:* 300 mg tid–qid to start; may gradually increase per blood levels (max: 2.4 g/24 hr). **May use twice-daily dosing if sustained-release product used.** *Renal impairment:* CrCl 10–50 mL/min: 50–70% of normal dose; CrCl <10 mL/min: 25–50% of normal dose.	*Adverse events:* Polydipsia, nausea, diarrhea, impaired taste, bloated feeling, weight gain, tremor, muscle twitching, weakness, fatigue, diabetes insipidus, nonspecific nephron atrophy, renal tubular acidosis, leukocytosis, vision problems, hypothyroidism, goiter, skin eruptions, acne. *Monitoring:* Serum lithium concentrations are essential to proper use of lithium, must be drawn 8–12 hr after a dose (therapeutic: acute mania 0.6–1.2 mEq/L; protection against future episodes 0.6–1 mEq/L; toxic >1.5 mEq/L; seizures >2.5 mEq/L). Watch for accumulation during salt loss and dehydration states.
Lomustine, CCNU Alkylating agent. CeeNu. Capsule: 10, 40, 100 mg.	**Treatment of various cancers (inhibits DNA and RNA synthesis).** *Children:* 75–100 mg/m^2 as single dose q 6 wk. *Adults:* 100–130 mg/m^2 as single dose q 6 wk.	*Adverse events:* Nausea, vomiting, myelosuppression (onset, 14 days, nadir, 4–5 wk; recovery, 6 wk), neurotoxicity, stomatitis, diarrhea, anemia, alopecia, hepatotoxicity, renal failure, pulmonary fibrosis (with cumulative doses >600 mg). *Monitoring:* Reduce dose if CrCl <50 mL/min or platelet and WBC counts remain low beyond 6 wk.
Loperamide Imodium; generic. Liquid: 1 mg/5 mL. Tablet: 2 mg. Capsule: 2 mg.	**Treatment of acute and chronic diarrhea (directly inhibits intestinal peristalsis).** *Children:* *2–5 yr:* 1 mg tid. *6–8 yr:* 2 mg bid. *8–12 yr:* 2 mg tid. *Adults:* 4 mg initially, then 2 mg after each loose stool (max: 16 mg/24 hr).	*Adverse events:* Sedatin, fatigue, dizziness, nausea, vomiting, constipation.
Loratadine Tablet: 10 mg. Claritin. Syrup: 1 mg/mL.	**Treatment of allergic symptoms (antihistamine, H_1-receptor antagonist).** *Children: >3 yr:* <30 kg: 5 mg/24 hr; >30 kg: 10 mg/24 hr. *Adults:* 10 mg/24 hr.	*Caution:* Prolonged Q-T intervals may occur if combined with drugs that inhibit liver enzymes; watch for drug interactions. *Adverse events:* Somnolence, fatigue, anxiety, depression, headache.
Lorazepam Ativan; generic. Injection. Tablet: 0.5, 1, 2 mg. Oral solution: 2 mg/mL.	**Treatment for anxiety, sedation, and seizures; adjunct to antiemetic therapy (benzodiazepine increases action of γ-aminobutyric acid).** Antiemetic therapy: *Children:* IV: 0.04–0.08 mg/kg/dose q 6 hr as needed. Anxiety/sedation: *Neonates:* IV: 0.1–0.4 mg/kg/dose q 4–6 hr as needed. *Infants and children:* IV: 0.05–0.1 mg/kg/dose q 4–8 hr. *Adults:* PO: 1–10 mg/24 hr in 2–3 divided doses. Insomnia: *Adults:* 2–4 mg at bedtime. Status epilepticus: *Neonates:* IV: 0.05–0.2 mg/kg/dose over 2–5 min, may repeat in 10–15 min. *Infants and children:* IV: Loading dose of 0.1 mg/kg over 2–5 min; may give additional 0.05 mg/kg bolus in 10–15 min. *Adolescents:* IV: 0.07 mg/kg/dose over 2–5 min; may repeat in 10–15 min. *Adults:* IV: 4 mg/dose over 2–5 min; may repeat in 10 min.	*Caution:* Do not discontinue abruptly after long-term use to avoid possible abstinence symptoms. *Adverse events:* Several cases of myoclonus have been reported in neonates; tachycardia, drowsiness, depression, confusion, paradoxical excitement, blurred vision, diplopia.
Magnesium citrate, citrate of magnesia Generic. Solution: 300 mL.	**Evacuation of bowel (osmotic retention of fluid and increased peristalsis).** *Children <6 yr:* 2–4 mL/kg. *Children 6–12 yr:* 100–150 mL. *>12 yr and adults:* 150–300 mL.	*Adverse events:* Hypermagnesemia, hypotension, abdominal cramps, muscle weakness, CNS depression. *Monitoring:* Toxicity related to serum magnesium levels (>3 mg/dL, depressed CNS; >5 mg/dL, somnolence and depressed deep tendon reflexes; >12 mg/dL, respiratory paralysis and heart block).
Magnesium gluconate Generic. Tablet: 500 mg.	**Magnesium replacement therapy.** *Children:* 10–20 mg/kg/dose elemental magnesium qid. *Adults:* 300 mg elemental magnesium qid.	*Adverse events:* Hypermagnesemia (see *Magnesium citrate, citrate of magnesia*). *Monitoring:* Serum magnesium concentration (normal: children, 1.5–1.9 mg/dL; adults, 2.2–2.8 mg/dL).

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Magnesium oxide Generic. Tablet: 400, 420, 500 mg. Capsule: 140 mg.		
Magnesium hydroxide, milk of magnesia Generic. Liquid, tablet.	**Short-term treatment of constipation (osmotic retention of fluid promotes peristalsis).** *Children:* <2 yr: 0.5 mL/kg/dose. 2–5 yr: 5–15 mL once daily. 6–12 yr: 15–30 mL once daily. >12 yr and adults: 30–60 mL once daily.	*Adverse events:* (see *Magnesium citrate, citrate of magnesia*).
Magnesium sulfate Generic. Granules: 40 mEq/5 g. Injection: 50% solution.	**Treatment of hypomagnesemia and seizures associated with acute nephritis in children; also used as a cathartic (cofactor for many enzymes in the body and important in calcium and potassium hemostasis).** Hypomagnesemia: *Neonates:* IV: 25–50 mg/kg/dose q 8 hr for 2–3 doses. *Children:* PO: 100–200 mg/kg/dose qid. IM, IV: 25–50 mg/kg/dose q 6 hr for 3–4 doses. *Adults:* PO: 3 g q 6 hr for 4 doses. IM, IV: 1 g q 6 hr for 4 doses. Daily maintenance magnesium: *Neonates, infants, and children:* IV: 30–60 mg/kg/24 hr. *Adolescents:* IV: 42–54 mg/kg/24 hr. *Adults:* IV: 0.5–3 g/24 hr. Infuse IV doses over 2–4 hr (max: 125 mg/kg/hr). Management of seizures and hypertension: *Children:* IM, IV: 20–100 mg/kg/dose q 4–6 hr as needed. Cathartic: *Children:* PO: 0.25 g/kg/dose. *Adults:* PO: 10–30 g	*Caution:* Magnesium may accumulate to toxic levels in renal insufficiency. *Adverse events:* (see *Magnesium citrate, citrate of magnesia*).
Manganese Injection: 0.1 mg/mL.	**Trace element added to parenteral nutrition (cofactor in many enzyme systems).** *Infants:* 2–10 μg/kg/24 hr in total parenteral nutrition solutions. *Adults:* 150–180 μg/24 hr in total parenteral nutrition solutions.	*Monitoring:* Reference manganese plasma level is 4–14 μg/L.
Mannitol Generic. Injection.	**Promotion of diuresis, reduction of increased intracranial pressure.** *Children and adults:* IV: 200 mg/kg test dose; initial, 0.5–1 g/kg; maintenance, 0.25–0.5 g/kg q 4–6 hr	*Adverse events:* Circulatory overload, congestive heart failure, headache, chills, seizures, fluid and electrolyte imbalance. *Monitoring:* After test dose, evaluate urine output of at least 1 mL/kg/hr (children) or 30–50 mL/hr (adults) for 2–3 hr; for increased intracranial pressure, maintain serum osmolality 310–320 mOsm/kg.
Mechlorethamine, nitrogen mustard **Alkylating agent.** Mustargen Hydrochloride. Injection.	**Cancer chemotherapy (inhibits DNA and RNA synthesis).** *Children:* IV: As part of MOPP regimen, 6 mg/m^2 on days 1 and 8 of 28 day regimen. *Adults:* IV: 0.4 mg/kg (12–16 mg/m^2) as single monthly dose.	*Caution:* Extravasation should be treated promptly with sterile sodium thiosulfate (1/6 M) and apply cold compress for 6–12 hr. *Adverse events:* Nausea, vomiting, diarrhea, severe myelosuppression (onset, 4–7 days; nadir, 14 days, recovery, 21 days), ototoxicity, precipitation of herpes zoster, alopecia, hyperuricemia.
Meclizine Generic. Tablet, capsule.	**Prevention and treatment of motion sickness and treatment of vertigo (anticholinergic and CNS depressant effects).** *Children and adults:* PO: 25–50 mg 1 hr before travel for motion sickness; 25–100 mg/24 hr in divided doses for vertigo.	*Adverse events:* Drowsiness, headache, fatigue, dry mouth, increased appetite, weight gain.
Medium chain triglycerides MCT Oil. Oil: 14 g/15 mL.	**Dietary supplement for those who cannot digest long-chain fats, ketogenic diet for seizure disorders (nutritional supplement).** *Infants:* 0.5 mL q other feed; may advance by 0.5 mL q 2–3 days as tolerated. *Children:* Ketogenic diet for seizures: 50–70% of total calories (usually about 40 mL with each meal). Cystic fibrosis: 1 tbs tid. *Adults:* 15 mL tid–qid.	*Adverse events:* Nausea, vomiting, abdominal pain, ketosis.
Medrysone HMS Liquifilm. Ophthalmic solution.	**Treatment of conjunctivitis (inhibits inflammatory response).** *Children and adults:* Ophthalmic: Instill 1 drop in conjunctival sac bid–qid (may use q 1–2 hr for 1–2 days).	*Adverse events:* Local stinging and burning, increased intraocular pressure, cataracts.
Melphalan Alkeran Alkylating agent. Injection. Tablet: 2 mg.	**Cancer chemotherapy (inhibits DNA and RNA synthesis).** *Children:* IV: 10–35 mg/m^2 dose q 21–28 days; high dose: 140–220 mg/m^2 before bone marrow transplantation. PO: 4–20 mg/m^2/24 hr for 1–21 days. *Adults:* IV: 16 mg/m^2 dose q 2 wk for 4 doses monthly. PO: 0.15 mg/kg/24 hr for 7 days or 0.25 mg/kg/24 hr for 4 days; repeat q 4–6 wk.	*Adverse evens:* Myelosuppression (onset, 7 days; nadir, 8–10 days and 27–32 days; recovery, 42–50 days), secondary malignancy, alopecia, vesiculation of skin, syndrome of inappropriate secretion of antidiuretic hormone, nausea, vomiting, diarrhea, stomatitis, hemorrhagic cystitis, pulmonary fibrosis, interstitial pneumonitis, vasculitis.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Meperidine Generic. Injection, syrup: 50 mg/5 mL. Tablet: 50, 100 mg.	**Narcotic analgesic, adjunct to anesthesia (binds to opiate receptors in CNS).** *Children:* IM, IV, SC: 1–1.5 q 3–4 hr. *Adults:* IM, IV, SC: 50–100 mg/dose q 3–4 hr as needed (equipotent oral dose is 3× IV dose).	*Caution:* Scheduled use may result in metabolite accumulation and diminished renal function, which may lead to CNS stimulation or seizures. *Adverse events:* Hypotension, weakness, tiredness, headache, anorexia, stomach cramps, hallucination, paradoxical excitation, seizures, physical and psychologic dependence. *Comment:* Equianalgesic dose to morphine 10 mg IV is meperidine 100 mg IV or IM, or 300 mg PO.
Mephenytoin Mesantoin. Tablet: 100 mg.	**Treatment of tonic-clonic and partial seizures (decreases sodium ion influx across cell membranes).** *Children:* 3–15 mg/kg/24 hr in 3 divided doses. *Adults:* Start 50–100 mg/24 hr; then increase weekly by 50–100 mg (max: 800 mg/24 hr).	*Adverse events:* Drowsiness, slurred speech, psychiatric changes, confusion, nausea, vomiting, constipation, leukopenia, hepatitis, blurred vision, nystagmus, photophobia, lymphadenopathy. *Monitoring:* Total mephenytoin level (25–40 μg/mL).
Mephobarbital Mebaral. Tablets: 32, 50, 100 mg.	**Sedative, treatment of epilepsy (increases seizure threshold).** *Children:* 4–10 mg/kg/24 hr in 2–4 doses. *Adults:* 200–600 mg/24 hr in 2–4 doses.	*Adverse events:* Drowsiness, lethargy, confusion, mental depression, paradoxical excitement, psychologic and physical dependence, constipation, nausea, vomiting. *Monitoring:* Phenobarbital concentrations (therapeutic 10–40 μg/mL).
Mercaptopurine Purinethol. Injection, tablet. Extemporaneous formulations may be prepared.	**Treatment of leukemias and non-Hodgkin lymphoma (antimetabolite, blocks purine synthesis).** *Children:* PO: Induction: 2.5–5 mg/kg once daily; maintenance: 1.5–2.5 mg/kg/24 hr. IV: Continuous infusion: 50 mg/m^2/hr for 24–48 hr. *Adults:* PO: Induction: 2.5–5 mg/kg once daily; maintenance: 1.5–2.5 mg/kg/24 hr. Renal function: Crcl < 50 mL/min: Dose q 48 hr.	*Adverse events:* Hepatotoxicity (cholestasis and necrosis), nausea, anorexia, vomiting, diarrhea, stomach pain, stomatitis, mucositis, rash, hyperpigmentation, myelosuppression (onset, 7–10 days; nadir, 14 days; recovery, 21 days), renal toxicity, hyperuricemia, eosinophilia, drug fever.
Mesna Mesnex. Injection: 100 mg/mL.	**Protects against hemorrhagic cystitis from ifosamide and cyclophosphamide therapy (binds and detoxifies urotoxic metabolites via active sulfhydryl group).** *Children and adults:* IV: 20% w/w of ifosfamide or cyclophosphamide dose started 15 min before alkylating agent dose. Repeat mesna dose 3, 6, 9, and 12 hr after alkylating agent dose. PO: 40% w/w of alkylating agent in 3 doses 4 hr apart.	*Adverse events:* Hypotension, headache, nausea vomiting, bad taste in mouth, limb pain. *Monitoring:* Urinalysis.
Metaproterenol, orciprenaline Alupent; Metaprel; generic. Metered-dose inhaler (MDI). Inhalation solution. Tablet: 10, 20 mg. Syrup: 10 mg/5 mL.	**Bronchodilator (stimulates β_2 receptors).** *Children:* PO: *<2 yr:* 0.4 mg/kg/dose tid–qid. *2–6 yr:* 1.3–2.6 mg/kg/24 hr divided q 6 hr. *6–9 yr:* 10 mg/dose qid. *>9 yr and adults:* 20 mg/dose tid–qid. MDI: 2–3 puffs q 4 hr. Nebulizer: *Infants and children:* 0.01–0.02 mL/kg of 5% solution q 4–6 hr. *Adolescents and adults:* 0.3 mL of 5% solution q 4–6 hr.	*Caution:* Some generic nebulizer solutions contain sulfites that may exacerbate asthma. *Adverse events:* Tremor, nervousness, overactivity, tachycardia, hypotension, headache. *Comment:* Dilute nebulizer solution in 2.5 mL normal saline.
Metformin Glucophage. Tablet: 500, 850, 1,000 mg.	**Treatment of type 2 diabetes; increases insulin sensitivity and improves glucose tolerance; hypoglycemic effect.** *Children 10–16 yr:* Start with 500 mg bid with meals; increase in 500 mg increments weekly to response (max: 2,000 mg/24 hr). *Adults:* Start with 850 mg q 24 hr or 500 mg bid; titrate by 500 mg once 1×/wk or 850 mg q 2 wk to response (max: 2550 mg/24 hr).	*Caution:* Avoid use if creatinine clearance <60 mL/min, serum creatinine >1.5 mg/dL (males) or >1.4 mg/dL (females). Monitor for lactic acidosis. Discontinue for any process that may predispose to metabolic acidosis or renal dysfunction until the situation is resolved. Avoid alcohol. *Adverse events:* Nausea, vomiting, diarrhea, indigestion, flatulence.
Methadone Dolophine; generic. Injection: 10 mg/mL. Tablet: 5, 10 mg. Oral solution: 5 mg/mL.	**Management of severe pain, narcotic detoxification (binds to opiate receptors in CNS).** *Neonates (abstinence syndrome):* 0.05–0.2 mg/kg/dose q 12 hr; then adjust or taper based on abstinence scores. *Children:* Analgesia: IV, IM, PO: 0.1 mg/kg/dose q 4 hr for 2–3 doses, then q 6–12 hr as needed. *Narcotic abstinence:* Start 0.05–0.1 mg/kg/dose q 6 hr and taper per abstinence scores. *Adults:* IV, IM, SC, PO. Analgesia: 2.5–20 mg q 6–8 hr. Detoxification: 15–40 mg/24 hr.	*Adverse events:* Weakness, drowsiness, dizziness, nausea, vomiting, constipation, ileus. *Monitoring:* Methadone accumulates with repeated doses, and patients should be monitored for excess CNS depression.
Methimazole Tapazole. Tablet: 5, 10 mg.	**Treatment of hyperthyroidism (blocks iodine synthesis in thyroid gland, inhibits synthesis of thyroid hormone).** *Children:* Start 0.4 mg/kg/24 hr, then maintenance 0.2 mg/kg/24 hr. *Adults:* Start 5 mg/kg q 8 hr; maintenance dose: 5–15 mg/24 hr (max: 60 mg/24 hr).	*Adverse events:* Fever, rash, leukopenia, agranulocytosis, systemic lupus erythematosus–like syndrome, nausea, vomiting, stomach pain, loss of taste, cholestatic jaundice, constipation, weight gain. *Monitoring:* Thyroid function tests for hypothyroidism or hyperthyroidism.
Methocarbamol Robaxin, generic. Injection: 100 mg/mL. Tablet: 500, 750 mg.	**Treatment of muscle spasm (skeletal muscle relaxant through CNS depressive effects).** *Children:* Treatment of tetanus: IV: 15 mg/kg/dose q 6 hr for 3 days only. *Adults:* IV: 1–2 g q 6 hr. PO: 1.5 g tid–qid for 2–3 days, then decrease to 4–4.5 g/24 hr.	*Adverse events:* Syncope, bradycardia, hypotension, drowsiness, dizziness, headache, nausea, metallic taste.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Methohexital Brevital. Injection.	**Induction and maintenance of general anesthesia (ultra–short-acting barbiturate).** *Children:* IM: Preoperative: 5–10 mg/kg/dose. IV: Induction dose of 1–2 mg/kg/dose. Rectal: 20–35 mg/kg/dose. *Adults:* IV: Induction dose of 50–120 mg, then 20–40 mg q 4–7 min.	*Adverse events:* Apnea, respiratory depression, hiccups, laryngospasm, hypotension, skeletal muscle twitching and rigidity, tremor, seizures, headache, nausea, vomiting.
Methotrexate Generic. Injection. Tablet: 2.5 mg.	**Treatment of neoplasms, psoriasis, rheumatoid arthritis (antimetabolite, inhibition of DNA and purine synthesis).** *Children:* Juvenile rheumatoid arthritis: PO, IM: 5–15 mg/m^2/wk as a single dose. Antineoplastic: PO, IM: 7.5–30 mg/m^2 q 1–2 wk. IV: 10–33 g/m^2 bolus dose or infused over 6–42 hr. *Adults:* Rheumatoid arthritis: PO: 7.5 mg 1× wk. Psoriasis: PO, IM: 10–25 mg/dose 1×/wk. Antineoplastic: PO, IM, IV: 25–50 mg/m^2/wk. Decreased renal function: CrCl 61–80 mL/min: Reduce dose by 25%. CrCl 51–60 mL/min: Reduce dose by 33%. CrCl 10–50 mL/min: Reduce dose by 50–70%.	*Caution:* Avoid in patients with severe renal or hepatic dysfunction. *Adverse events:* Hepatotoxicity, nephropathy, vasculitis, malaise, fatigue, encephalopathy, headache, seizures, chills, fever, cystitis, stomatitis, enteritis, nausea, vomiting, diarrhea, alopecia, photosensitivity, increase or decrease in skin pigmentation, urticaria, arthralgia, hyperuricemia myelosuppression (onset, 7 days; nadir, 10 days; recovery, 21 days). *Monitoring:* Methotrexate concentrations (toxic if >1 × 10^{-7} mol/L for >40 hr). Ensure adequate hydration and urinary alkalinization.
Methsuximide Celontin. Capsule: 150, 300 mg.	**Control of absence seizures and adjunct in partial complex seizure management (increases seizure threshold, suppresses nerve transmission).** *Children:* 10–15 mg/kg/14 hr divided in 3–4 doses; may increase at weekly intervals (max: 30 mg/kg/24 hr). *Adults:* Start 300 mg/24 hr; may increase by 300 mg/24 hr at weekly intervals (max: 1,200 mg/24 hr).	*Adverse events:* Dizziness, drowsiness, lethargy, headache, ataxia, aggressiveness, depression, anorexia, nausea, vomiting, hiccups, agranulocytosis, aplastic anemia, leukopenia, thrombocytopenia. *Monitoring:* Methsuximide concentrations (therapeutic 10–40 μg/mL, toxic >4 μg/mL).
Methyldopa Aldomet, generic. Injection: 50 mg/mL. Tablet: 125, 250, 500 mg. Oral suspension: 250 mg/5 mL.	**Treatment of hypertension (false α neurotransmitter metabolite stimulates inhibitory α-adrenergic receptors).** *Children:* PO: Start 10 mg/kg in 2–4 doses; may increase q 2 days (max: 65 mg/kg/24 hr or 3 g/24 hr). IV: Start 2–4 mg/kg/dose; may increase to 5–10 mg/kg/dose per response (max: 65 mg/kg/24 hr). *Adults:* PO: Start 250 mg tid; may increase (max 3 g/24 hr). IV: 0.25–1 g q 6 hr (max: 4 g/24 hr).	*Caution:* Tolerance to effects occurs, so chronic use requires concurrent diuretic. *Adverse events:* Drowsiness, mental depression, headache, dry mouth, fever, chills, vertigo, fluid retention, edema, hepatocellular injury, cholestatic liver disease, cirrhosis, pancreatitis, nausea, vomiting, diarrhea, hemolytic anemia, positive Coombs test, leukopenia, thrombocytopenia, paresthesias, weakness, hypotension, bradycardia. *Monitoring:* Blood pressure, liver enzymes, direct Coombs test.
Methylene blue Urolene Blue. Injection: 10 mg/mL. Tablet: 65 mg	**Antidote for cyanide poisoning and drug-induced methemoglobinemia (promotes conversion of methemoglobin to hemoglobin; combines with cyanide to form cyan-methemoglobin).** *Children and adults:* Methemoglobinemia: IV: 1–2 mg/kg; may repeat after 1 hr if needed. Nicotinamide-adenine dinucleotide phosphate–methemoglobin reductase deficiency: PO: 1–1.5 mg/kg/24 hr (given with 5–8 mg/kg/24 hr of ascorbic acid).	*Caution:* Avoid in glucose-6-phosphate dehydrogenase deficiency and renal insufficiency. *Adverse events:* Urine and feces turn blue-green; anemia.
Methylphenidate Ritalin; generic. Tablet 5, 10, 20 mg. Tablet, sustained-release: 20 mg.	**Attention deficit disorder (ADD), narcolepsy, adjunct for pain management (CNS stimulant).** *Children > 5 yr:* 0.3–0.6 mg/kg/dose (max: 2 mg/kg/24 hr). *Adults:* 10 mg bid–tid (max: 60 mg/24 hr).	*Cautions:* Avoid in patients with motor tics, Tourette syndrome, or marked agitation or psychosis. May become addictive if used in high doses at frequent intervals. *Adverse events:* Nervousness, insomnia, agitation, anorexia, weight loss, tachycardia, movement disorders, tics, growth retardation (controversial and minimal, if real), addiction (not a concern with typical ADD dosing).
Methylprednisolone Anti-inflammatory and immunosuppressant glucocorticoid. Depo-Medrol (injection, IM); Medrol (tablets); Solu-Medrol (injection); generic. Topical ointment.	**Used in allergic, inflammatory, and neoplastic disorders and acute spinal cord injury.** *Children:* Anti-inflammatory and immunosuppressant: PO, IM, IV: 0.5–2 mg/kg/24 hr divided q 6–12 hr. Lupus nephritis: IV: 30 mg/kg q other day for 6 doses. Acute spinal cord injury: 30 mg/kg over 15 min, followed in 45 min by continuous infusion of 5.4 mg/kg/hr for 23 hr. PO: 2–60 mg/24 hr in 1–4 doses. IV: 40–250 mg q 4–6 hr. IM: 10–80 mg/24 hr.	*Caution:* Avoid if live virus vaccine is given or if tuberculosis or fungal infection is present. *Advers events:* Hpertension, edema, nervousness, agitation, psychosis, pseudomotor cerebri, headache, mood swings, delirium, euphoria, hyperglycemia, hypokalemia, alkalosis, HPA-axis (adrenal) suppression, Cushing syndrome, skin atrophy, bruising, hyperpigmentation, peptic ulcer disease, muscle weakness, bone loss, joint pain, growth retardation, cataracts, glaucoma, immunosuppression. *Comment:* See comparison of corticosteroids under *Hydrocortisone*.
Metoclopramide Reglan, generic. Injection. 5 mg/mL. Tablet: 5, 10 mg. Oral solution: 10 mg/mL. Syrup: 5 mg/5 mL.	**Treatment of diabetic gastroparesis, gastroesophageal reflux, and nausea associated with chemotherapy and surgery (blocks dopamine receptors in chemoreceptor trigger zone, enhances gastrointestinal motility and gastroduodenal sphincter tone).** *Neonates, infants, and children:* Gastroesophageal reflux: IV, PO: 0.033–0.1 mg/kg/dose q 8 hr. *Children:* Postoperative antiemetic: IV: 0.1–0.2 mg/kg/dose q 6–8 hr as needed.	*Cautions:* May precipitate seizures, cause acute dystonic reactions, and worsen asthma (if sulfite-containing formulation). In elderly, chronic use is associated with increased risk and earlier onset of Parkinson disease (pediatric studies lacking). *Adverse events:* Weakness, drowsiness, diarrhea, prolactin stimulation, breast, prolactin stimulation, breast tenderness, extrapyramidal reaction; IV administration associated with an intense feeling of anxiety and restlessness, followed by drowsiness.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
	Chemotherapy antiemetic: PO, IV: 1–2 mg/kg/dose q 2–4 hr (pretreat with diphenhydramine to avoid extrapyramidal reactions). *Adults:* Antiemetic: PO, IV: 1–2 mg/kg/dose q 2–4 hr. Gastroesophageal reflux: PO: 10–15 mg qid. Renal dysfunction: Decrease dose.	*Comment:* Administer oral doses 30 min before meals and at bedtime. *Monitoring:* Creatinine clearance: CrCl 40–50 mL/min: give 75% of recommended dose; CrCl < 40 mL/min: give 50% of recommended dose; CrCl < 10 mL/min: give 25% of recommended dose.
Metolazone Mykrox; Zaroxolyn. Tablet.	**Treatment of fluid overload states (diuresis; inhibits sodium reabsorption at distal tubules).** *Children:* 0.2–0.4 mg/kg/24 hr in 1–2 doses. *Adults:* 2.5–20 mg/24 hr.	*Adverse events:* Fluid and electrolyte imbalance, hyperglycemia, hypocalcemia, hypomagnesemia, nausea, vomiting, blood dyscrasias.
Metoprolol Lopressor. Injection: 1 mg/mL. Tablet: 50, 100 mg.	**Treatment of hypertension, tachyarrhythmias, idiopathic hypertrophic subaortic stenosis, migraine prophylaxis (selective blocker of β_1 receptors).** *Children:* PO: 1–5 mg/kg/24 hr. *Adults:* PO: 100–450 mg/24 hr in 2–3 doses. IV: 5 mg q 2 min for 3 doses.	*Adverse events:* Mental depression, tiredness, weakness, bradycardia, reduced peripheral circulation; insomnia, nightmares, worsens diabetes mellitus, worsens asthma.
Mexiletine Mexitil; generic. Capsule: 150, 200, 250 mg. Extemporaneous formulations may be prepared.	**Treatment of ventricular arrhythmias, neuropathic pain (class 1B antiarrhythmic).** *Children:* 1.4–5 g/kg/dose q 8 hr. *Adults:* 200 mg q 8 hr (max: 1,200 mg/24 hr). Renal dysfunction: CrCl < 10 mL/min: Give 50% of dose.	*Adverse events:* Atrial and ventricular arrhythmias, bradycardia, hypotension, confusion, dizziness, nervousness, tremor, ataxia, numbness of fingers or toes, weakness, blurred vision, tinnitus, increased liver enzymes, gastrointestinal discomfort. *Monitoring:* Mexiletine concentrations: therapeutic 0.5–2 μg/mL, toxic > 2 μg/mL.
Midazolam Versed. Injection: 1, 5 mg/mL. Extemporaneous formulations may be prepared.	**Sedation, anticonvulsant (benzodiazepine, increase γ-aminobutyric acid).** *Neonates:* IV: Continuous infusion 0.15–0.5 μg/kg/min for sedation, IV bolus 0.05–0.15 mg/kg q 2–4 hr. *Infants and children:* Status epilepticus: IV: loading dose of 0.15 mg/kg followed by continuous infusion of 1 μg/kg/min. Sedation: IV: loading dose of 0.05–0.2 mg/kg, then either same dose q 1–2 hr or continuous infusion of 1–2 μg/kg/min. Intranasal: 2.5 mg (0.5 mL) in each naris (total, 5 mg) using 5 mg/mL injection. *>12 yr:* 0.5 mg q 3–4 min to effect. *Adults:* 0.5–2 mg q 2 min to effect (usually 2–5 mg).	*Adverse events:* Several cases of myoclonus and prolonged movement disorders have been reported in neonates treated with midazolam. Withdrawal reactions may occur with abrupt discontinuation. Sedation, amnesia, paradoxical excitation, blurred vision, diplopia, nasal burning, apnea, respiratory depression.
Mitomycin Alkylating agent. Mutamycin. Injection.	**Cancer chemotherapy (antibiotic-type alkylating agent inhibits DNA and RNA synthesis).** *Children and adults:* Depends on protocol; typically IV 3 mg/m^2/24 hr for 5 days q 4–6 wk; up to 40–50 mg/m^2 in a single dose for bone marrow transplant.	*Adverse events:* Nausea, vomiting, myelosuppression (onset, 21 days; nadir, 36 days; recovery, 42–56 days), tingling of extremities, paresthesias, alopecia, fingernail discoloration, mouth ulcers, cardiac failure (doses > 30 mg), interstitial pneumonitis, pulmonary fibrosis.
Mitoxantrone, DHAD Novantrone. Injection.	**Cancer chemotherapy (anthracycline analog inhibits DNA and RNA synthesis throughout entire cell cycle).** Acute nonlymphocytic leukemias: *Children < 2 yr:* 0.4 mg/kg/24 hr for 3–5 days. *> 2 yr and adults:* 8–12 mg/m^2/24 hr for 5 days. Solid tumors: *Children:* 18–20 mg/m^2 q 3–4 wk or 5–8 mg/m^2 weekly. *Adults:* 12–14 mg/m^2 q 3–4 wk (max: total 80–120 mg/m^2).	*Adverse events:* Cardiotoxicity (less than with other anthracyclines), seizures, headache, fever, elevated liver enzymes, renal failure, conjunctivitis, myelosuppression (onset, 7–10 days; nadir, 14 days; recovery, 21 days).
Molindone hydrochloride Moban. Tablet: 5, 10, 25, 100 mg. Oral concentrate: 20 mg/mL.	**Management of psychotic disorder (actions similar to chlorpromazine, but with extrapyramidal effects and less sedation).** *Children:* *3–5 yr:* 1–2.5 mg/kg/24 yr in 4 doses. *5–12 yr:* 0.5–1 mg/kg/24 hr in 4 doses. *Adults:* 50–225 mg/24 hr.	*Adverse events:* Extrapyramidal effects, akathisia, dyskinesias, constipation, blurred vision, orthostatic hypotension, seizures, neuroleptic malignant syndrome, dry mouth, weight again, galactorrhea, urinary retention, agranulocytosis, leukopenia, retinal pigmentation.
Montelukast Singulair. Leukotriene receptor blocker. Tablet: 10 mg. Tablets chewable: 4.5 mg.	**Prophylaxis and chronic treatment of asthma (leukotriene receptor blocker for LTD_4).** *Children 2–5 yr:* 4 mg once-daily in the evening. *Children: 6–14 yr:* 5 mg once daily in the evening. *>15 yr and adults:* 10 mg once daily in the evening.	*Adverse events:* Headache, dizziness, dyspepsia, fatigue, elevated liver enzymes.
Morphine Narcotic analgesic. Generic. Injection, oral solution, suppository. Tablet. Tablet, sustained-release. Tablet, controlled-release.	**Relief of moderate to severe pain.** *Neonates:* IV, IM, SC: Analgesia: 0.05–0.2 mg/kg/dose q 2–4 hr; continuous infusion of 0.025–0.05 mg/kg/hr. *Infants and children:* IV, IM, SC: 0.1–0.2 mg/kg/dose q 2–4 hr; PO: 0.2–0.5 mg/kg/dose q 4–6 hr. *Adolescents > 12 yr:* IV: 3–4 mg; may repeat in 5 min if needed. *Adults:* PO: 10–30 mg q 4 hr or controlled-release tablet 15–30 mg q 8–12 hr. IV, IM, SC: 2.5–20 mg/dose q 2–6 hr as needed or continuous infusion of 0.8–10 mg/hr.	*Cautions:* Physical dependence may develop after >5–7 days continuous use, if so, taper dose. Some preparations contain sulfites. *Adverse events:* Hypotension, bradcardia, nausea, vomiting, constipation, sedation, confusion, decreased urination, respiratory depression.
Mupirocin Bactroban. Ointment: 2%.	**Topical treatment of impetigo and other gram-positive skin infections (inhibits bacterial protein and RNA synthesis).** *Children and adults:* Apply to affected area 4–5 times daily. Intranasal (eliminate nasal carriage of *Staphylococcus aureus*): Apply small amount bid–qid for 5–14 days.	*Adverse events:* Stinging and irritation at application site.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Muromonab-CD3, OKT3 Orthoclone OKT3. Injection: 5 mg/5 mL.	**Treatment of acute allograft rejection in renal transplant (coats circulating T lymphocytes, facilitating their opsonization by the reticuloendothelial system and promotes removal of all CD3 molecules from T-lymphocyte antigen receptor complex).** *Children <12 yr:* 0.1 mg/kg/24 hr for 10–14 days, or if < 30 kg, give 2.5 mg/24 hr for 10–14 days. *>12 yr and adults:* 5 mg/24 hr for 10–14 days.	*Cautions:* Severe first-dose reactions may occur; give methylprednisolone 1 mg/kg IV 2–6 hr before first OKT3 dose and hydrocortisone 100 mg IV 30 min after each OKT3 dose and as needed. *Adverse events:* Shortness of breath, pulmonary edema, fever, chills, trembling, nausea, vomiting, diarrhea, headache, stiff neck, photophobia, flu-like symptoms. *Monitoring:* OKT3 serum trough levels (if maintained near 1 μg/mL, then CD3 counts remain low).
Mycophenolate mofetil CellCept. Capsule: 250 mg.	**Prevents rejection of allograph transplants, used in conjunction with other drugs (active metabolite MPA inhibits T- and B-cell proliferation, T-cell generation, and antibody secretion).** *Children:* 660 mg/m²/dose bid. *Adults:* 1,000 mg/dose bid.	*Adverse events:* Hypertension, insomnia, dizziness, fever, headache, bone marrow suppression, tremor, back pain, myalgia, dyspnea, cough, pharyngitis, hematuria, renal tubular necrosis, lymphoproliferative disease.
Nadolol Nonselective β-adrenergic receptor antagonist. Corgard. Tablet: 20, 40, 80, 120, 160 mg.	**Antiarrhythmic, antihypertensive, and migraine prophylaxis.** *Children:* PO: 0.5–2.5 mg/kg daily for supraventricular tachycardia. *Adults:* 40 mg daily; titrate upward to desired effect (usual dose 40–80 mg/24 hr up to 640 mg/24 hr).	*Cautions:* Do not use in patients with asthma, bronchoconstriction, or uncontrolled heart failure. Adjust dose with renal dysfunction (CrCl < 50 mL/min). *Adverse effects:* Bradycardia, heart failure, bronchospasm. *Drug interactions:* Other hypotensive drugs, diuretics. Antagonizes β-sympathomimetic drugs (e.g. albuterol).
Nalbuphine Nubain. Injection. IM, IV, SQ: 10 mg/mL.	**Analgesic (opiate agonist with partial opiate antagonistic activity for treatment of moderate to severe pain).** *Children ≥ 1 yr:* IV, IM, SC: 0.1–0.2 mg/kg q 3–4 hr. Maximum single dose: 20 mg; maximum daily dose: 160 mg.	*Cautions:* Like most opiate analgesics, may stimulate histamine release and cause CNS and respiratory depression. Use with caution in hepatic disease or with other respiratory depressants. Dependence potential. *Adverse effects:* Hypotension, sedation, respiratory depression.
Naloxone Opiate antagonist. Narcan; generic. Injection: 0.4 mg/mL. Injection, neonate: 0.02 mg/mL.	**Antagonizes all opiate receptors; used in the treatment of opiate excess (overdose, poisoning).** *Neonates and children:* IV: 0.1 mg/kg (max: 2 mg). If no response, repeat q 2–3 min until desired effect. May give by continuous IV infusion.	Naloxone reverse effects. *Cautions:* May precipitate acute opiate withdrawal. Duration of effect of many opiates may be longer than that or naloxone, requiring individualized naloxone dosing. Administer via IV push.
Naproxen Nonsteroidal anti-inflammatory drug. Aleve; Anaprox; Naprosyn; generic. Tablet: 220, 250, 275, 375, 550 mg. Suspension: 125 mg/5 mL.	**Treatment of mild to moderate pain, inflammation, fever (inhibits prostaglandin synthesis).** *Neonates:* Do not use owing to probable negative effects on renal function. *Children:* PO: 5–7 mg/kg q 8–12 hr. *Adults:* PO: 250–375 mg q 8–12 hr (max: 1,250 mg/24 hr).	*Cautions:* Gastrointestinal upset or irritation, reversible interference with platelet aggregation. Do not administer to infants < 3 mo of age. *Adverse effects:* Dizziness, gastrointestinal irritation, rash, age-related decreased renal function.
Nedocromil Mast cell stabilizer. Tilade. Aerosol: 1.75 mg/activation.	**Chronic treatment of asthma and allergic disorders. Stabilizes other cells to mediator release: neutrophils, eosinophils, platelets; nonsteroidal.** *Children and adults:* 1–2 puffs bid–qid. Dose titrated to clinical response.	*Cautions:* Only effective as chronic therapy. Produces no bronchodilatation. *Adverse effects:* Dysphonia, chest irritation and pain.
Neostigmine Prostigmin; generic. Tablet: 15 mg (as bromide). Injection: 0.25, 0.5, 1 mg/mL (as methylsulfate).	**Treatment of myasthenia gravis, reversal of nondepolarizing neuromuscular blocking agents (NDNM). Competitively inhibits acetylcholine esterase–augmenting effects of endogenous acetylcholine.** *Children:* IV, IM, SC: 0.01–0.04 mg/kg q 2–4 hr; titrate dose to desired effect. To reverse NDNM, 0.025–1 mg/kg/dose (max adult dose: 5 mg).	*Cautions:* Patients with asthma or bronchospasm, bradycardia. Does not antagonize succinylcholine. *Adverse effects:* Bradycardia, abdominal cramps, urinary frequency.
Niacin Nicobid; generic. Tablet: 25, 50, 100, 250, 500 mg. Tablet, timed-release: 150, 250, 500, 750 mg. Capsule, timed-release: 125, 250, 300, 400, 500 mg. Elixir: 50 mg/5 mL. Injection: 100 mg/mL.	**Vitamin supplementation (vitamin B_3), hyperlipidemia, vasodilator.** *Children:* IV, IM, SC, PO: Titrated to desired effect (max: 10 mg/kg/24 hr).	*Cautions:* Titrate dose upward and administer IV slowly to avoid or minimize flushing. *Adverse effects:* Flushing, tachycardia, dizziness, hyperuricemia. *Drug interactions:* Augments hypotensive effects of antihypertensives.
Nifedipine Adalat; Procardia; generic. Capsule (liquid-filled): 10, 20 mg. Capsule, timed-release: 30, 60, 90 mg. Tablet, timed-release: 30, 60, 90 mg.	**Antihypertensive, antiarrhythmic calcium channel antagonist.** *Infants and children:* Hypertensive emergency PO/sublingual 0.25–0.5 mg/kg/dose q 4–6 hr (max: 10 mg). Hypertropic cardiomyopathy: PO: 0.2–0.3 mg/kg q 8 hr. *Adults:* 10 mg/dose titrated to effect (max: 120–180 mg/24 hr).	*Caution:* Do not crush or break timed-release tablet. *Adverse effects:* Profound, acute hypotension, flushing, dizziness. More rapid effect if drug is administered without food. Concurrent grapefruit juice may increase bioavailability and effects. *Drug interactions:* Cimetidine, cyclosporine, phenytoin, and possibly digoxin. *Comment:* Preferred route is oral, not sublingual. Clinical effects due to swallowing. Capsule content approximates 10 mg in 0.34 mL and 20 mg in 0.45 mL.
Nitroprusside Nipride; generic. Injection: 10, 25 mg/mL.	**Antihypertensive, congestive heart failure: controlled, titratable blood pressure control.** *Children and adults:* IV 0.3–0.5 μg/kg/min; titrate dose to desired effect; rarely requires >6 μg/kg/min (probable max: 8 μg/kg/min).	*Cautions:* Metabolized to thiocyanate/cyanide, which accumulates with renal dysfunction. *Adverse effects:* Profound hypotension, tachycardia, thyroid suppression, acidosis, seizures. Cyanide toxicity—metabolic acidosis, pink skin, methemoglobinemia. Administer by continuous IV infusion. Protect solution from direct light. Thiosulfate co-administration prevents toxicity (10 mg thiosulfate for each 1 mg nitroprusside).

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Norepinephrine bitartrate Sympathomimetic/adrenergic agonist. Levophed. Injection: 1 mg/mL base.	**Hypotension and shock.** *Children:* 0.05–0.1 μg/kg/min; titrate dose to desired effect (max: 2 μg/kg/min).	*Cautions:* Extravasation may cause severe tissue necrosis. Administer into large vein by continuous IV infusion. Ensure patient fluid status. May cause profound vasoconstriction. *Adverse effects:* Hypertension, cardiac arrhythmias, headache. Drug dose based on norepinephrine base.
Nortriptyline Tricyclic antidepressant; central synaptic norepinephinct serotomin inhibitor. Aventyl; Pamelor; generic. Capsule: 10, 25, 50, 75 mg. Solution: 10 mg/5 mL.	**Treatment of nocturnal enuresis depression.** *Children:* Nocturnal enuresis: PO: 10–20 mg/24 hr; titrate upward (max: 40 mg/24 hr). Depression: PO: 1–3 mg/kg/24 hr (bedtime) titrated to effect. May give in divided doses q 6 hr (usual max: 150 mg/24 hr).	*Cautions:* Avoid in patients with cardiac conduction abnormalities, cardiac disease. Slow dose adjustment in patients with hepatic dysfunction. *Adverse effects:* Anticholinergic effects (dry mouth, tachycardia, blurred vision, urinary retention), sedation. *Drug interactions:* Clonidine, monoamine oxidate inhibitors.
Octreotide Sandostatin. Injection: 0.05, 0.1, 0.2, 0.5, 1 mg/mL.	**Antisecretory somatostatin analog.** *Children:* Secretory diarrhea: IV, SC: 1–10 μg/kg q 12 hr; titrate dose to effect. May give via continuous IV infusion. *Adults:* Treatment of vasoactive intestinal peptide–secreting tumors: IV, SC: 100–150 μg q 12 hr.	*Cautions:* Continuous long-term use (mo) may cause cholelithiasis, hypothyroidism. *Adverse effects:* Flushing, dizziness, hypo/hyperglycemia. Infuse IV over 20–30 min, IV push over 3 min.
Olanzapine Zyprexa. Tablet: 2.5, 5, 7.5, 10, 15, 20 mg.	**Atypical antipsychotic, monaminergic antagonist with high affinity for serotonin, dopamine, histamine, muscarinic, and α1-adrenergic receptors. Actual mechanism of action unknown.** *Children:* Start 2.5–5 mg q 24 hr; titrate weekly by 2.5–5 mg to 15–20 mg/24 hr as q daily dosing. *Adults:* Start 5–10 mg/24 hr; increase by 5 mg weekly to response (max: 20 mg/24 hr).	*Adverse events:* Postural hypotension, somnolence, tremor, dizziness, akathisia, asthenia, dry mouth, constipation, dyspepsia, increased appetite, weight gain, hyperglycemia, amenorrhea, vaginitis in females.
Olsalazine Anti-inflammatory drug; 5-aminosalicylic acid derivative. Dipentum. Capsule: 10, 20, 250 mg.	**Treatment of inflammatory bowel disease.** *Adults:* 500 mg q 12 hr.	*Cautions:* Administer with food. *Adverse effects:* Headache, cramps, diarrhea, dizziness, rash, cholestasis.
Omeprazole Proton pump inhibitor of parietal cell hydrogen ion secretion. Prilosec. Capsule: 10, 20 mg.	**Treatment of gastric acid hypersecretion/ulcer disease.** *Children:* PO: 0.6–0.7 mg/kg q 24 hr. Dose titrated to desired gastric pH. *Adults:* PO: 20–40 mg/24 hr.	*Caution:* Drug granules in capsule must be swallowed whole; do not chew. *Drug interactions:* May decrease diazepam, phenytoin clearance. May reduce itraconazole, digoxin absorption.
Ondansetron Antiemetic, selective serotonin-3 receptor antagonist. Ondansetron. Tablet: 4, 8 mg. Injection: 2 mg/mL.	**Treatment of nausea and vomiting associated with cancer chemotherapy or surgery and other causes (drug toxicity).** *Infants and children:* 0.15 mg/kg IV q 8 hr; may give as continuous IV infusion 0.45 mg/kg/24 hr (max: 24–32 mg/24 hr). *Children:* Mild to moderate nausea/vomiting: PO: 4–8 mg q 8–12 hr.	*Adverse effects:* Headache, chest pain. Does not cause dystonia/sedation. *Comment:* Oral bioavailability ≈50%. Doses given ≈30 min before starting chemotherapy.
Oxcarbazepine Trileptal. Tablet, film-coated: 150, 300, 600 mg. Suspension: 300 mg/5 mL.	**Treatment of seizure disorders (except absence).** *Children 3–17 yr:* Start 8–10 mg/kg/24 hr divided bid (max: 600 mg/24 hr); increase over 2 wk to 30–45 mg/kg/24 hr divided bid per response. *Adults:* Start at 600 mg/24 hr divided bid, then gradually increase over 2–4 wk to 1,200 mg/24 hr divided bid (max: 2,400 mg/24 hr).	*Cautions:* Cut dose in half if creatinine clearance <30 mL/min. Toxicity mainly CNS (headache, somnolence, dizziness, etc.), diplopia, gastrointestinal (nausea, vomiting, diarrhea), and hyponatremia.
Oxybutynin Urinary antispasmodic. Ditropan; generic. Tablet: 5 mg. Syrup: 5 mg/5 mL.	**Relaxes smooth muscle by antagonizing acetylcholine.** *Children:* PO: 0.2 mg/kg q 6–12 hr (max: 5 mg PO q 8 hr). *Adults:* 5 mg/dose up to 4× daily.	*Cautions:* Patients with renal and/or liver disease. *Adverse effects:* Tachycardia, drowsiness, sedation, dry mouth, blurred vision. *Drug interactions:* Additive anticholinergic effects/CNS depression (e.g., antihistamines).
Oxycodone Opiate analgesic. Various brands, generic. Tablet: 5 mg.	**Treatment of moderate to severe pain.** *Children:* PO: 0.05–0.15 mg/kg q 4–6 hr (max: 5 mg). *Adults:* PO: 5 mg/dose q 4–6 hr (max: 5 mg).	*Cautions:* Like most opiate analgesics, may stimulate histamine release and may cause CNS and respiratory depression. Use with caution in hepatic disease or with other respiratory depressants. Dependence potential. *Adverse effects:* Hypotension, sedation, respiratory depression. Naloxone reverses effects.
Pamidronate disodium Bisphosphonate derivative. Aredia. Injection: 30, 60, 90 mg.	**Treatment of hypercalcemia, Paget disease, osteogenesis imperfecta, osteopenia. Binds to bone, inhibiting osteoclast-mediated calcium resorption. Dose based on serum calcium concentration.** *Children:* 1 mg/kg/24 hr for consecutive days q 3 mo; 10–40 mg/m^2 over 5–8 hr q mo. *Adults:* Serum calcium 12–13.5 mg/dL: 60–90 mg; serum calcium >13.5 mg/dL: 90 mg. Wait 7 days to assess full effect of dose before retreatment. Paget disease: 30 mg/24 hr for 3 consecutive days.	*Cautions:* Leukopenia, thrombophlebitis. Drug incompatible with calcium-containing IV solutions. *Adverse effects:* Hypertension, syncope, hypocalcemia, hypophosphatemia, hypothyroidism, bone pain.
Pancreatin Various brands. Capsule, tablet, timed-release capsule, powder.	**Pancreatic enzyme replacement. Individual products contain different amounts of lipase, amylase, and protease.** *Children and adults:* Dose titrated to desirable stool frequency and consistency.	*Cautions:* Excessive dosing may lead to impaction; inadequate dosing may lead to steatorrhea. Exogenous pancreatic enzymes inactivated by gastric acid; use microencapsulated forms when possible. *Drug interactions:* Reduction of gastric acid (e.g., H_2-receptor antagonists/omeprazole/antacids) may enhance effectiveness. *Adverse effects:* Rash, abdominal symptoms, constipation, hyperuricemia, allergy.
Pancuronium Pavulon; generic. Injection: 1, 2 mg/mL.	**Anesthetic and skeletal muscle relaxant. Nondepolarizing neuromuscular antagonist.** *Children and adults:* IV: 0.04–0.1 mg/kg q 20–30 min. Dose titrated to desired effect.	*Cautions:* Ventilation must be supported during neuromuscular blockade. Dose adjustment with renal dysfunction. *Adverse effects:* Tachycardia, hypertension, prolonged muscle weakness. *Drug interactions:* Possible augmented muscle weakness with aminoglycosides, anesthetics, and colistin.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Papaverine hydrochloride Vasodilator; antimigraine; generalized smooth muscle relaxant. Cerespan; Pavabid; generic. Capsule: 150 mg. Tablet, timed-release. Injection.	**Common pediatric use for preservation of arterial catheters to prolong function.** *Children:* 30 mg papaverine plus 250 u heparin/250 mL IV solution (0.45–0.9% NaCl) infused.	*Cautions:* Avoid in neonates because it may cause cerebral vasodilatation, predisposing to CNS hemorrhage. *Adverse effects:* Flushing, tachycardia, hypotension, dizziness. *Drug interactions:* Additive hypotensive effect.
Paraldehyde Anticonvulsant; sedative; generalized CNS depressant. Paral; generic. Liquid: 1 g/mL.	**Used as adjunct treatment for refractory status epilepticus, alcohol withdrawal.** *Children:* PO, Rectal: 0.15 mL/kg/dose. May repeat once in 4–6 hr. IM formulation not available in USA. *Adults:* 5–10 mL/dose.	*Cautions:* May give IM, but inject remote from nerves owing to risk of damage. Use glass syringe/tubing because drug reacts with plastic. Rectal route preferred to IM route. Mix rectal solution 2:1 in oil (e.g., olive oil). *Adverse effects:* Sedation, gastric irritation, thrombophlebitis.
Paregoric Antidiarrheal, analgesic. Generic. Liquid: 2 mg morphine equivalent/5 mL.	**Camphorated tincture of opium.** *Children:* PO: 0.25–0.5 mL/kg q 6–12 hr. *Adults:* PO: 5–10 mL q 6–12 hr. Neonatal abstinence syndrome: Dose titrated to desired effect.	*Comments:* Each 5 mL of paregoric contains 2 mg morphine equivalent, 20 mg camphor, 20 mg benzoic acid. Final alcohol content 45%.
Paroxetine Serotonin reuptake inhibitor. Paxil. Tablet: 10, 20, 40 mg. Oral suspension: 10 mg/5 mL.	**Treatment of depression, obsessive-compulsive disorder, panic disorder, and social anxiety disorder.** *Children:* Start 10 mg q daily; increase at weekly intervals by 10 mg/daily (max: 60 mg/24 hr). *Adults:* Start 20 mg daily increase by 10 mg daily at weekly intervals to response (max: 60 mg/24 hr).	*Cautions:* Do not discontinue abruptly or withdrawal syndrome may occur. Taper by 10 mg/24 hr every 5–7 days to avoid problems. Avoid use with monamine oxidase inhibitors except in extreme situations. *Adverse events:* Somnolence, dizziness, insomnia, tremor, nervousness, decreased appetite, asthenia, nausea, constipation. *Drug interactions:* Paroxetine inhibits the cytochrome 2D6 isoenzyme and may interact with phenothiazines and type 1C antiarrhythmics. Concurrent use with thioridazine may elevate thioridazine levels, causing prolonged QTc intervals and predispose to torsades de pointes.
Pegaspargase Antineoplastic agent. Oncaspar. Injection.	**Used in combination for induction of acute lymphoblastic leukemia. Also called PEG-L-asparaginase.** *Children and adults:* IM, IV: 2,500 u/m^2 q 14 days. Dose usually dictated by specific protocol.	*Cautions:* Hepatotoxic, allergic reactions. Contraindicated in patients with pancreatitis, significantly hemorrhagic events associated with L-asparaginase. *Drug interactions:* Possible interactions with methotrexate, vincristine, corticosteroids.
Pemoline CNS stimulant. Cylert. Tablet: 18.75, 37.5, 75 mg. Tablet: chewable: 37.5 mg.	**Treatment of attention deficit disorder. Structurally unique from methylphenidate.** *Children:* PO: 1 mg/kg/24 hr as single dose each morning. Titrate to effect 0.5 mg/kg/24 hr q 1–2 wk (max: 3 mg/kg/24 hr; ≈112.5 mg/24 hr).	*Cautions:* Insomnia, anorexia, weight loss. *Adverse effects:* CNS stimulation, seizures, hypertension, increased liver function, hepatitis, movement disorders. *Drug interactions:* Possible with other CNS stimulants, sympathomimetics.
Penicillamine Chelating agent. Cuprimine; Depen. Capsule: 12, 250 mg. Tablet: 250 mg.	**Metal chelating agent with affinity for copper (Wilson disease) and lead. Also used as an adjunct for the treatment of severe rheumatoid arthritis.** Wilson disease: Dose titrated to maintain >1 mg/24 hr urinary copper excretion. *Infants and children:* PO: 20 mg/kg/24 hr q 6–12 hr (max: 1 g/24 hr). *Adults:* PO: 1 g/24 hr q 6–12 hr (max: 2 g). Lead intoxication: *Infants and children:* PO: 30–40 mg/kg/24 hr q 8–12 hr (max: 1.5 g/24 hr). *Adults:* PO: 1–1.5 g/24 hr q 8–12 hr. Rheumatoid arthritis: *Children:* PO: 3 mg/kg/24 hr q 12 hr, increasing by 3 mg/kg/24 hr q 2–3 mo (max: 10 mg/kg/24 hr).	*Cautions:* Cross allergen in patients allergic to penicillin. Do not give with food or iron/zinc compounds. *Adverse effects:* Rash, pruritus, nausea, vomiting, anemia, bone marrow suppression, nephrotic syndrome, systemic lupus erythematosus–like syndrome. *Drug interactions:* Other metals, iron, gold, mercury, antimalarials.
Pentazocine Talwin. Tablet: 50 mg with 50 mg naloxone (parenteral deterrent). Injection: 30 mg/mL.	**Opiate analgesic of the benzo orphan type for the treatment of moderate to severe pain.** *Children > 14 yr of age and adults:* PO: 50 mg q 3–4 hr, titrate to effect to 100 mg dose, not to exceed 600 mg/24 hr. May give IM or IV, reducing oral dose by 1/3.	*Cautions:* Generalized CNS depressant possesses weak antagonistic action and may precipitate opiate withdrawal. *Adverse effects:* CNS depression, nausea, vomiting, respiratory depression, histamine release.
Pentobarbital Nembutal; generic. Short-acting barbiturate. Capsule: 50, 100 mg. Elixir: 18.2 mg/5 mL. Suppository: 30, 60, 120, 200 mg. Injection.	**Used as an anticonvulsant, sedative/hypnotic, and anesthetic.** Sedation: *Children:* PO, IM: 2–6 mg/kg/24 hr q 6 hr. May give rectally dosed by body weight: 4.5–10 kg: 30 mg 10–18 kg: 30–60 mg; 18–36 kg: 60 mg; 36–50 kg: 60–120 mg. Pentobarbital coma: *Children:* IV: Loading dose of 10–15 mg/kg slowly over 1–2 hr, monitoring blood pressure and heart rate. Maintenance infusion of 1 mg/kg/hr, increasing up to 5 mg/kg/hr to maintain burst suppression on electroencephalogram.	*Cautions:* Hypotension in hypovolemic patients; injectables contain propylene glycol. *Adverse effects:* Arrhythmias bradycardia, hypotension, respiratory depression, laryngospasm, dependence. *Drug interactions:* May increase metabolism of many hepatically cleared drugs, oral contraceptives, griseofulvin, corticosteroids. *Monitoring:* Pentobarbital concentrations: sedation 1–5 μg/mL; coma 20–40 μg/mL.
Pentoxifylline Trental. Tablet, timed-release: 400 mg.	**Used in the treatment of peripheral vascular disease (Raynaud syndrome) and investigationally in reducing tumor necrosis factor, neutrophil adhesion, and platelet aggregation.** *Children:* Antiplatelet effect in Kawasaki disease: PO: 20 mg/kg/24 hr q 8 hr. *Adults:* PO: 400 mg tid.	*Cautions:* Administer with meals to reduce gastrointestinal upset. *Adverse effects:* Hypotension, tachycardia, dizziness, nausea, vomiting. *Drug interactions:* Cimetidine, possible augmenting of warfarin, heparin effects.
Phenazopyridine Urinary anesthetic. Pyridium; generic. Tablet: 100, 200 mg.	**Possible symptomatic relief of urinary burning and itching associated with urologic procedures or urinary tract infection.** *Children:* PO: 12 mg/kg/24 hr q 8 hr. *Adults:* PO. 100–200 mg q 6–8 hr.	*Caution:* Discolors urine to orange or red. *Adverse effects:* Headache, rash, methemoglobinemia. Administer with food to decrease gastrointestinal side effects.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Phenobarbital Generic. Barbiturate CNS depressant. Elixir: 15 mg/5 mL; 20 mg/5 mL. Tablet: 8, 15, 30, 60, 100 mg Injection: 30, 60, 130 mg/mL.	**Sedative hypnotic anticonvulsant, and anesthetic.** Anticonvulsant: **Loading dose:** *Children and adults:* PO, IV: 15–20 mg/kg. Maintenance dose: Neonates: PO, IV: 3–4 mg/kg/24 hr, q 12–24 hr. *Children:* PO, IV: 5–6 mg/kg/24 hr, q 12–24 hr. *Adults:* PO, IV: 1–3 mg/kg/24 hr q 12–24 hr. Sedation: *Children:* 2 mg/kg/dose. Hyperbilirubinemia: Sedation: *Children:* PO, IV: 3–8 mg/kg/24 hr q 12–24 hr. *Adults:* PO, IV: 90–180 mg/24 hr q 12–24 hr.	*Cautions:* Dose titrated to desired effect. Administer IV ≤30 mg/min in infants and children and ≤60 mg/min in adults. *Adverse effects:* Hypotension, drowsiness, respiratory depression, paradoxical hyperactivity. *Drug interactions:* May increase metabolism of many hepatically cleared drugs; oral contraceptives, griseofulvin, corticosteroids. Certain drugs may interface with phenobarbital metabolism: valproic acid, chloramphenicol, felbamate. *Target serum concentrations:* 15–40 μg/mL; coma (acute) > 60 μg/mL. *Monitoring:* Phenobarbital concentrations: sedation 15–40 μg/mL; coma > 60 μg/mL.
Phenoxybenzamine Dibenzyline. α-Adrenergic receptor antagonist. Capsule: 10 mg.	**Symptomatic treatment of pheochromocytoma.** *Children:* PO: 0.2–2 mg/kg/24 hr q 24 hr. Titrate dose to desired effect (e.g., blood pressure). *Adults:* PO: 10 mg/dose q 12 hr. Titrate dose to effect.	*Cautions:* Long-acting α-receptor antagonist. *Adverse effects:* Postural hypotension, syncope, dizziness. *Drug interactions:* Sympathomimetics.
Phentolamine Regitine. α-Adrenergic antagonist. Injection: 5 mg/mL.	**Diagnosis and treatment of pheochromocytoma and extravasation of drugs with α-adrenergic effects (e.g., dopamine, dobutamine, epinephrine, norepinephrine, phenylephrine).** Pheochromocytoma: Diagnosis: *Children:* IV 0.05–0.1 mg/kg/dose (max: 5 mg). *Adults:* IV 5 mg/dose. Preoperatively: *Children:* IV 0.05–0.1 mg/kg/dose q 1–2 hrs titrating to effect and needed duration. (max: 5 mg). Extravasation: 5–10 mg in 10 mL normal saline. Infiltrate area with small volume using 27–30 gauge needle (max: 0.1 mg/kg).	*Cautions:* Short-acting α-receptor antagonist. *Adverse effects:* Hypotension, dizziness, gastritis. *Drug interactions:* Sympathomimetics.
Phenylephrine hydrochloride Neo-Synephrine; generic. α-Adrenergic receptor agonist; peripheral vasoconstrictor. Injection: 10 mg/mL. Nasal drops, spray: 0.16–1%. Eyedrops.	**Treatment of hypotension in shock and used in many nasal decongestants.** Nasal decongestant: *Infants:* 1–2 drops per nostril q 3–4 hr; 0.16% solution. *Children 1–6 yr:* 1–2 drops or spray per nostril q 3–4 hr; 0.125% solution. *6–12 yr:* 1–2 drops or spray q 3–4 hr; 0.25% solution. *>12 yr and adults:* 1–2 drops or spray per nostril q 3–4 hr; 0.25–0.5% solution. Hypotension and shock: *Children:* IV: 5–20 μg/dose q 10–15 min. May give by continuous IV infusion 0.1–0.5 μg/kg/min, titrated to desired effects (e.g., blood pressure). *Adults:* IV 0.1–0.5 mg/dose q 10–15 min by continuous infusion 100–180 μg/min, titrated to desired effect. Paroxysmal supraventricular tachycardia: *Children:* IV: 5–10 μg/kg over 20–30 sec. *Adults:* IV: 0.25–0.5 mg over 20–30 sec.	*Cautions:* Patients with hypertension. Injection contains sulfites. Rebound nasal stuffiness with prolonged nasal use/abuse. *Adverse effects:* Hypertension, angina, bradycardia, restlessness, necrosis if IV infiltrates. *Drug interactions:* Sympathomimetics, α-receptor antagonists, monoamine oxidase inhibitors.
Phenytoin Anticonvulsant and antiarrhythmic. Dilantin; generic (use cautiously) Capsule, slow-(extended-) release: 30, 100 mg. Capsule, prompt release: 30, 100 mg. Suspension: 125 mg/5 mL. Injection: 50 mg/mL.	**Status epilepticus:** Loading dose: *Neonate:* IV: 15–20 mg/kg (max: 0.5 mg/kg/min). *Children and adults:* IV: 15–18 mg/kg (max: 1–3 mg/kg/min). Maintenance dose: PO, IV: *Neonate:* 5 mg/kg/24 hr q 12–24 hr. *Children 0.5–0.6 yr:* 8–10 mg/kg/24 hr. *7–9 yr:* 6–8 mg/kg/24 hr q 12–24 hr. *10–16 yr:* 6–7 mg/kg/24 hr q 12–24 hr. *Adults:* 300–600 mg/24 hr q 12–24 hr.	*Cautions:* Infuse slowly IV; variable oral bioavailability; chewable tablet most consistent. Must shake oral suspension very well before use. Follows saturation (Michaelis-Menten) pharmacokinetics. Certain disease states (renal failure, acute head trauma) may lead to imbalance between free and protein-bound drug. *Adverse effects:* Lethargy, dizziness, nystagmus, hypotension, hirsutism, gingival hyperplasia, rash, Stevens-Johnson syndrome, hepatitis, thrombophlebitis. *Drug interactions:* May increase metabolism of certain hepatically cleared drugs; oral contraceptives, griseofulvin, corticosteroids, cyclosporin; highly protein-bound and may cause displacement interaction. *Monitoring:* Phenytoin concentrations: therapeutic 8–20 μg/mL. If necessary, measure free drug concentration: therapeutic 1–2 μg/mL.
Physostigmine Antilirium. Competitive antagonist of acetylcholine. Injection, ophthalmic solution, ointment.	**Unlike neostigmine, crosses the blood-brain barrier with central effects. Used with extreme caution in the reversal of anticholinergic effects.** IM, IV, SC: *Children:* 0.001–0.03 mg/kg/dose q 15–20 min to desired effect (max: 2 mg). *Adults:* 0.5–2 mg q 15–20 min to desired effect.	*Cautions:* Patients with bradycardia, cardiac dysrhythmias, asthma, ulcer disease. Should be used as an antidote only in life-threatening situations by experienced individuals. *Adverse effects:* Palpitations, restlessness, excessive salivation, secretions, muscle fasciculations, bronchospasm.
Phytonadione AquaMEPHYTON; Mephyton. Tablet: 5 mg. Injection.	**Vitamin K_1 for nutritional supplementation and treatment of hemorrhagic disease of the newborn or warfarin-like compound anticoagulant toxicity.** *Children:* IM, IV, SC: 1–2 mg/dose dosed to effect; PO: dose may increase to 2.5–5 mg. *Adults:* IM, IV, SC: 10 mg/24 hr; PO: 5–25 mg/24 hr. Higher doses may be required for reversal of warfarin-like anticoagulant toxicity.	*Cautions:* Infuse slowly IV (over 15–30 min) to avoid flushing. Multiple doses may be needed for prolonged period, depending on type of coumarin anticoagulant. *Adverse effects:* Flushing, hypotension.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Piroxicam Feldene. Nonsteroidal anti-inflammatory agent. Capsule: 10, 20 mg.	**Analgesic and therapy for rheumatoid disorders.** PO: *Children:* 0.2–0.3 mg/kg q 24 hr (max: 15 mg/kg/24 hr). *Adults:* 10–20 mg q 24 hr.	*Cautions:* Limited data in infants and children; may require more frequent daily dosing in pediatrics. Administer with food or milk to decrease gastrointestinal side effects. Do not use in young infants. *Adverse effects:* Dizziness, gastrointestinal upset, nausea/vomiting, ulcer, hepatitis, decreased renal function.
Polyethylene glycol-electrolyte solution Bowel lavage solution. Colovage; Colyte; Golytely Power for reconstitution.	**Used before bowel radiology or in poisonings.** *Children:* 25–40 mL/kg/hr up to 1.5–2 L/hr until rectal effluent is clear; usual max dose of 4 L for x-ray may go much higher if used for poisonings (e.g., iron). *Adults:* 2,400 mg q 10–20 min until 4 L is consumed. May go higher for poisonings.	*Caution:* Patients with bowel disease (colitis) or obstruction. *Adverse effects:* Nausea, cramps, bloating.
Poractant alfa Curosurf. Intratracheal suspension of porcine lung extract, surfactant (80 mg phospholipids, 1 mg protein, 0.3 mg SP-B/mL).	**Prophylaxis or treatment of respiratory distress syndrome, treatment of persistent pulmonary hypertension.** *Neonates:* 2.5 mL/kg (200 mg/kg) for dose 1, may repeat dose of 1.25 mL/kg (100 mg/kg) 2 × q 12 hr. *Children and adults:* Not indicated.	*Caution:* Monitor ventilator status closely; may require rapid weaning within min of dose. *Adverse events:* Bradycardia, airway obstruction, cyanosis.
Pralidoxime Acetylcholinesterase reactiveator. Protopam (2-PAM). Tablet: 500 mg. Injectable.	**Treatment of organophosphate poisoning; possible treatment of toxicity from cholinergic drugs.** IM, IV: *Children:* 20–50 mg/kg/dose repeated in 1–2 hr if muscle weakness has not been relieved; when desired effect obtained, dose q 12 hr. *Adults:* 1–2 g q 5–6 hr; dose based on clinical response.	*Caution:* As antidote for organophosphate poisoning; use in combination with atropine. Excessive dosing may cause cholinergic effects. Too-rapid IV administration associated with tachycardia, laryngospasm. Infuse IV over 15–30 min. *Adverse effects:* Hypertension, dizziness, nausea, muscle weakness or rigidity.
Prazosin Minipress; generic. Capsule: 1, 2, 5 mg.	**Competitive antagonist of postsynaptic α-adrenergic receptors used in the treatment of hypertension or heart failure.** PO: *Children:* 0.1 mg/kg/24 hr q 6 h, titrating dose to desired blood pressure (max: 0.4 mg/kg/24 hr or 15 mg total dose). Consider additive/synergistic combinations with diuretics. *Adults:* 3 mg/24 hr q 8–12 hrs, titrating dose to desired blood pressure. Usual dose range: 3–15 mg/24 hr.	*Caution:* Profound hypotension may occur after first dose (dose "first-dose phenomenon"); more common in fluid- and/or salt-depleted patients. *Adverse effects:* Syncope, palpitations, dizziness, fluid retention. *Drug interactions:* Other hypotensive drugs (diuretics, β-receptor antagonists).
Prednisolone Glucocorticosteroid. Delta Cortef; Hydeltrasol; Predalone; generic. Tablet: 5 mg. Suspension. Injection.	**Treatment of inflammatory disorders, including allergic, respiratory, rheumatic, endocrine, and neoplastic disorders.** Asthma: PO, IV: *Children:* 0.5–4 mg/kg/24 hr q 6–12 hr. *Adults:* 5–60 mg/24 hr. Anti-inflammatory: PO, IV: *Children:* 0.1–2 mg/kg/24 hr q 6 hr–daily.	*Cautions:* Dose titrated to desired effect; use shortest treatment course to avoid side effects. May slow growth, increase salt retention. *Adverse effects:* Edema, hypertension, psychosis, Cushing syndrome, HPA-axis (adrenal) suppression, peptic ulcer. *Drug interactions:* Barbiturates, phenytoin, rifampin. *Comment:* See comparison of corticosteroids under *Hydrocortisone*.
Prednisone Glucocorticosteroid. Deltasone; Liquid Pred; generic. Tablet: 1, 2.5, 5, 10, 20, 50 mg. Syrup: 5 mg/5 mL. Injection.	**Treatment of inflammatory disorders, including allergic, respiratory, rheumatic, endocrine, and neoplastic disorders.** Asthma: PO: *Children:* 0.5–4 mg/kg/24 hr q 6–12 hr. *Adults:* 5–60 mg/24 hr. Anti-inflammatory PO, IV: *Children:* 0.1–2 mg/kg/24 hr q 6–24 hr.	*Cautions:* Dose titrated to desired effect; use shortest treatment course to avoid side effects. May slow growth, increase salt retention. *Adverse effects:* Edema, hypertension, psychosis, Cushing syndrome, HPA-axis (adrenal) suppression, peptic ulcer. *Drug interactions:* Barbiturates, phenytoin, rifampin. *Comment:* See comparison of corticosteroids under *Hydrocortisone*.
Primidone Anticonvulsant. Mysoline; generic Tablet: 50, 250 mg. Suspension: 250 mg/5 mL.	**Treatment of generalized tonic-clonic, complex partial, and focal seizures.** PO: *neonates:* 12–20 mg/kg/24 hr q 8–12 hr. *Children:* 10–25 mg/kg/24 hr q 8–12 hr. *Children >8 yr and adults:* 125–1,500 mg/24 hr q 8–12 hr (max: 2 g/24 hr).	*Caution:* Partially metabolized to phenobarbital and PEMA. *Adverse effects:* Sedation, ataxia, rash. *Drug interactions:* Valproate, griseofulvin, phenytoin. *Monitoring:* PEMA concentrations: therapeutic 5–12 μg/mL.
Procainamide Class 1a antiarrhythmic. Procan; Pronestyl. Tablet and capsule: 250, 375, 500 mg. Tablet, sustained-release: 250, 500, 750, 1,000 mg. Injection.	**Treatment of ventricular tachycardia, premature ventricular contractions, paroxysmal atrial tachycardia, atrial fibrillation.** Loading dose: *Children:* IV: 3–6 mg/kg/dose over 5 min, not to exceed 100 mg/dose; repeat q 5–10 min as needed (max: 15 mg/kg total dose). Do not exceed 500 mg in 30 min. Maintenance dose: PO: *Children:* 15–50 mg/kg/24 hr, q 3–6 hr, 20–30 mg/kg/24 hr, not to exceed 4 g/24 hr; continuous IV infusion of 20–80 μg/kg/min (max: 2 g/24 hr). *Adults:* 250–500 mg/dose q 3–6 hr (max: 2–4 g/24 hr).	*Caution:* Causes positive antinuclear antibody reaction, general cardiodepressant. Metabolized to active NAPA. *Adverse effects:* Hypotension, arrhythmias, AV block, confusion, agranulocytosis, systemic lupus erythematosus–like syndrome, fever, rash. *Drug interactions:* Cimetidine, β antagonists, anticholinergic agents. *Monitoring:* Procainamide concentrations: therapeutic 4–10 μg/mL. Sum of procainamide and NAPA: therapeutic 10–30 μg/mL.
Procarbazine Antineoplastic agent. Capsule: 50 mg.	**Treatment of Hodgkin disease, bronchogenic carcinoma.** Hodgkin disease: *Children:* PO: 1.5–3 mg/kg/24 hr (50–100 mg/m^2) q 24 hr for 10–14 days/28 day cycle. Bone marrow transplant preparation: 12.5 mg/kg/dose. Neuroblastoma and medulloblastoma: *Children:* 100–200 mg/m^2 dose per protocol.	*Caution:* Dose based on disease-based protocol and concurrent drugs. Avoid alcohol (causes disulfiram-like reaction). Possesses some monoamine oxidase inhibitory activity. *Adverse effects:* CNS depression, confusion, ataxia, marrow suppression, alopecia, flu-like syndrome. *Drug interactions:* Alcohol, tricyclic antidepressants, phenothiazines, tyramine-containing foods sympathomimetics.
Prochlorperazine Compazine; generic. Tablet: 5, 10, 25 mg. Capsule, sustained-release: 10, 15, 30 mg. Injection. Suppository: 2.5, 2, 25 mg. Syrup: 5 mg/5 mL.	**Piperazine-type phenothiazine antiemetic. Use should be avoided in children.** *Children:* PO, rectal: 0.4 mg/kg/24 hr q 6–8 hr. SIM: 0.1–0.15 mg/kg/24 hr q 8–12 hr. *Adults:* PO: 5–10 mg/dose tid–qid.	*Caution:* Acute dystonic reaction common in children. *Adverse effects:* Sedation, extrapyramidal reactions, photosensitivity, cholestatic jaundice. *Drug interactions:* Additive CNS effects, α-receptor antagonists.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Promethazine Phenergan; generic. Tablet: 12.5, 25, 50 mg. Syrup. Suppository. Injection.	**Phenothiazine with primary antihistaminic activity used in the treatment of nausea, vomiting, motion sickness, allergy.** Motion sickness: *Children:* PO: 0.5 mg/kg 30–60 min before departure; then q 8–12 hr as needed. Sedative antiemetic: *Children:* IM, IV, rectal: 0.25–1 mg/kg/dose q 4–6 hr as needed.	*Caution:* Potentiates anticholinergic effects. *Adverse effects:* Sedation, hypotension, extrapyramidal reactions, blurred vision. *Drug interactions:* Additive sedative effects.
Propafenone Class 1 c antiarrhythmic agent. Rythmol. Tablet: 150, 225, 300 mg.	**Effective against pediatric supraventricular tachycardia.** *Children:* PO: 200–600 mg/m^2/24 hr divided. *Adults:* 150 mg q 8 hr. (450 mg/24 hr). May titrate at 3–5 day intervals to 300 mg q 8 hr (max: 900 mg/24 hr).	*Cautions:* May worsen or cause arrhythmias, heart failure, or angina. Also causes dizziness, fatigue, nausea, vomiting, and constipation. *Drug interactions:* Increases digoxin levels (dose-related), cyclosporin, and theophylline.
Propantheline bromide Pro-Banthine; generic. Tablet: 7.5, 15 mg.	**Synthetic anticholinergic antispasmodic used as adjunctive therapy for gastrointestinal or bladder spasm, irritable bowel.** *Children:* PO: 1.5–3 mg/kg/24 hr q 4–8 hr. Dose to desired effect.	*Caution:* Avoid in patients with decreased bowel motility. *Adverse effects:* Sedation, tachycardia, dry mouth, blurred vision, mydriasis.
Propofol Diprivan. Injection.	**Nonbarbiturate sedative, hypnotic, general anesthetic.** Sedation: *Children:* IV: 1.5–3 mg/kg/dose over 1–2 min. Continuous sedation (mechanical ventilation): *Children:* IV: 5.5 mg/kg for 30 min, increase to 6 mg/kg for 30 min, increase to 8 mg/kg for 1 hr, increase to 10 mg/kg for 1 hr, increase to final infusion rate of 12.5 mg/kg/hr.	*Caution:* Dose titration regimen to permit adequate sedation accommodating complex pharmacokinetics of drug. Single-use vials in lipid emulsion. *Adverse effects:* Hypotension, bradycardia, hyperlipidemia, questionable metabolic acidosis.
Propoxyphene Darvon. Capsule. Tablet.	**Analgesic for mild to moderate pain. Binds opiate receptors. Less dependence liability than codeine.** PO: *Children:* 2–3 mg/kg24 hr q 4–6 hr. Titrate dose to desired effect. *Adults:* Hydrochloride 65 mg/dose q 4–6 hr (max: 390 mg); napsylate salt 100 mg q 4–6 hr (max: 600 mg).	*Caution:* Weak opiate agonist with limited abuse potential. *Adverse effects:* Sedation, dizziness, nausea, vomiting, constipation, dependence.
Propranolol Inderal; generic. Tablet: 10, 20, 40, 60, 80 mg. Solution: 4, 8, and concentrate 80 mg/mL. Injection: 1 mg/mL. Capsule, sustained-release: 60, 80, 120, 160 mg.	**Nonselective β-adrenergic receptor antagonist (β_1 and β_2** *Neonates:* PO: 0.25 mg/kg/dose q 6–8 hr; titrate to desired response, increasing dose slowly (max: 5 mg/kg/24 hr). IV: 0.01 mg/kg over 10–15 min; titrate to desired effect (max: 1 mg/kg/24 hr). Arrhythmias/hypertension: *Children:* PO: 0.5–1 mg/kg/24 hr q 6–8 hr titrated upward to 2–5 mg/kg/24 hr, over 3–5 days. IV: 0.01–0.1 mg/kg/dose infused over 10–15 min as needed (max: 1 mg infants; 3 mg children). *Adults:* PO: 40–80 mg/24 hr, titrating to response range: 40–320 mg/24 hr q 6–8 hr. Thyrotoxicosis: *Neonates:* PO: 2 mg/kg/24 hr q 6–8 hr; titrate to response. *Children:* PO: 2–4 mg/kg/24 hr q 6–8 hr; titrate to response. Migraine prophylaxis: *Children:* PO: 0.6–2 mg/kg/24 hr q 6–8 hr (max: 4 mg/kg/24 hr).	*Caution:* Drug undergoes substantial first-pass metabolism, explaining huge difference between IV and PO doses. Use cautiously IV and in patients with congestive heart failure, asthma, chronic obstructive pulmonary disease. Monitor heart rate for drug effect. *Adverse effects:* Decreased cardiac contractility, hypotension, bradycardia, hypoglycemia, bronchospasm.
Propylthiouracil (PTU) Generic. Tablet: 50 mg.	**Antithyroid that inhibits thyroid hormone synthesis by interfering with incorporation of iodine.** PO: *Neonates:* 5–10 mg/kg/24 hr q 8 hr; titrate to effect. *Children:* 5–7 mg/kg/24 hr q 8 hr; titrate to effect. *Adults:* 300–450 mg/24 hr q 8 hr; increasing to 600–1,200 mg/24 hr.	*Caution:* Marked drug effect usually requires 24–36 hr. *Adverse effects:* Vertigo, rash, blood dyscrasias, hepatitis, arthralgia, interstitial pneumonitis.
Protamine sulfate Generic. Injection: 10 mg/mL.	**Heparin antidote, neutralizing its anticoagulant effect.** 1 mg protamine neutralizes 90 USP units of lung-derived heparin and 115 USP units of intestinal-derived heparin. Protamine dose calculated based on duration of time since last heparin dose using heparin elimination half-life (≈ hr) to determine estimated heparin body stores.	*Caution:* Calculate dose carefully; protamine excess can cause anticoagulation. Monitor partial thromboplastin time with use. *Adverse effects:* Hypotension, dyspnea, hypersensitivity.
Pseudoephedrine Generic. Tablet: 30, 60 mg. Tablet, timed-release: 12 mg. Capsule: 60 mg. Capsule, timed-release: 120 mg. Syrup: 15 mg/mL.	**Indirectly acting sympathomimetic used as nasal decongestant to treat symptoms of common cold.** PO: *Infants and children:* 4 mg/kg/24 hr q 6–12 hr. *Adults:* 6 mg/dose q 6–8 hr (max: 240 mg/24 hr).	*Caution:* Patients with hypertension, heart disease. *Adverse effects:* Tachycardia, headache, nervousness, tremor. *Drug interactions:* Monoamine oxidase inhibitors, propranolol, pressors.
Pyridostigmine Mestinon. Tablet: 60 mg. Tablet, sustained-release 180 mg. Syrup: 60 mg/5 mL. Injection: 5 mg/mL.	**Cholinesterase inhibitor used to treat myasthenia gravis; reversal of neuromuscular blocking agents.** Myasthenia gravis: *Children:* IM, IV: 0.05–0.15 mg/kg/dose (max: 10 mg); titrate to desired effect. PO: 7 mg/kg/24 hr in 5–6 divided doses. *Adults:* IM, IV: 2 mg q 2–3 hr. PO: 60 mg/dose q 8 hr; titrate to desired effect. Reversal of neuromuscular blocking agents: *Children:* IM, IV: .01–0.25 mg/kg/dose; titrate to effect; may need to co-administer atroping/glycopyrrolate. *Adults:* 10–20 mg/dose with atropine/glycopyrrolate.	*Caution:* Patients with asthma, cardiac dysfunction or arrhythmias, peptic ulcer. *Adverse effects:* Bradycardia, AV block, seizures, headache, diarrhea, abdominal cramping, salivation, urinary frequency, muscle weakness, miosis, lacrimation, increased bronchial secretions.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Pyridoxine Nestrex; generic. Tablet: 25, 50, 100 mg; Tablet, sustained-release: 100 mg. Injection: 100 mg/mL.	**Vitamin B_6 used for dietary or drug-induced (e.g., isoniazid, hydralazine) deficiency and B_6-dependent seizures.** Pyridoxine-dependent seizures: *Children:* PO, IM, IV. 50–100 mg; maintenance dose 50–100 mg/24 hr. Dietary deficiency: *Children:* 5–15 mg/24 hr for 3–4 wk, then 2.5–5 mg/24 hr. *Adults:* 10–20 mg/24 hr for 3–4 wk. Drug-induced neuritis: PO, IM, IV: *Children:* 1 mg/kg/24 hr daily. *Adults:* 100–200 mg/24 hr daily.	*Caution:* May decrease serum phenobarbital and phenytoin concentrations. Large IV doses may precipitate seizures. *Adverse effects:* Nausea, decreased folic acid, liver function tests.
Quetiapine Atypical antipsychotic. Seroquel. Tablet: 25, 100, 200, 300 mg.	**Antagonist of serotonin, dopamine, and α_1- and α_2-adrenergic receptors.** *Children:* PO: Start 12.5 mg bid, then increase in 25–50 mg increments to 300–400 mg/24 hr divided in 2–3 doses. *Adults:* PO: Start 25 mg bid, then increase in 25–50 mg increments q 2–3 days to response, to 300–400 mg/24 hr divided in 2–3 doses (max: 800 mg/24 hr).	*Adverse events:* Somnolence, dizziness, headache, constipation, dry mouth, dyspepsia, postural hypotension, tachycardia.
Quinidine Quinaglute, Quinidex; generic. Tablet (sulfate): 200, 300 mg. Tablet sustained-release (sulfate): 300 mg. Tablet, sustained-release (gluconate): 324 mg. Injection (gluconate): 80 mg/mL.	**Myocardial depressant used in the treatment of arrhythmias: supraventricular tachycardia, paroxysmal ventricular tachycardia, premature atrial/ventricular contractions.** *Children:* PO, IM, IV: 2 mg/kg Test dose to exclude idiosyncrasy: 20–50 mg/kg/24 hr sulfate salt q 4 hr PO; gluconate salt 2–10 mg/kg/dose q 3–6 hr IV. *Adults:* 199–600 mg/dose sulfate salt q 4–6 hr PO; 324–972 mg/dose gluconate q 8–12 hr; 200–400 mg/dose sulfate IV; titrate to effect.	*Caution:* First-dose syncope; 267 mg quinidine gluconate = 200 mg quinidine sulfate. Infuse IV slowly <10 mg/min *Adverse effects:* Syncope, hypotension, heart block, fever, abdominal discomfort, bone marrow suppression, thrombocytopenia, idiopathic thrombocytopenic purpura, cinchonism. *Drug interactions:* Verapamil, cimetidine, phenytoin, phenobarbital, rifampin, digoxin.
Ranitidine Zantac; generic. Tablet/capsule: 150, 300 mg. Syrup: 15 mg/mL. Injection: 25 mg/mL. Effervescent granules and tablet: 150 mg.	**H_2-receptor antagonist competitively inhibits gastric acid secretion in gastric or peptic ulcer disease and stress ulcer prophylaxis; gastroesophageal reflux disease.** *Neonates:* PO, IV: 1.5–2 mg/kg/24 hr q 12 hr; continuous 24 hr IV infusion 0.04 mg/kg/hr (max: 1 mg/kg/24 hr). *Children:* PO, IM, IV: 1–5 mg/kg/24 hr q 6–8 hr; continuous 24 hr IV infusion 2–5 mg/kg/24 hr. *Adults:* PO: 150 mg/dose q 12 hr or 300 mg PO at bedtime. IM, IV: 50–100 mg/dose q 6–8 hr.	*Caution:* Dose may be titrated to desired gastric pH from gastric aspirate. *Adverse effects:* Headache, mental confusion, pain at injection site. *Comment:* Very few if any clinically important drug-drug interactions.
Risperidone Risperdal. Tablet: 0.25, 0.5, 1, 2, 3, 4 mg. Oral liquid: 1 mg/mL.	**Atypical antipsychotic.** *Children:* Start 0.25 mg bid; increase per response to 3 mg bid. *Adolescents and adults:* Start 1 mg bid; increase to 3 mg bid or to response.	*Caution:* May cause Q-T prolongation and increase risk of sudden cardiac death; monitor ECG and avoid concurrent use with other drugs that prolong QT interval. *Adverse events:* Dizziness, drowsiness, agitation, headache, tachycardia, constipation, dry mouth, orthostatic hypotension, weight gain.
Riboflavin Generic. Tablet: 25, 50, 100 mg.	**Vitamin used in supplementation and deficiency states.** Deficiency: *Children:* PO: 2.5–10 mg/24 hr q 8–12 hr. *Adults:* PO: 5–30 mg/24 hr q 8–12 hr.	*Adverse effects:* Extremely rare. *Drug interaction:* Probenecid.
Rocuronium Zemuron. Injection: 10 mg/mL.	**Anesthetic/skeletal muscle relaxant, nondepolarizing neuromuscular blocking agent.** *Children and adults:* Initial dose: 0.6–12 mg/kg; subsequent doses administered as needed at 0.2 mg/kg q 20–30 min. Continuous IV infusion or 10–12 μg/kg/min.	*Cautions:* Ventilation must be supported during neuromuscular blockade. Dose adjustment with hepatic dysfunction. *Adverse effects:* Tachycardia, hypotension, prolonged muscle weakness, bronchospasm. *Drug interactions:* Possible augmented muscle weakness with aminoglycosides, anesthetics, colistin.
Salmeterol Serevent. Aerosol canister.	**Long-acting β_2-adrenergic agonist (≈8–12+ hr); bronchodilator used to treat reversible airway disease. Excellent in patients with nocturnal asthma.** *Children and adults:* 1–2 puffs (21 μg), aerosol q 12 hr; titrate to desired effect.	*Caution:* Not for use in acute asthma attack. *Adverse effects:* Tachycardia, palpitations, headache, nervousness, muscle tremor, cough, airway irritation.
Sargramostim Leukine; Prokine. Injection: 250, 500 μg.	**Granulocyte-macrophage (GM-CSF) colony-stimulating factor for acceleration of myeloid recovery from chemotherapy or marrow insult.**	*Caution:* Monitor white blood cell count to define duration of therapy. *Adverse effects:* Tachycardia, hypotension, flushing, fluid retention, fever, malaise, bone pain, myalgia, rigors, dyspnea.
Scopolamine Transderm Scop; generic. Transdermal patch.	**Anticholinergic agent used to control secretions; postoperative antiemetic; treatment or motion sickness.** Postoperative emesis: *Children:* IM, IV, SC: 6μg/kg/dose q 6–8 hr. *Adults:* 0.3–0.65 mg/dose q 6–8 hr. Motion sickness: *Children and adults:* 1 patch behind the ear at least 4 hr before movement.	*Caution:* Narrow-angle glaucoma, ileus. Use patch cautiously in children <12 yr. *Adverse effects:* Tachycardia, disorientation, sedation, psychosis, dry mouth, constipation, urinary retention, blurred vision. *Drug interactions:* Other anticholinergic compounds; may interfere with gastrointestinal absorption of certain drugs.
Senna Senokot; X-Prep; generic. Syrup: 218 mg/5 mL. Tablet: 187, 217, 600 mg. Granules: 326 mg/tsp.	**Stimulant cathartic for short-term treatment of constipation; bowel preparation before radiology.** *Children:* PO: 10–20 mg/kg/dose, q 12–24 hr.	*Caution:* Avoid prolonged use (>1 wk); dependence. *Adverse effects:* Abdominal cramping, diarrhea, fluid and electrolyte imbalance.
Sertraline Antidepressant; serotonin reuptake inhibitor. Zoloft. Tablet: 25, 50, 100 mg. Oral solution (concentrate): 20 mg/mL.	**Treatment of depression, obsessive-compulsive disorder, panic disorder, post-traumatic stress disorder, attention deficit disorder.** *Children 6–12 yr:* Start 25 mg q 24 hr; increase by 25 mg weekly to response, dose q 24 hr (max: 200 mg/24 hr). *Children > 12 yr and adults:* Start 50 mg q 24 hr, increase 25–50 mg weekly to response; dose q 24 hr (max: 200 mg/24 hr).	*Caution:* Do not discontinue abruptly or withdrawal symptoms (selective serotonin reuptake inhibitor discontinuation syndrome) may occur. Taper maximum or 50 mg/24 hr q 5–7 days. *Adverse events:* Insomnia, somnolence, headache, dry mouth, nausea, diarrhea.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Simethicone Gas-X; Mylicon; generic. Tablet, chewable: 40, 80, 125 mg. Capsule: 125 mg. Drops: 40 mg/0.6 mL.	**Antiflatulent for symptomatic relief of colic, excessive gas.** *Children < 2 yr:* PO: 20 mg/dose q 4–6 hr. *Children 2–12 yr:* PO: 40 mg/dose q 6 hr. *Children > 12 yr and adults:* PO: 40–120 mg q 6 hr; dose titrated to effect.	*Comments:* Very safe drug with rare adverse effects. Dose may be titrated to desired effect by increasing dose or more frequent doses/day. Avoid gas-producing and gastrointestinal irritant foods.
Sodium polystyrene sulfonate Kayexalate; generic. Powder for suspension.	**Ion-exchange resin that removes potassium for sodium for the treatment of hyperkalemia.** *Children:* PO: 4 g/kg/24 hr, q 4–8 hr; rectal: 4–12 g/kg/24 hr q 2–6 hr. *Adults:* PO: 15 g/dose, q 6–12 hr.	*Cautions:* Follow serum potassium closely. Do not mix with potassium-containing liquids (e.g., orange juice). *Adverse effects:* Abdominal cramping, bloating, hypokalemia.
Sodium thiosulfate Tinver, generic. Injection: 100, 250 mg/mL.	**Cyanide (nitroprusside) and cisplatin antidote. Provides an extra sulfur to rhodanese enzyme to enhance cyanide detoxification.** Nitroprusside: *Children and adults:* IV: 1 g sodium thiosulfate for every 100 mg nitroprusside administered. May infuse in same IV. Cisplatin: *Adults:* IV: 12 g infused over 6 hr before or concurrent with cisplatin infusion. Alternate: 9 g/m^2 IV bolus followed by 1.2 g/m^2/hr for 6 hr before or during cisplatin infusion.	*Caution:* Rapid IV infusion may cause hypotension. *Adverse effects:* Very unusual. Hypotension, local irritation at infusion site.
Sotalol Class III antiarrhythmic. Betapace. Tablet: 80, 120, 160 mg.	**Treatment of supraventricular and ventricular arrhythmias.** *Children:* PO: 2–8 mg/kg/24 hr divided q 8–12 hr. *Adults:* PO: Start 80 mg q 12 hr and titrate q 3–4 days to response (max: 640 mg/24 hr).	*Cautions:* Proarrhythmic effect that worsens congestive heart failure or diabetes. Reduce dose for declining renal function (1/2 dose for CrCl < 60 mL/min, 1/3 dose for CrCl < 30 mL/Min). Extend interval to decrease dose.
Spironolactone Aldactone; generic. Tablet: 25, 50, 100 mg.	**Competitive aldosterone antagonist used as a mild, potassium-sparing diuretic, an antihypertensive, and in chronic liver disease.** *Neonates:* PO: 1–3 mg/kg/24 hr divided q 12–24 hr. *Children:* PO: 1.5–3.3 mg/kg/24 hr divided q 8–24 hr. *Adults:* PO: 25–200 mg/dose q 12–24 hr.	*Caution:* Careful monitoring of serum potassium/potassium intake. Suspension may be made with crushed tablets in water/glycerin. *Adverse effects:* Lethargy, hyperkalemia, gynecomastia, nausea, rash.
Streptokinase Streptase. Injection.	**Thrombolytic agent used to treat deep vein thrombosis, stroke, catheter patency.** Thrombosis: IV: 3,500–4,000 units infused IV over 30 min followed by 1,000–1,500 units by continuous infusion. Clotted catheter: IV: 10,000–25,000 units in normal saline at the volume of the catheter instilled into catheter for ~1 hr, then removed (aspirated).	*Caution:* Recent strep infection may reduce efficacy. *Adverse effects:* Bleeding bronchospasm, flushing, rash. *Drug interactions:* Anticoagulants, antiplatelet drugs.
Succimer Chemet. Capsule: 100 mg.	**Metal chelator that forms water-soluble salts with lead, mercury, and arsenic.** *Children and adults:* PO: 10 mg/kg/dose q 8 hr for 5 days, then 10 mg/kg/dose q 12 hr for 14 days.	*Caution:* Maintain adequate hydration. Capsule may be opened and beads sprinkled onto soft foods. *Adverse effects:* Headache, dizziness, nausea, abdominal cramping, flu-like symptoms.
Succinylcholine Anectine. Injection.	**Neuromuscular blocking agent.** *Children:* IV: 1–2 mg initial dose; maintenace dose of 0.3–0.6 mg/kg q 5–10 min, titrated to level of skeletal muscle relaxation. *Adults:* IV: 0.6 mg/kg up to 150 mg initial dose; maintenance dose of 0.04–0.07 mg/kg q 5–10 min titrated to effect.	*Caution:* Patients with hyperkalemia, severe trauma, increased intraocular or intracranial pressure. *Adverse effects:* Bradycardia, hypotonsion, malignant hyperthermia, hyperkalemia, bronchospasm. *Drug interactions:* Muscle depressants or relaxants.
Sucralfate Carafate. Tablet: 1 g. Suspension: 1 g/10 mL.	**Aluminum salt of sulfated sucrose in presence of acid forms a pastelike substance that adheres to damaged mucosa.** *Children:* PO: 40–80 mg/kg/24 hr divided q 6–8 hr. Stomatitis: PO: 5–10 mL swish/spit or swallow q 6 hr. *Adults:* PO: 1 g/dose q 4–6 hr.	*Caution:* May use topically for stomatitis. *Adverse effects:* Headache, constipation, abdominal cramping, rash. *Drug interactions:* Decreases absorption of phenytoin, tetracycline, ketoconazole, theophylline, digoxin, cimetidine.
Sufentanil Sufenta. Injection.	**Opioid analgesic used in anesthesia and for pain management.** *Children:* IV: 10–25 μg/kg initial dose, titrated to desired effect with 25–50 μg/kg. *Adults:* IV: 0.5–8 μg/kg initial dose with maintenance dose of 10–50 μg/kg.	*Caution:* In patients with head trauma or concurrent monoamine oxidase inhibitors, adverse effect profiles of all opiates are potentiated. *Adverse effects:* Bradycardia, vasodilatation, nausea, vomiting, blurred vision, respiratory depression, addiction potential. *Drug interactions:* CNS and respiratory depressants.
Sulfasalazine Azulfidine; generic. Tablet: 500 mg.	**Anti-inflammatory 5-aminosalicylic acid derivative combined with sulfonamide used in treatment of inflammatory bowel disease.** *Children:* PO: Initially, 40–75 mg/kg/24 hr divided q 4–6 hr (max: 6 g/24 hr); maintenance dose of 30–50 mg/kg/24 hr divided q 6–8 hr. *Adults:* PO: 1 g/dose q 6–8 hr (max: 6 g/24 hr).	*Caution:* Hypersensitivity to sulfa drugs. *Adverse effects:* Rash, dizziness, headache, nausea, bone marrow suppression. *Drug interactions:* Decreases folate and digoxin absorption.
Tacrolimus Immunosuppressant. Prograf. Injection. Capsule: 1, 5 mg. Extemporaneous preparations may be prepared.	**Prevents graft vs host disease in organ transplant.** *Children:* PO: 0.15 mg/kg q 12 hr; IV: continuous infusion of 0.05–0.1 mg/kg/24 hr. *Adults:* PO: 0.075–0.15 mg/kg q 12 hr; IV: continuous infusion of 0.05–0.1 mg/kg/24 hr.	*Adverse events:* Hypertension, headache, insomnia, abdominal and back pain, fever, asthenia, pruritus, hypo/hyperkalemia, hypomagnesemia, hyperglycemia, nausea, vomiting, diarrhea, anemia, leukocytosis, liver damage, nephrotoxicity, dyspnea, pleural effusion, peripheral edema. *Monitoring:* Tacrolimus trough concentrations: therapeutic: 9.8–19.4 ng/mL using whole blood ELISA assay; 0.5–1.5 ng/mL using serum high-pressure liquid chromnatography.
Teniposide, VM-26 Vumon. Injection: 10 mg/mL.	**Treatment of acute lymphocytic leukemia (ALL) and lung cancer (inhibits cells from entering mitosis).** *Children:* IV: Start 130 mg/m^2/wk, increase at 3 wk to 150 mg/m^2, and at 6 wk to 180 mg/m^2. *Adults:* ALL: 250 mg/m^2 wk for 4–8 wk.	*Caution:* Increases intracellular accumulation of methotrexate and thus toxicity. *Adverse events:* Nausea, vomiting, diarrhea, mucositis, myelosuppression, alopecia, rash, fever, hemorrhage, peripheral neuropathy. *Comment:* Patients with Down syndrome should be started at 1/2 the usual dose.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Terbutaline sulfate Brethine; generic. Injection. Tablet: 2.5, 5 mg. Metered-dose inhaler (MDI).	**Bronchodilator (β_2-receptor agonist).** *Children < 12 yr:* PO: 0.05 mg/kg/dose q 8 hr (max: 5 mg). SC: 0.005–0.01 mg/kg/dose; may repeat in 15–20 min (max: 0.4 mg). *Children ≥ 12 yr and adults:* PO: 2.5–5 mg/dose q 6–8 hr. SC: 0.25 mg/dose; may repeat in 15 min. *Children and adults:* MDI: 1–2 puffs q 6–8 hr as needed.	*Adverse events:* Tachycardia, arrhythmias, flushing, headache, nervousness, tremor, hypokalemia, muscle cramps, paradoxical bronchospasm.
Terfenadine Seldane. Tablet: 60 mg.	**Treatment of allergic symptoms (antihistamine).** *Children:* *3–6 yr:* 15 mg bid. *6–12 yr:* 30 mg bid. *>12 yr and adults:* 60 mg bid.	*Caution:* Prolonged Q-T interval and fatal arrhythmias may occur if combined with drugs that inhibit liver enzymes. *Adverse events:* Drowsiness, fatigue. *Drug interactions:* Azole antifungals, macrolides, and cimetidine may prolong Q-T interval and produce dysrhythmias.
Testosterone Generic. Injection.	**Androgen replacement in male hypogonadism and delayed puberty (replacement therapy).** *Children:* IM Male hypogonadism: Initiation of prepubertal growth and delayed puberty: 40–50 mg/m^2/dose monthly; terminal growth phase: 100 mg/m^2/dose 2× monthly. *Adults:* Hypogonadism: IM: 50–400 mg q 2–4 wk.	*Caution:* May accelerate bone maturation without producing compensating gain in linear growth. *Adverse events:* Acne, bladder irritability, aggressive behavior, depression, sleeplessness, headache, hirsutism, hepatic dysfunction.
Tetanus antitoxin Injection.	**Prevention or treatment of tetanus when tetanus immune globulin unavailable.** *Children and adults:* SC, IM: Prophylaxis: <30 kg 1,500 units; >30 kg 3,000–5,000 units. Treatment: Inject 10,000–40,000 units into wound and 40,000–100,000 units IV.	*Adverse events:* Serum sickness, urticaria, skin eruptions, allergic reactions.
Tetanus immune globulin Hyper-Tet. Injection.	**Prophylaxis and treatment of tetanus.** Prophylaxis: *Children:* IM 4 u/kg. *Adults:* IM: 250 units. Treatment: *Children:* IM 500–3,000 units. *Adults:* IM 3,000–6,000 units (infiltrate some of dose around wound).	*Adverse events:* Allergic reactions.
Theophylline Generic. Syrup, solution, elixir, capsule, tablet (sustained-release forms also). (See *Aminophylline* for IV dosing).	**Treatment of apnea of prematurity, symptoms of reversible airway disease (affects intracellular transport of calcium, phosphodiesterase inhibitor, weak anti-inflammatory agent).** *Neonates:* Apnea, bronchodilation: Loading dose or 6–10 mg/kg; maintenance dose or 2–4 mg/kg/dose q 12 hr. *Infants and children:* *6 wk–6 mo:* 10 mg/kg/24 hr. *6 mo–1 yr:* 12–18 mg/kg/24 hr. *1–9 yr:* 20–24 mg/kg/24 hr. *9–12 yr:* 16 mg/kg/24 hr. *12–16 yr:* 13 mg/kg/24 hr. *Adults:* 10 mg/kg/24 hr. Dosing may be increased for smokers and enzyme-inducing drugs; decrease dose for patients with enzyme inhibitors, liver disease, heart failure, or hypothyroidism.	*Cautions:* May cause or worsen arrhythmias, seizures, or gastroesophageal reflux. Theophylline clearance is modified by numerous disease states and drugs requiring dosing adjustments guided by serum theophylline concentrations. Clearance is reduced by viral illnesses, fever >102°F for > 24 hr, cor pulmonale, and drugs that inhibit P450 enzymes (cimetidine, verapamil, macrolides, quinolones); reduce dose by 50%. *Adverse events:* Tachycardia, nervousness, hyperactivity, difficulty concentrating, irritability, agitation, headache, nausea, vomiting, abdominal pain, feeding intolerance, frequent urination, seizures and arrhythmias at toxic levels. *Monitoring:* Theophylline concentrations: therapeutic: neonatal apnea: 6–15 μg/mL; prevent intubation or promote extubation: 10–20 μg/mL; bronchodilation: 5–20μg/mL; toxic > 20μg/mL.
Thiamine Generic. Injection. Tablet: 50, 100, 250, 500 mg.	**Nutritional supplement, treatment of beriberi and Wernicke encephalopathy (essential coenzyme in carbohydrate metabolism).** Beriberi: *Children:* IM, IV: 10–25 mg/24 hr. PO: 10–50 mg/24 hr for 2 wk, then 5–10 mg/24 hr for 1 mo. *Adults:* IM, IV: 5–30 mg tid for 2 wk, then 15–30 mg/24 hr PO for 1 mo. Wernicke encephalopathy: IM, IV: 100 mg/24 hr until consuming a balanced diet.	*Adverse events:* Cardiovascular collapse with repeated IV doses, angioedema, rash, tingling.
Thioguanine 6-TG. Tablet: 40 mg.	**Treatment of leukemias (purine analog inhibits synthesis and use of purine nucleotides).** *Children < 3 yr:* Acute nonlymphocytic leukemia: PO: 3.3 mg/kg/24 hr in 2 doses for 4 days. *Children > 3 yr and adults:* PO: 2–3 mg/kg daily (rounded to nearest 20 mg) until remission.	*Adverse events:* Myelosuppression (onset, 7–10 days; nadir, 14 days; recovery, 21 days), nausea, vomiting, diarrhea, anorexia, stomatitis, hyperuricemia, unsteady gait.
Thiopental Ultra–short-acting barbiturate. Pentothal Sodium. Injection.	**Anesthesia induction and maintenance, intractable seizures, increased intracranial pressure.** *Neonates:* IV: Anesthesia: 3–4 mg/kg. Seizures: 2–3 mg/kg; repeat doses 1 mg/kg as needed. *Infants and children:* IV: Anesthesia: 5–8 mg/kg. Seizures: 2–3 mg/kg. Increased intracranial pressure: 1.5–5 mg/kg, repeated as needed.	*Adverse events:* Cramping, diarrhea, rectal bleeding, hypotension, myocardial depression, prolonged somnolence and recovery, emergence delirium, respiratory depression, coughing, bronchospasm, laryngospasm, hiccups, sneezing. *Monitoring:* Thiopental concentrations: therapeutic: hypnosis: 1–5 μg/mL; anesthesia: 7–130 μg/mL; coma: 30–100 μg/mL.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
	Adults: IV: 25–250 mg as needed for effect. Sedation: Rectal: *Children:* 5–10 mg/kg/dose. *Adults:* 3–4 g/dose.	
Thioridazine Mellaril; generic. Oral concentrate: 30, 100 mg/mL. Oral suspension: 25 mg/5 mL, 100 mg/5 mL. Tablet: 10, 15, 25, 50, 100, 150, 200 mg.	**Treatment of psychosis, neurosis, and severe behavior problems in children (phenothiazine; blocks dopamine receptors in the brain).** *Children > 2 yr:* 0.5–3 mg/kg/24 hr in 2–3 doses PO. *Children > 12 yr and adults:* 25–800 mg/24 hr in 2–4 doses PO.	*Adverse events:* Pseudoparkinsonism, tardive dyskinesia, akathisia, dystonias, dizziness, neuroleptic malignant syndrome, impaired temperature regulation, orthostatic hypotension, pigmentary retinopathy, cholestatic jaundice, leukopenia, agranulocytosis, urinary retention, constipation, dry mouth, gastrointestinal upset, hyperpigmentation, photosensitivity.
Thiotepa Thioplex. Alkylating agent. Injection.	**Cancer chemotherapy (inhibits DNA, RNA, and protein synthesis).** *Children:* IV (depends on protocol): regular dose: 25–65 mg/m^2 q 3–4 wk; high dose: 300 mg/m^2/24 hr for 3 doses. *Adults:* IV: continuous infusion of 15–35 mg/m^2 over 48 hr.	*Adverse events:* Myelosuppression (onset, 7–10 days; nadir, 14 days; recovery, 28 days), dizziness, fever, headache, anorexia, nausea, vomiting, alopecia, rash, pruritus, hyperuricemia, hematuria, hemorrhagic cystitis, stomatitis.
Thiothixene Navane; generic. Injection. Capsule: 1, 2, 5, 10, 20 mg. Oral concentrate: 5 mg/mL.	**Management of psychosis (phenothiazine; blocks CNS dopamine receptors).** *Children <12 yr:* 0.25 mg/kg/24 hr in divided doses. *Children >12 yr and adults:* PO: 6–60 mg/24 hr in 3 doses. IM: 4 mg bid–qid (max: 30 mg/24 hr).	*Adverse events:* Orthostatic hypotension, pseudoparkinsonism, tardive dyskinesia, akathisia, dystonias, constipation, urinary retention, dry mouth, stomach pain, nasal congestion, pigmentary retinopathy, agranulocytosis, leukopenia, neuroleptic malignant syndrome, impaired temperature regulation, finger tremor, cholestatic jaundice.
Thrombin, topical Thrombinar; Thrombogen; Thrombostat. Powder.	**Hemostasis for minor bleeding from capillaries and venules (catalyzes conversion of fibrinogen to fibrin).** *Children and adults:* Apply topically as solution 1,000–2,000 u/mL directly to site.	*Adverse events:* Allergy.
Tiagabine Gabitril. Tablet: 2, 4, 12 16, 20 mg.	**Treatment of partial seizures. Used as adjunctive, add-on therapy. γ-Aminobutyric acid reuptake inhibitor.** *Adolescents and adults:* PO: Start at 4 mg daily; increase by 4–8 mg q wk until response (max: 56 mg/24 hr).	*Cautions:* CNS problems, including dizziness, drowsiness, ataxia, tremor, and muscle weakness; also may cause nonconvulsive status epilepticus.
Timolol Timoptic. Ophthalmic solution, ophthalmic gel, tablet.	**Treatment of elevated intraocular pressure (blocks β_1 and β_2 receptors and decreases aqueous humor production).** *Children:* (only ophthalmic use) Instill 0.25% solution 1 drop twice daily; may increase to 0.5% solution if response inadequate; may decrease to once daily if controlled. *Adults:* Same ophthalmic dose as children.	*Adverse events:* Bronchospasm, bradycardia, hypotension, visual disturbance, conjunctivitis, keratitis.
Tissue plasminogen activator Alteplase; Retavase. Injection.	**Thrombolytic therapy (enhances conversion of plasminogen to plasmin).** *Neonates:* 0.1–0.5 mg/kg/hr for 3–10 hr. *Children:* 0.1–0.6 mg/kg/hr for 6 hr. *Adults:* 100 mg infused as 60 mg in first hr, 20 mg in 2nd hr, 20 mg in 3rd hr.	*Caution:* Initiate heparin concurrently to avoid thrombosis and thrombotic emboli. *Adverse events:* Bleeding, arrhythmias (related to post-first myocardial infarction reperfusion). *Monitoring:* D-Dimer, fibrinogen, bleeding time.
Tolazoline Priscoline. Injection: 25 mg/mL.	**Treatment of persistent pulmonary hypertension (α-adrenergic blocker and histamine release).** *Neonates:* IV: loading dose of 1–2 mg/kg, then 1–2 mg/kg/hr as continuous infusion.	*Adverse events:* Hypotension, flushing, tachycardia, increased secretions from respiratory and gastrointestinal tracts; gastrointestinal bleeding and perforation; oliguria; pulmonary hemorrhage; thrombocytopenia. *Monitoring:* Preductal and postductal oxygen saturation, arterial blood gases.
Tolmetin sodium Nonsteroidal anti-inflammatory agent; prostaglandin inhibitor. Tolectin; generic. Tablet: 200, 600 mg. Capsule: 400 mg.	**Treatment of rheumatoid arthritis, including juvenile rheumatoid arthritis.** *Children >2 yr:* PO: 15–30 mg/kg/24 hr in 3–4 doses. Analgesia: 5–7 mg/kg/dose. *Adults:* 400–600 mg tid (max: 2 g/24 hr).	*Adverse events:* Gastrointestinal upset, peptic ulcer disease, hypertension, edema, dizziness, headache, acute renal failure, tinnitus.
Topiramate Topamax. Capsule: 15, 25 mg. Tablet: 25, 100, 200 mg.	**Treatment of seizure disorders. Broad spectrum of seizure types covered, and multiple mechanisms proposed.** *Children 2–16 yr:* PO: Start 1–3 mg/kg/24 hr at bedtime for 1 wk; titrate dose increases every 1–2 wk by 1–3 mg/kg/24 hr dosed bid; typical dose 5–10 mg/kg/24 hr divided q 12 hr. Capsules may be sprinkled on food to administer. *Adults:* PO: Start 25–50 mg q 24 hr; increase by 25–50 mg/24 hr q wk (max: 1,600 mg/24 hr). Reduce dose by 50% if CrCl < 60 mL/min.	*Cautions:* If used with other carbonic anhydrase inhibitors, additive effects may predispose to renal stones.
Tranexamic acid Cyklokapron. Injection: 100 mg/mL. Tablet: 500 mg.	**Used in hemophilia during and after tooth extractions to reduce or prevent hemorrhage (competitively inhibits activation of plasminogen).** *Children and adults:* IV: 10 mg/kg immediately before surgery, then 25 mg/kg/dose PO tid–qid for 2–8 days.	*Adverse events:* Hypotension, thromboembolic complications (including CNS), thrombocytopenia, nausea, vomiting, diarrhea. *Comment:* Decrease dose in renal impairment (CrCl 50–80 mL/min: give 50% of dose; CrCl 10–50 mL/min; give 25% of dose; CrCl <10 mL/min: give 10% of dose).
Trazodone Desyrel; generic. Tablet: 50, 100, 150, 300 mg.	**Antidepressant (inhibits serotonin reuptake, α-adrenergic blockade).** *Children 6–18 yr:* Start 1.5–2 mg/kg/24 hr in 3 doses; may increase q 3–4 days (max: 6 mg/kg/24 hr). *Adolescents:* Start 25–50 mg/24 hr; may increase gradually (max: 150 mg) in 2–3 doses. *Adults:* Start 50 mg tid; may increase by 50 mg.	*Adverse events:* Headache, confusion, dizziness, dry mouth, nausea, bad taste in mouth, constipation, blurred vision, muscle tremors, hypotension, tachycardia. *Drug interactions:* Fluoxetine may increase levels. *Monitoring:* Trazodone concentrations (limited correlation with clinical effectiveness): therapeutic 0.5–2.5 μg/mL; toxic > 4 μg/mL.
Tretinoin Retin-A. Cream: 0.025%, 0.05%, 0.1%. Topical gel: 0.01%, 0.025%. Topical liquid: 0.05%.	**Treatment of acne vulgaris, photo-damaged skin, and some skin cancers (inhibits microcomedone formation and eliminates lesions).** *Children > 12 yr:* Apply weaker formulation daily at bedtime. Increase as needed.	*Adverse events:* Excessive skin dryness, erythema, scaling, and local stinging and burning; photosensitivity (use sun block), initial acne flare-up.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Triamcinolone Corticosteroid. Generic. Injection (Amcort). Oral (Aristocort). Topical (Aristocort). Metered-dose inhaler (MDI) (Azmacort). Nasal spray (Nasacort).	**Treatment of inflammatory and allergic conditions.** *Children 6–12 yr:* IM: 0.03–0.2 mg/kg q 1–7 days. MDI: 2 puffs bid–qid. Intranasal: 1 spray in each nostril 1–2 times/24 hr. Injection: Intra-articular, intrabursal, or tendon sheath: 2.5–15 mg (repeat as needed). *Children > 12 yr* and adults: MDI: 2–4 puffs bid–qid. Intranasal: 2 sprays in each nostril daily (max: 4 sprays/24 hr). Intra-articular, intrasynovial: 2.5–40 mg. PO: 40–100 mg/24 hr in 1–4 doses. Topical: Apply thin film bid–tid.	*Adverse events:* Atrophy of tissue at local application site, fatigue, cataracts, osteoporosis, oral candidiasis (with MDI), poor growth. *Comment:* See comparison of corticosteroids under *Hydrocortisone.*
Triamterene Dyrenium. Capsule: 50, 100 mg (combination drugs, e.g., with hydrochlorothiazide).	**Diuretic to treat edema or hypertension (competes with aldosterone for receptor sites in distal renal tubules).** *Children:* PO: 2–4 mg/kg/24 hr in 1–2 doses (max: 6 mg/kg/24 hr). *Adults:* 100–300 mg/24 hr in 1–2 doses.	*Caution:* Do not use in patients with renal failure; avoid concurrent potassium supplements to avoid hyperkalemia. *Adverse events:* Constipation, nausea, headache, fatigue, hyperkalemia, hyponatremia, hyperchloremic metabolic acidosis.
Trientine Chelating agent. Syprine. Capsule: 250 mg.	**Treatment of Wilson disease in patients who cannot tolerate penicillamine.** *Children < 12 yr:* 500–1,500 mg/24 hr in 2–4 doses. *Children > 2 yr and adults:* 750–2,000 mg/24 hr in 2–4 doses.	*Comment:* Take 1 hr before or 2 hr after meals. Do not break capsule in any way, and take with full glass of water. If capsule breaks, wash area of skin where contents touched thoroughly with water. *Adverse events:* Iron-deficiency anemia, malaise, epigastric pain, thickening and fissuring of skin, muscle cramps, systemic lupus erythematosus.
Trifluoperazine Stelazine. Oral concentrate: 10 mg/mL. Tablet: 1, 2, 5, 10 mg. Injection.	**Treatment of psychosis (phenothiazine; blocks dopamine in the CNS).** *Children 6–12 yr:* PO: 1 mg 1–2 times/24 hr, gradually increase to effect (max: 15 mg/24 hr). IM: 1 mg bid. *>12 yr and adults:* PO: 1–2 mg bid. IM: 1–2 mg q 4–6 hr as needed (max: 10 mg/24 hr).	*Adverse events:* Hypotension, tachycardia, arrhythmias, pseudoparkinsonism, tardive dyskinesia, akathisia, dystonias, constipation, nasal congestion, dry mouth, malignant hypertension.
Trimethaphan camsylate Adrenergic and cholinergic blocker. Arfonad. Injection.	**Treatment of hypertensive emergencies.** *Children:* 50–150 µg/kg/min. *Adults:* 0.5–2 mg/min.	*Adverse events:* Anorexia, nausea, dry mouth, ileus, urinary retention, cycloplegia, itching, urticaria, apnea, hypotension.
Trimethobenzamide Tigan; generic. Capsule: 100, 250 mg. Rectal suppository: 100, 200 mg. Injection: 100 mg/mL.	**Control of nausea and vomiting (inhibits CNS stimulation of chemoreceptor trigger zone).** *Children:* PO, rectal: 15–20 mg/kg/24 hr in 3–4 doses. *Adults:* PO: 250 mg tid–qid. IM, rectal: 200 mg tid–qid.	*Adverse events:* Drowsiness, dizziness, headache, diarrhea, muscle cramps.
Tromethamine THAM. Injection: 0.3 M (1 mEq THAM = 3.3 mL).	**Correction of metabolic acidosis (combines with hydrogen ions to form bicarbonate and buffer).** *Neonates, infants, children, and adults:* Dose (mL of 0.3 M solution) = weight (kg) × base deficit, or 1–2 mEq/kg/dose.	*Adverse events:* Apnea, hypoglycemia, hyperkalemia, tissue irritation, or necrosis if direct contact.
Tropicamide Mydriacyl. Ophthalmic solution: 0.5%, 1%.	**Short-acting mydriatic agent (blocks sphincter muscle of iris and ciliary body from responding to cholinergic stimulation).** *Children and adults:* Cycloplegia: Instill 1–2 drops of 1% solution; may repeat in 5 min. Mydriasis: Instill 1–2 drops of 0.5% solution 15–20 min before examination.	*Adverse events:* Tachycardia, drowsiness, headache, dry mouth, blurred vision, photophobia.
Tubocurarine Injection.	**Neuromuscular blocker used in anesthesia (blocks acetylcholine receptors).** *Neonates:* Start 0.3 mg/kg; maintenance dose of 0.1 mg/kg/dose. *Children:* Start 0.2–0.5 mg/kg, then maintenance dose of 0.04–0.1 mg/kg/dose. *Adults:* Start 6–9 mg, then maintenance dose of 3–4.5 mg.	*Adverse events:* Hypotension, prolonged respiratory depression.
Urokinase Abbokinase. Injection.	**Thrombolytic agent for treatment of recent-onset thrombosis (activates plasminogen conversion to plasmin).** *Neonates, infants, children, and adults:* IV: Loading dose of 4,400 u/kg; maintenance dose or 4,000–10,000 u/kg/hr. Occluded IV catheter: Fill entire volume of catheter with urokinase 5,000 u/mL and leave in lumen for 1–4 hr.	*Adverse events:* Bleeding, hematoma, allergic reactions, bronchospasm. *Monitoring:* D-Dimer, fibrin degradation products, activated coagulation time.
Ursodiol, ursodeoxycholic acid Actigall. Capsule: 300 mg. Extemporaneous formulations may be compounded.	**Gallbladder stone dissolution, reversal of total parenteral nutrition–induced cholestasis in neonates (decreases cholesterol content of bile).** *Neonates:* PO: 10–18 mg/kg/24 hr divided into 1–3 doses day. *Infants:* 30 mg/kg/24 hr divided q 8–12 hr. *Adults:* 300 mg at bedtime for 6–12 mo.	*Adverse events:* Diarrhea, dyspepsia, biliary pain, rhinitis, pruritus, headache.
Valproic acid and derivatives Depakene, Depakote; generic. Depakote delayed-release tablet, capsule sprinkle: 125,250,500 mg. Depakene capsule: 250 mg. Syrup: 250 mg/5 mL. Injection.	**Treatment of simple and complex generalized and partial seizures (blocks sodium and slows T channels).** *Neonates:* Refractory seizures: PO: loading dose of 20 mg/kg, then 10 mg/kg/dose q 12 hr. *Children and adults:* Seizures: IV or PO.	*Caution:* Hepatic failure with fatalities have been reported, especially for patients < 2 yr of age or receiving other anticonvulsants. If used in neonates, monitor serum ammonia. *Adverse events:* Drowsiness, irritability, confusion, malaise, headache, tremor, sensorineural hearing loss, hyperammonemia, hepatotoxicity, nausea, vomiting, diarrhea, pancreatitis, thrombocytopenia, increased appetite, weight gain.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
	10–15 mg/kg/24 hr in 2–3 doses; increase weekly by 5–10 mg/kg/24 hr to effect; may need up to 100 mg/kg/day in 3–4 divided doses, especially if used with concurrent enzyme inducers (e.g., phenytoin, carbamazepine).	*Monitoring:* Valproate concentrations: therapeutic 50–100 μg/mL; toxic > 150 μg/mL.
Vasopressin Antidiuretic hormone analog. Pitressin. Injection: 20 pressor u/mL.	**Treatment of diabetes insipidus; prevention and treatment of postoperative abdominal distention; treatment of acute gastrointestinal hemorrhage.** *Children:* Diabetes insipidus: IM, SC: 2.5–10 u/dose bid–qid. Gastrointestinal hemorrhage: IV: continuous infusion of 0.002–0.01 u/kg/min. *Adults:* Diabetes insipidus: IM, SC: 5–10 u/dose bid–qid. Gastrointestinal hemorrhage: IV: continuous infusion of 0.2–0.4 u/min.	*Adverse events:* Increased blood pressure, bradycardia, arrhythmias, fever, flatulence, abdominal cramps, nausea, vomiting, tremor, sweating, circumoral pallor, water intoxication.
Vecuronium Norcuron. Injection.	**Adjunct to anesthesia, neuromuscular blocker (blocks acetylcholine from binding to motor end plates).** *Neonates:* 0.03–0.15 mg/kg/dose q 1–2 hr as needed. *Infants > 7 wk–12 mo:* 0.05–0.1 mg/kg q hr as needed. *Children 1 yr–adults:* 0.05–0.1 mg/kg q hr as needed.	*Adverse events:* Tachycardia, hypotension, flushing, bradycardia, circulatory collapse, hypersensitivity reactions.
Venlafaxine Serotonin and norepinephrine reuptake inhibitor. Effexor. Tablet: 25, 37.5, 50, 75, 100 mg.	**Treatment of depression, obsessive-compulsive disorder, attention deficit disorder** *Children:* 25–200 mg/24 hr; start low and titrate up q 4–7 days. *Adults:* Start 75 mg/24 hr; titrate q 4–7 days to effect (max: 375 mg/24 hr).	*Caution:* Taper slowly (max: 25 mg/24 hr q 5–7 days) if stopping drug to avoid withdrawal syndrome. *Adverse events:* Headache, somnolence, dizziness, insomnia, nervousness, nausea, dry mouth, constipation, blurred vision.
Verapamil Calan; Isoptin; generic. Capsule, sustained-release: 120, 180, 240, 360 mg. Tablet: 40, 80, 120 mg. Tablet, sustained-release: 120, 180, 240 mg. Injection.	**Calcium channel antagonist used to treat hypertension and supraventricular dysrhythmias.** Doses in infants and young children not well established. *Infants:* IV: 0.1–0.2 mg/kg dose repeated to desired effect. *Children:* IV: 0.1–0.3 mg/kg dose repeated to desired effect. *Children:* PO: 4–8 mg/kg/24 hr q 6–8 hr; usual dose 5 mg/kg/24 hr. *Adults:* PO: 240–480 mg/24 hr divided q 6–8 hr; q 12 hr with extended-release products. May sprinkle contents of capsule onto soft food without affecting absorption.	*Caution:* Adjust dose in renal disease. Avoid IV use in neonates and young infants, or those with heart failure. *Adverse effects:* Hypotension, bradycardia, heart block, dizziness, seizure, abdominal discomfort. Avoid in newborns because of several reports of fatality due to heart block. *Drug interactions:* May increase concentrations of caffeine, digoxin, carbamazepine, cyclosporine; decreased concentrations with rifampin, phenobarbital.
Vigabatrin Sabril (not available in USA; available in Canada, Mexico, Europe, and other countries). Tablet: 500 mg. Dry powder sachet.	**Effective against infantile spasms, partial seizures, and other seizure types. Mechanism is γ-aminobutyric acid transaminase inhibitor.** *Children:* 40–150 mg/kg/24 hr in 1–2 doses.	*Caution:* May cause bilateral visual field deficits; perform baseline eye examination and then every 6 months. CNS depression, psychiatric reactions, behavioral problems, and gastrointestinal intolerance may occur.
Vinblastine sulfate Alkaban-AQ; Velban; generic. Injection.	**Treatment of several cancers (binds to mitotic spindle to inhibit metaphase).** *Children:* Hodgkin disease: IV: 2.5–6 mg/m^2/24 hr q 1–2 wk for 3–6 wk (max: 12.5 mg/m^2/wk). *Adults:* 3.7–18.5 mg/m^2/24 hr q 7–10 days.	*Adverse events:* Alopecia, nausea, vomiting, abdominal cramps, constipation, diarrhea, stomatitis, myelosuppression (onset, 4–7 days; nadir, 4–10 days; recovery, 17 days), tachycardia, orthostatic hypotension, dermatitis, photosensitivity, muscle pain, paresthesias, urinary retention, hyperuricemia, peripheral neuropathy (loss of deep tendon reflexes, headache, weakness).
Vincristine Oncovin; generic. Injection.	**Treatment of various cancers (binds to mitotic spindle to inhibit metaphase).** *Children:* *<10 kg or body surface area < 1 m^2:* 0.05 mg/kg q/wk. *>10 kg or body surface area > 1 m^2:* 1–2 mg/m^2 q/wk. *Adults:* 0.4–1.4 mg/m^2 q/wk.	*Adverse events:* Constipation, paralytic ileus, depression, confusion, insomnia, headache, jaw pain, optic atrophy, blindness, loss of deep tendon reflexes in legs, numbness, tingling, pain, stocking-and-glove paresthesias, footdrop, wristdrop, syndrome of inappropriate secretion of antidiuretic hormone, photophobia, hyperuricemia, stomatitis, phlebitis, myelosuppression (onset, 7 days; nadir, 10 days; recovery, 21 days).
Vitamin A Aquasol A; generic. Injection. Oral drops. Capsule.	**Treatment or prevention of deficiency; supplementation in patients with measles (cofactor for many biochemical processes); improve growth in children with HIV or malaria. Prevention of bronchopulmonary dysplasia in neonates.** *Neonates:* IM: 4,000 IU 3× wk, or 2,000 IU IM q other day. Vitamin A deficiency with xerophthalmia: *Children 1–8 yr:* PO: 5,000 u/24 hr for 5 days; IM: 5000–15,000 u/24 hr for 10 days. *Children >8 yr and adults:* PO: 500,000 u/24 hr for 3 days, then 50,000 u/24 hr for 14 days, then 20,000 u/24 hr for 2 months. Vitamin A deficiency without corneal changes: *Children <1 yr:* IM: 100,000 units q 4–6 mo. >1 yr: IM: 200,000 units q 4–6 mo. *>8 yr and adults:* IM: 100,000 u/24 hr for 3 days, then 50,000 u/24 hr for 14 days. Prophylaxis for patients at risk and supplementation in measles: PO dose q 4–6 mo. *Children <1 yr:* 100,000 units. *>1 yr:* 200,000 units Improvement of growth in children with HIV, malaria, or diarrheal disease: *Infants < 1 yr:* 100,000 u/24 hr for 2 doses, then 100,000 units (1 dose) at 4 and 8 mo. *Children >1 yr:* 200,000 u/24 hr for 2 doses, then 200,000 units (1 dose) at 4 and 8 mo.	*Adverse events:* Irritability, vertigo, lethargy, fever, headache, hypercalcemia.

TABLE 716-1. General Medications—cont'd

DRUG (TRADE NAMES, FORMULATIONS)	INDICATIONS (MECHANISM OF ACTION AND DOSING)	COMMENTS (CAUTIONS, ADVERSE EVENTS, MONITORING)
Vitamin E Generic. Capsule, oral drops, tablet, cream, ointment.	**Nutritional supplement (antioxidant).** *Neonates, premature infants:* PO 25–50 u/24 hr. *Children:* PO 1 u/kg/24 hr. Sickle cell disease: PO 450 u/24 hr. Cystic fibrosis: PO 100–400 u/24 hr. β-thalassemia: PO 750 u/24 hr. *Adults:* PO 60–75 u/24 hr.	*Adverse events:* Rare.
Warfarin Coumadin; generic. Tablet: 1, 2, 2.5, 4, 5, 7.5, 10 mg.	**Anticoagulant that antagonizes hepatic vitamin K synthesis, depleting vitamin K–dependent clotting factors II, VII, IX, and X.** *Children:* PO: Initial dose of 0.2 mg/kg, then usual dose approximates 0.1 mg/kg/24 hr. Dose titrated to desired prothrombin time and international normalized ratio targets. Avoid large loading doses because complete anticoagulant effect depends on elimination half-lives of the target clotting factors. Full effects may not be observed until 2–3 days after a warfarin dose adjustment, negating rapid dose changes. *Caution:* Younger infants require higher doses (typical mean dose: 0.3 mg/kg/24 hr). Avoid foods with high vitamin K content (green leafy vegetables).	*Adverse effects:* Bleeding, skin necrosis, hemoptysis. *Drug interactions:* Aspirin, barbiturates, carbamazepine, cimetidine, omeprazole, phenytoin, rifampin, vitamin K, ritonavir, delavirdine.
Xylometazoline Otrivin. Nasal solution: 0.05%, 0.1%.	**Symptomatic relief of nasal congestion (stimulates α-adrenergic receptors to produce vasoconstriction).** *Children 2–12 yr:* Instill 2–3 drops 0.05% solution in each nostril q 8–10 hr. *Children > 12 yr and adults:* Instill 2–3 drops 0.1% solution in each nostril q 8–10 hr.	*Caution:* Do not use for more than 4 consecutive days or exceed recommended dosage because it may cause rebound congestion and chemical pneumonitis and create dependence. *Adverse events:* Palpitations, headache, dizziness, drowsiness, sweating, blurred vision.
Zafirlukast Accolate. Tablet: 20 mg.	**Leukotriene D_4 and E_4 antagonist, inhibiting effect of slow-reactive substance(s) of anaphylaxis on bronchial smooth muscle. Not effective in reversing acute bronchoconstriction, although therapy can be continued in acute attacks.** *Children 7–11 yr:* PO: 20 mg/24 hr divided q 12 hr. *Adolescents and adults:* PO: 40 mg/24 hr divided q 12 hr. Give 1 hr before or 2 hr after meals.	*Caution:* Based on mechanism of action, this drug is effective for prophylaxis and does not reverse bronchoconstriction. *Adverse effects:* Headache, nausea, dyspepsia, elevated liver function tests. *Drug interactions:* Blocks CYP2C9 and 3A4 hepatic isozymes; macrolides, theophylline, carbamazepine, terfenadine, astemizole.
Zileuton Zyflo. Tablet: 600 mg.	**5-Lipoxygenase inhibitor inhibiting formation of leukotrienes LTB_1, LTC_1, LTD_1, and LTE_1. Not effective in reversing acute bronchoconstriction, although therapy can be continued in acute attacks.** *Adolescents and adults:* PO: 2,400 mg/24 hr divided q 6 hr.	*Caution:* Based on mechanism of action, this drug is effective for prophylaxis and does not reverse bronchoconstriction. *Adverse effects:* Chest pain, headache, nausea, dyspepsia, elevated liver function tests. *Drug interactions:* Macrolides, theophylline propranolol, warfarin, terfenadine, astemizole.
Zinc supplements Generic. Injection, liquid, tablets.	**Prevention and treatment of zinc deficiency (replacement therapy).** Zinc deficiency: PO: *Infants and children:* 0.5–1 mg/kg/24 hr in 1–3 doses. *Adults:* 25–50 mg/dose tid. TPN supplement: *Preterm infants:* 400 μg/kg/24 hr. *Infants < 3 mo:* 250 μg/kg/24 hr. *Infants > 3 mo:* 100 μg/kg/24 hr. *Children:* 50 μg/kg/24 hr.	*Adverse events:* Rare, but if excessive doses are used, may cause copper deficiency.
Ziprasidone Geodon. Capsule: 20, 40, 60, 80 mg.	**Atypical antipsychotic.** *Children:* Start 5 mg/24 hr; increase q 48 hr to response. Dose bid. *Adults:* Start 20 mg bid; increase q 48 hr to response (max. 80 mg bid).	*Caution:* May prolong QTc intervals and predispose to arrhythmia (especially torsades de pointes); avoid concurrent use of drugs that may also prolong QTc interval. *Adverse events:* Agitation, anxiety, dizziness, drowsiness, headache, insomnia, tachycardia, constipation, dry mouth, orthostatic hypotension, weight gain. *Drug interactions:* CYP3A4 inhibitors will decrease clearance and predispose to toxicity. Enzyme inducers will increase clearance and may increase dose requirements.
Zonisamide Zonegran. Capsules (gelatin): 100 mg.	**Treatment of seizure disorders. Mechanism uncertain.** *Children:* Start 2–4 mg/kg/24 hr; then increase by 2–5 mg/kg/24 hr q 2–4 days to response, usually 4–20 mg/kg/24 hr. *Adults:* Start with 100 mg/24 hr; may increase by 100 mg/24 hr q 2 wk (max: 600 mg/24 hr).	*Cautions:* Children are predisposed to hypohidrosis and hyperthermia with this drug. Most common side effects are drowsiness, rash, and renal stones.