

Index

Note: page numbers in *italics* refer to figures; those in **bold** to tables or boxes.

4-2-1 rule, maintenance fluids 217, **217**, 353
 22q11 deletion syndrome *see* velocardiofacial syndrome
 1234-78910 rule, tracheal tube length 315
 1500 rule, insulin therapy 222
 abatacept 681, 682
 ABC sequence, CPR 260-2
 ABC transporters 169-70
 abdominal compartment syndrome (ACS) 504, 505
 abdominal examination, premature infants 487
 abdominal masses 726-30, **727**
 abdominal pain, functional (FAP) 870
 abdominal surgery 720-39
 case study 738-9
 conditions requiring 720-34
 specific procedures 734-8
 abdominal trauma 913-14, **916**
 abdominal wall defects, congenital
 anesthesia management 503-6
 developmental basis 152
 ABO blood group 239, **239**
 compatibility of transfusions 240, **240**
 cross-matching 243
 typing 243
 ABO-incompatible heart transplantation 704
 ABO-incompatible transfusions 248
 abortion, elective, parental involvement 5
Academic Medicine (journal) 32
 acardiac twin 454, 454
 accelerometry 192
 AccessMedicine 1277
 Accreditation Council for Graduate Medical Education (ACGME) 25, 28, 1221
 Anesthesiology Residency Review Committee (RRC) 28-9
 evaluation of educational programs 34
 human performance competencies 1222, **1223**
 acetaminophen 191, 850
 after adenotonsillectomy 784
 after ear surgery 779-80
 after outpatient surgery 885
 after spinal surgery 674
 case study 203
 dosing 191, 376, 850, **852**, 1296
 metabolism 172, **173**, 191, 850
 pharmacokinetics 189, 191
 postoperative pain 375-6

acetylcholine (ACh), neuromuscular transmission 191
 acetylcholinesterase inhibitors 196
 achondroplasia **773**, **1004-5**
 airway management problems 320, 660-1
 acid-base balance, renal function 162, 163
 acid-base disturbances
 congenital heart disease 602, 630, 648
 end-stage liver disease 685-6
 end-stage lung disease 709-10
 liver transplantation 691-2
 malignant hyperthermia 1166
 pyloric stenosis 732-3
 see also metabolic acidosis
 α 1-acid glycoprotein (AGP) 170, 171, 198
 acid maltase deficiency **1040-3**
 acrocephalosyndactylies 817-19
 acrocephaly **814**
 ACTH test 986
 actin, cardiac muscle contraction 86-7, 87
 activated partial thromboplastin time (aPTT)
 231, 231-2, **982**
 coagulation factor assays 231-2
 lupus anticoagulant 231
 neonates 212, 212, 229
 point-of-care testing 234
 preoperative testing 233, 278, 279
 reference range 1312
 active compression-decompression device (ACD) 261
 actors, standardized patient 1227-9, 1229
 acupuncture 287, 378
 acute chest syndrome (ACS), sickle cell 238, 983-4
 acute graft rejection
 transplanted lungs 713
 treatment 682
 acute kidney injury (AKI; acute renal failure)
 164-5
 dialysis 751, **752**, 980-1
 etiology **164**
 hyperkalemia 979
 ICU patients 979-80
 intrinsic renal disease **164**, 165, 979
 non-oliguric 979
 oliguric 979, **979**, 980
 postrenal 979
 prerenal **164**, 165, 979
 prognosis 165
 acute lung injury (ALI) 968-71
 definition 968-9, **970**
 morbidity and mortality 970
 one-lung ventilation-related 570

pediatric research 970-1
 therapy 971
 transfusion-related (TRALI) 249, 982
 acute normovolemic hemodilution (ANH) 252
 spinal surgery 667, 668
 acute pain services 862-4
 acute renal failure (ARF) *see* acute kidney injury
 acute respiratory distress syndrome (ARDS)
 968-71
 definition 968-9, **970**
 extracorporeal life support 971, 973
 morbidity and mortality 970
 pediatric research 970-1
 therapy 971
 acute tubular necrosis 165
 Adamkiewicz, great radicular artery of 128, 656
 adductor pollicis, monitoring neuromuscular blockade 192-3
 A δ fibers 200, 867, 1157-8
 adenine-saline additive solutions (AS-1, AS-3, AS-5) 241
 adenoidectomy 781
 see also adenotonsillectomy
 adenoid hyperplasia 781
 adenoids 303
 adenosine
 cardiac arrest 265
 dosing 1296
 re-entrant supraventricular tachycardias 954
 adenotonsillectomy 781-5
 coagulation status 783
 craniofacial disorders 782, 825
 discharge criteria 367
 Down syndrome 782-3, 995
 intraoperative management 783-5, 784
 obstructive sleep apnea 781-3, 876-7, 879
 outpatient anesthesia 876-8, 879
 postoperative analgesia 784-5, 850-1, 886
 postoperative complications 785, 877
 preoperative assessment 331, 781-2
 preoperative coagulation tests 233
 sickle cell disease 783
 adenylyl cyclase (AC) 83, 85
 adjuvants, local anesthetic 202, 422-3
 administrative data 1241-2
 adolescents 520-38
 alcohol and drug use 521
 bariatric surgery 535, 535-6, 536
 case study 537-8
 chronic diseases 522-34
 cigarette smoking 522
 confidentiality issues 4-5
 decision-making capacity 3, 3

adolescents (*cont.*)
 developmental/behavioral issues 520–1, 521
 ethical case study 12–14
 obesity 534–6
 pain self-reporting 847–8
 pregnancy 522
 refusal of emergency care 5
 transition to adult care 522–3
 adrenal function, effects of etomidate 185
 adrenaline *see* epinephrine
 adrenal insufficiency 957, 986
 adrenergic receptors (AR) 81–3
 burn patients 907
 immature heart 84, 88
 ligand-induced activation 81–2
 molecular structure 82
 signaling 83
 acute myocardial dysfunction 91–2
 cardiomyopathy 93
 congenital heart disease 92–3
 congestive heart failure 93
 developmental changes 84
 subtypes 82–3, 83
see also α -adrenergic receptors; β -adrenergic receptors
 adrenocorticotropin hormone (ACTH) test 986
 adrenoleukodystrophy 1004–5
 adult learners 31
 adverse drug reactions, postmarket surveillance 48
 advocacy 10, 10–11, 1282
 A-fibers 122, 125, 867
see also A fibers
 age
 anesthetic requirement and 22
 decision-making capacity and 3, 3, 52
 limits, pediatric care 523
 pulmonary function by 104–6, 105
see also adolescents; children; infants
 Agency for Health Care Policy and Research (AHCPR) 1252
 Agency for Health Care Research and Quality (AHRQ) 949, 1252, 1277
 TeamSTEPPS® system 1281
 agitation, emergence *see* emergence agitation/delirium
 AIDS *see* HIV infection
 AIMS *see* anesthesia information management systems
 air embolism
 congenital heart disease 603
 interventional cardiology procedures 620
 intravascular catheter-associated 400–1
 neurosurgical patients 548–9
 air leak test, intubated patients 315
 Airtraq® intubating device 323, 323–4
 airway(s) 300–5
 anatomy, relevant 302–5
 artificial 308–9
see also nasopharyngeal airways; oral airways
 development 100, 301, 301–2
 developmental physiology 305
 difficult *see* difficult pediatric airway
 edema, after foreign body removal 795
 epithelial cells 100
 examination 276, 307, 307, 332
 foreign bodies 792–5, 793
 MRI studies 921
 muscularization 100
 pregnancy-related changes 460–1
 preoperative assessment 305–7
 craniofacial anomalies 834
 protective mechanisms, development 305
 remodeling, asthma 107, 107
 surgical, emergency techniques 327, 911
 traumatic injuries 910–11
 airway complications 786–90
 cardiac arrest 1154, 1155, 1155
 closed claims analysis 1243
 ex-premature infants 498

intraoperative 316–17
 lung transplantation 712
see also laryngospasm; respiratory complications
 airway conductance, specific 963
 airway management 305–29
 burn patients 900–2, 902
 case study 327–9
 cleft lip and palate surgery 840, 840
 co-existing disease and 306
 complications 316–17
 CPR 260
 craniofacial surgery 835–6, 838–9
 difficult airway 319–22
 epidermolysis bullosa 1001
 equipment
 difficult airway 319, 320, 321
 preparation 307, 338–9, 339
 esophageal atresia and tracheo-esophageal fistula 508–9
 extramural anesthesia 938–9
 genetic syndromes 993–4
 head injury 558–9, 909
 history 18, 18–19
 natural airway 309–10
 obesity 535
 postoperative 316, 367–8
 pregnant women 460–1
 routine 307–11
 spinal surgery 661, 665
 tracheostomy insertion 317–19
 trauma 909–10, 916
 upper respiratory tract infections and 282
see also facemask ventilation; tracheal intubation
 airway obstruction
 adenoid and tonsillar hyperplasia 781
 anterior mediastinal mass 581
 artificial airway insertion 308–9
 congenital high 798
 craniofacial anomalies 824–5, 825, 834
 Down syndrome 995
 during facemask ventilation 308
 flow-volume loops 961, 961
 foreign body-induced 793, 793–4
 laryngeal papillomatosis 796–7
 laryngospasm 786, 787
 neurodevelopmental sequelae of chronic 1215
 postintubation croup 317
 postoperative
 management 316
 palatoplasty or pharyngoplasty 841
 spinal surgery 673–4
 stridor 787–8
 supraglottitis 789
 airway resistance (R_{aw}) 105, 105
 Alagille syndrome 147, 1004–7
 alanine aminotransferase 1301
 alar plate 656
 albumin (human serum albumin; HSA)
 drug binding 170
 halogenated agent binding 175
 local anesthetic binding 421, 421
 normal values 1301
 solutions, dosing 1298
 albumin/creatinine ratio 1301
 albuterol
 asthma 966, 967
 tracheal tube delivery 348
 alcohol use 521
 aldosterone 162, 163, 209–10
 Aldrete score, modified 366, 366, 890, 890
 alemtuzumab 681, 696
 alfentanil
 cerebral effects 542
 hepatic metabolism 172
 pharmacokinetics 183, 187, 189
 ALI *see* acute lung injury
 alkaline phosphatase 1301
 allantois 159, 160
 allergic reactions
 drugs 332, 1177, 1178
 muscle relaxants 195–6
 radiocontrast media 943–4
 transfusions 249
see also anaphylaxis; latex allergy
 allergic rhinitis 777
 allergies
 asthma 106–7
 laboratory tests 1179–80, 1181
 preoperative evaluation 332
 allodynia 867
 burn injuries 907
 alloimmunization, transfusion-related 250
 allometric scaling 169, 169
 all-patient refined diagnosis-related groups (APR-DRGs) 1254
 α 1-acid glycoprotein (AGP) 170, 171
 local anesthetic binding 198, 421
 serum levels vs. age 421, 421
 α 1-adrenergic receptors 83
 α 1-antitrypsin deficiency 147–8
 α 2-adrenergic receptors 83
 α -adrenergic receptors 82
 signaling 83, 84, 93
 subtypes 83, 83
 α -adrenoreceptor blockers, pheochromocytoma 729
 alveolar cells
 type 1 101
 type 2 100–2
 alveolar gas equation 962
 alveolar recruitment maneuver 347
 alveoli
 cell types and development 100–1
 development (alveolarization)
 postnatal 96, 104
 prenatal 96, 97
 vascular relationships 98, 99
 infant lung 104
 primary septa 97, 98
 secondary septa 97, 98
 amblyopia 121
 ambulatory anesthesia *see* outpatient anesthesia
 ambulatory surgery center (ASC) 876, 878
 American Academy of Pediatrics (AAP)
 fellowship section of anesthesiology 25
 informed permission concept 2–3
 safety monitoring of drug trials 57
 American Board of Anesthesiology (ABA)
 Directors 25
 examination requirements 29
 Maintenance of Certification in Anesthesiology (MOC) 30, 1225
 subspecialty certification 34
 American College of Critical Care Medicine (ACCM) 957, 958
 American College of Surgeons (ACS)
 quality improvement program 1250–1
 trauma center designation 908–9
 American Heart Association (AHA)
 CPR 269
 endocarditis prophylaxis 336
 newborn resuscitation 514, 514
 septic shock 957
 American Society for Regional Anesthesia/Pain Medicine (ASRA) 1249
 American Society for Testing and Materials (ASTM), MRI safety labels 922, 923
 American Society of Anesthesiologists (ASA)
 Anesthesia Quality Institute (AQI) 1249, 1278
 annual meetings 24–5
 Closed Claims Project 1153, 1242–3
 continuing medical education 1225
 extramural sedation and anesthesia guidance 934, 935
 information resources 1277
 monitoring requirements 340, 340
 MRI recommendations 921
 physical status classification 274, 333, 333
 outpatient anesthesia 878
 postanesthesia care 363, 364, 890

- preoperative fasting guidelines 279, 279, 334
quality incentives 1289, 1290
- Ametop® 346
- amino acids
gut transporters 155
hepatic metabolism 142
renal excretion 162, 164
- γ -aminobutyrate *see* GABA
- ϵ -aminocaproic acid (EACA) 253
dosing 1297
liver transplantation 691
spinal surgery 669–70
- aminoglycosides, nephrotoxicity 165
- aminophylline 967
- amiodarone
cardiac arrest 265, 268
dosing 1296
heart transplantation 701
re-entrant supraventricular tachycardia 954
- ammonia, plasma
elevated levels 684–5
reference range 1301
- amnesia, infantile 291
- amnioreduction, serial 452
- amobarbital sodium, intravenous 932
- ampicillin 1296
- amplitude-integrated electroencephalogram (aEEG) 136
- amputation, pain after 865
- amrinone 953
- amylase 1302
- analgesics 848–58
cancer pain 865–6
developmental pharmacology 848–9
dosing 1294
maintenance phase of anesthesia 352
non-opioid 375–6, 849–52, 852, 1296
opioid *see* opioid(s)
outpatient surgery 885–6
postoperative pain 375–6
tolerance to, ex-premature infants 500
see also specific agents
- anaphylaxis 1176–80
definition 1177
delayed 1178, 1179
diagnosis 1178–9, 1179
epidemiology 1177
etiology 1177
laboratory tests 1179–80
management 1180
muscle relaxants 195–6, 1178
outside the operating room 937
pathophysiology 1177–8
perioperative causes 1178
radiocontrast media 943–4
transfusions 249
see also allergic reactions; latex allergy
- Andersen disease 1044–5
- Andersen syndrome 1062–3
- Anderson cardiomyopathic periodic paralysis 1034–5
- Anderson-Fabry disease 1032–3
- Anderson-(Twail) syndrome 1034–5
- anemia
burn injuries 900
end-stage renal disease 694
erythropoietin therapy *see under* erythropoietin
ex-premature infants 500
physiological, of pregnancy 459
premature infants 480–1
preoperative assessment 277, 278
spinal surgery 663
- anencephaly 120, 555
- anesthesia crisis resource management (ACRM) 1222, 1224–5, 1280–1
cognitive aid 1224
debriefing sessions 1230–1
key points 1281
performance goals compared 1223
- anesthesia equipment *see under* equipment
- anesthesia information management systems (AIMS) 1257–78
criteria for evaluating 1268
data dictionary task force 1249
data display 1262–5
data protection 1270–2
decision support 1274, 1275, 1290, 1291
implementation 1268–70
interoperability 1268, 1269
medico-legal issues 1267–8
paper records vs 1258, 1258–61, 1259–60
patient care applications 1272–6, 1273, 1274
perioperative management support 1275–6
potential problems 1261–5, 1266, 1276
rationale for 1261
research applications 1249–50, 1276–8
role in safety 1290
special nature 1266
standards 1265–6
- anesthesia machines
developing countries 1142, 1143
MRI-compatible 924–5, 925
outside the operating room 934
preparation 338
malignant hyperthermia 333, 1170
respiratory monitoring 405, 405–6
ventilation strategies 340
- Anesthesia Patient Safety Foundation (APSF) 1249, 1258, 1289, 1290
- anesthesia providers
developing countries 1140, 1141–3
outside the operating room 934–5
specialist *see* anesthesiologists
- Anesthesia Quality Institute (AQI) 1249, 1278
- anesthesiologists
communication with PACU 364
developing countries 1140, 1141–3, 1142
education and training *see* pediatric
anesthesiology education
ethical obligations 10, 10–12
- anesthetic agents
anaphylactic reactions 1178
congenital heart disease 604–8, 605
developmental neurotoxicity *see* neurotoxicity, developmental anesthetic-induced
dosing 1294
extramural procedures 939–40
fetal effects 462–3, 470
intraocular pressure effects 803–4
neuropharmacology 540–4
neuroprotective effects 1213–14
outpatient anesthesia 883–5
placental transfer 463, 467–8
pulmonary vascular responses 593
supplies, developing countries 1148
teratogenicity 462
thermoregulatory effects 1156, 1160–2
see also specific agents and categories of agents
- anesthetic depth monitoring *see* depth of anesthesia monitoring
- Angelman syndrome 1006–7
- angiocatheter technique, cricothyroidotomy 327
- angio-edema, hereditary 1050–3
- angiogenesis, pulmonary 98, 99
- angiography 928–30
postanesthesia care 937
- angiokeratoma corporis diffusum 1032–3
- angio-osteohypertrophy syndrome 1060–1
- angiotensin-converting enzyme inhibitors (ACEi), teratogenic effects 164, 210
- angiotensin II (AII) 209
newborn 210
peripheral vasoconstriction 90
renal actions 164
- aniridia 749
- ankle clonus test 671
- anteriorgrade cerebral perfusion (ACP) 613
- anterior cardinal veins 66, 66, 67, 68
- anterior cerebral arteries 127
- anterior cricoid split procedure 799, 799
- anterior mediastinal mass (AMM) 336, 580–1
adolescents 528
- anesthetic management 580–1, 582
case study 586
imaging 580, 580, 581
- anterior spinal artery 128, 129, 656
- anterior spinal artery syndrome 440
- antiarrhythmic medications
cardiac arrest 265, 268
dosing 1296
- antibiotic-impregnated catheters 400
- antibiotics 1296
- anaphylactic reactions 1178
bacterial meningitis 978
cystic fibrosis 115, 525
- PICU patients 987
- preterm infants 480
- supraglottitis 790
- vesicoureteral reflux 747
see also endocarditis prophylaxis
- anticardiolipin antibodies 236–7, 1302
- anti-CD52 antibodies 682
- anticholinergic agents 197
- anticoagulant therapy
dosing 1297
Fontan patients 633
liver transplantation 691
- anticonvulsant medications
enzyme induction 662
neuropathic pain 868
preoperative evaluation 661–2
- antidepressants, neuropathic pain 868
- antidiuretic hormone (ADH) *see* vasopressin
- anti-Dnase-B 1302
- antiemetics
opioid-induced vomiting 858
prophylactic 354, 356, 377–8, 887–8
radiation therapy 931
strabismus surgery 802
therapeutic 378, 888–90
- antiepileptic agents *see* anticonvulsant medications
- antifibrinolytics
craniofacial surgery 838
heart transplantation 700
hemophilia 236
intraoperative use 252–3
liver transplantation 691
spinal surgery 669–70
von Willebrand disease 235
- antihistamines
anaphylactic reactions 1180
antiemetic use 888
dosing 1297
opioid-induced pruritus 857
- antihyperalgesic effects, ketamine 186
- antihypertensives, dosing 1295
- antiphospholipid antibodies 236–7
- α 2-antiplasmin 227
- antiproliferative agents 680, 681, 682
- antistreptolysin-O 1302
- antithrombin (ATIII) 226, 227
developmental changes 228, 229
dosing 1297
inherited deficiency 236
plasma 1302
- antithymocyte globulin (ATG) 680, 681, 682, 696
- α 1-antitrypsin deficiency 147–8
- Antley-Bixler syndrome 1006–7
- anus, imperforate 152, 487
- anxiety, preoperative 283–90
assessment 274, 284, 284–5, 285
case study 298
outpatient anesthesia 881
risk factors 283–4
- anxiolysis 342–4
defined 936
- non-pharmacological 285–8, 342–3
- pharmacological 288–90, 343–4
see also premedication

- aorta
 coarctation of 646–7
 cross-clamping 647, 696, 701
 development 71, 72–5, 74
 aortic arch(es)
 cervical (high) 78
 derivatives 75, 75
 determination of sidedness 75
 development 72–5, 74
 developmental defects 77, 77–8
 double 77, 78
 interrupted 77, 647
 aortocopulmonary septum 70, 73
 failure of septation 77
 aortic stenosis
 critical 647–8
 fetal aortic valvuloplasty 458–9
 aortic valve insufficiency, after transposition repair 642
 aortic valvuloplasty, *in utero* 459
 aortocaval compression, gravid uterus 460
 aortopulmonary artery shunts 622
 anesthesia before and during 623, 623
 anesthesia for pre-existing 623–4
 aortopulmonary window 77
 Apert syndrome 817, 1006–9
 airway management 825
 anesthetic implications 773
 clinical phenotype 817, 817, 818
 genetics 814
 intracranial pressure 823
 midface advancement 829
 preoperative evaluation 660–1
 Apgar, Virginia 20, 20
 Apgar score 20
 apheresis 241, 242
 apnea
 defined 369
 at induction 345
 of infancy 367
 obstructive sleep *see* obstructive sleep apnea
 PACU 369
 postanesthetic 369, 492–3
 historical aspects 21
 inguinal hernia repair 732
 outpatient anesthesia and 878–9
 risk factors 492–3, 499, 499
 of prematurity 478–9
 ex-premature infants 335, 492, 498–9
 postoperative monitoring 366–7, 492, 499
 preoperative evaluation 485
 apnea-hypopnea index (AHI) 782, 782
 apneic reflexes, laryngeal 305
 apologies 11
 apoptosis, neuronal *see* neuronal apoptosis
 appendicitis 733–4, 734
 aprepitant 888–90
 aprotinin 252–3
 liver transplantation 691
 spinal surgery 670
 aPTT *see* activated partial thromboplastin time
 aqueous humor 802, 803
 ARDS *see* acute respiratory distress syndrome
 argatroban 1297
 arginine vasopressin *see* vasopressin
 Arnold-Chiari malformation *see* Chiari malformation
 arrhythmias
 after Fontan procedure 631, 632
 after lung transplantation 712
 after tetralogy of Fallot repair 635, 636–7
 after transposition of great arteries repair 641
 catheter-induced 400, 617, 617
 CPR 268
 during anesthesia 340
 during eye surgery 801–2
 during liver transplantation 689–90
 ICU patients 953–5
 postoperative 371
- arterial access 389–92
 heart transplantation 700
 trauma 915
 arterial blood gases *see* blood gases, arterial
 arterial blood pressure *see* blood pressure, arterial
 arterial catheters 389–92
 cutdown insertion technique 392
 infections complicating 400
 sizes 389
 ultrasound-guided insertion 395
 arterial pressure waveforms, interpretation 395, 395–6, 396
 arterial puncture, inadvertent 399–400
 arterial switch operation (ASO) 639–41
 complications 641, 642
 neurodevelopmental outcomes 1209–10, 1212
 arteria radicularis magna 128
 arteriovenous (AV) fistulas
 during renal transplantation 695, 696
 surgical creation 753, 754
 arteriovenous malformations (AVM)
 endovascular treatment 929
 intracranial 128, 562–4
 anesthetic management 563–4
 endovascular treatment 565, 930
 postoperative care 564
 artery of Adamkiewicz 128, 656
 arthrodento-osteodysplasia 1048–9
 arthrodesis, osteogenesis imperfecta 767
 arthrogryposis (multiplex congenita) 768–9, 1010–11
 airway management 320, 769
 artifacts, electronic anesthesia records 1276
 ASA *see* American Society of Anesthesiologists
 ascites, after Fontan procedure 628, 631
 ASD *see* atrial septal defects
 asleep-aware-asleep (AAA) craniotomy 561, 562
 aspartate aminotransferase 1302
 asphyxiating thoracic dystrophy 1056–7
 aspiration, foreign body 792–5, 793
 aspiration of gastric contents, pulmonary 317
 assessment of risk 306–7, 337
 development of protective mechanisms 305
 emergency surgery risk 334
 postoperative 370
 pregnant women 461
 prophylaxis, extramural anesthesia 938
 aspirin 376
 assent
 informed 2, 3
 to research participation 52
 assertion tools 1282
 Association of French Speaking Paediatric Anaesthetists (ADARPEF) study 424–5, 425, 440–1
 asthma 106–8
 acute severe 966
 evaluation 107–8
 ICU management 965–8, 969
 outpatient anesthesia 881
 pathophysiology 106–7, 107, 965–6
 preoperative assessment 277, 280, 306, 334–5
 tobacco smoke exposure and 106, 522
 treatment 108, 109–12
see also bronchospasm
 atelectasis, segmental 347
 ATP-binding cassette (ABC) transporters 169–70
 atracurium 194–6
 case study 203
 cerebral effects 543–4
 dosing 196, 1294
 pharmacodynamics 195–6
 pharmacokinetics 193, 195
 atrial baffle procedures 639, 641
 atrial fibrillation 954
 atrial flutter 954
 after Fontan procedure 631, 632
- atrial natriuretic factor (ANF) 90, 210
 atrial septal defects (ASD) 76, 642–3
 anesthetic management 643
 transcatheter device closure 619–20
 atrial septation 61–3, 64, 72
 defects 76
 atrial septo(s)tomy
 complications 618
 transposition of great arteries 639
 atrial tachycardia, ectopic (EAT) 954
 atriodigital dysplasia *see* Holt-Oram syndrome
 atrioventricular canal 69, 71, 72, 73
 defects 76, 644–5
 atrioventricular (AV) node, development 66, 71
 atrioventricular node re-entrant tachycardia (AVNRT) 954
 atrioventricular septal defects 76
 atrioventricular septum, development 69
 atrioventricular valves
 defects in development 76
 development 69, 71
 atropine 197
 bradycardia 350, 371
 cardiac arrest 265
 congenital heart disease 604
 dental surgery 807
 dosing 1295
 eye surgery 801, 802
 laryngospasm 349, 787
 auscultation
 anesthetized patients 401
 premature infants 484
 preoperative 332–3
 austenite 924
 authorship of published papers 46, 57
 autism spectrum disorder (ASD) 533–4, 1000, 1010–11
 autologous blood donation, preoperative (PABD) 252, 664, 667–8
 automated external defibrillators (AEDs) 268
 automatic implantable cardiac defibrillators (AICD) *see* implantable cardioverter-defibrillators
 autonomic control, body temperature 1158
 autonomic innervation, neonatal heart 80
 autoregulation
 cerebral vascular *see* cerebral blood flow, autoregulation
 renal blood flow 164
 AVAD acronym 319, 320
 aviation, development of simulation 1220
 avoidance behaviors 283
 AVP (arginine vasopressin) *see* vasopressin
 awake craniotomy, epilepsy surgery 560–1
 awareness 290–4, 342
 in adults 291–2
 causes 292–3
 characteristics 292
 consequences 293, 297
 definition 290
 frequency 292
 measurement 291
 prevention and management 293–4
 very young children 294
 volatile agents 177
 A wave 396–7
 axillary artery catheters 390–1
 insertion 390–1
 sizes 389
 axillary blocks 433–4
 hand surgery 763, 763
 ultrasound guidance 433, 433–4
 axillary temperature 406, 1163
 Ayre's T-piece 18, 18
 azathioprine (AZA)
 inflammatory bowel disease 725
 transplant recipients 680, 681, 682
 azithromycin, cystic fibrosis 525
 azotemia, prerenal 979
 azygos vein, development 68

- Baby Doe regulations 2
 BabSIM, METI 1228, 1236
 back pain 869–70
 back-up behavior, team working 1282–3
 bacterial colonization, neonatal gut 158
 balloon and stent dilatations, complications 618, 619
 barbiturates
 central nervous system effects 541–2
 cerebral blood flow responses 132, 133
 dosing 1294
 sedation at extramural sites 939
 see also pentobarbital; phenobarbital; thiopental
 barcodes 1289, 1291
 bariatric surgery
 adolescents 535, 535–6, 536
 case study 537–8
 Barlow sign, hip dislocation 758
 basal plate 656
 basic life support 259
 basilic vein, PICC insertion 388
 basiliximab 680, 681, 696, 1298
 B-cells, gastrointestinal tract 157
 Beare-Stevenson cutis gyrata syndrome 814
 Becker muscular dystrophy 771, 1010–13
 Beckwith-Wiedemann syndrome 1012–13
 airway management 320
 Wilms tumor 749
 Beer-Lambert equation 408
 behavior, adolescents 520–1
 behavioral disturbances, dental surgery 807
 behavior disorders, postoperative *see*
 postoperative behavior disorders
 belatacept 681, 682
 Belmont Report 49–50
 Belton, Kay 17
 benzodiazepines 180–1
 antagonism 181
 cerebral effects 542
 congenital heart disease 607
 dosing 181, 1294
 extramural sedation 940
 metabolism 172, 180
 pharmacodynamics 180–1
 pharmacokinetics 180, 181
 see also specific agents
 Bernard-Soulier syndrome 230
 berry aneurysms 128
 best interest standard 2–3
 Best Pharmaceuticals for Children Act (BPCA, 2002) 49
 β 1-adrenergic receptors 82, 83
 β 2-adrenergic receptors 82–3
 regulation of vascular tone 90, 91
 β -adrenergic receptor blockers (β -blockers) 729, 1296
 β -adrenergic receptors (β -AR) 82–3, 83
 calcium cycling and 85
 desensitization and downregulation 91–2, 92
 molecular structure 82
 signaling 83
 acute myocardial dysfunction 91–2
 cardiomyopathy 93
 congenital heart disease 92–3
 congestive heart failure 93
 developmental changes 84
 subtypes 82–3
 β -agonists
 anaphylactic reactions 1180
 asthma 108, 280
 ICU setting 966, 967
 stepwise approach 111–12
 β -arrestin 91, 92
 B-hydroxybutyrate 1302
 bicarbonate
 fluid compartments 206, 206
 renal excretion 162, 163, 209
 serum 209
 see also sodium bicarbonate
 bicoronal craniosynostosis (brachycephaly) 815, 816, 816
 intracranial hypertension 823, 823–4
 bicoronal scalp incision 826, 826
 bidirectional Glenn (BDG) procedure 623, 629
 Bier block, hand surgery 763
 Bieri faces scale 846
 bile, formation and secretion 143, 144
 bile acids
 accumulation in cholestasis 143–4
 transporters 143, 144
 bile salt export pump (BSEP) 143, 144, 148
 bile salt transporters 143, 155
 bilevel positive airway pressure (BiPAP)
 obstructive sleep apnea 535, 781
 PICU 963
 postoperative period 316
 biliary atresia 146, 721–2
 classification 146
 management 722
 biliary tract, development 140, 140
 bilirubin
 metabolism 142, 143, 173
 neurotoxicity 144, 482
 secretion into bile 143
 serum/plasma
 premature infants 482
 reference range 1302
 triggering exchange transfusion 482, 482
 biochemical tests, normal values 1300–14
 BiPAP *see* bilevel positive airway pressure
 birth asphyxia
 neonatal resuscitation 513–16
 premature infants 476
 birth defects, statistics 27
 births, US data 27, 28
 Bispectral Index (BIS) 136–7, 342, 415–16
 factors influencing 342
 volatile agents 176–7, 178
 wake-up test 672
 Bispectral Index® (BIS) monitor 136, 415
 bisphosphonates, osteogenesis imperfecta 767
 bivalirudin 1297
 Bivona® tracheostomy tubes 924
 bladder, urinary
 catheterization 989
 development 160, 741
 bladder extrophy 741–4, 742
 epidural catheter placement 742–3, 743
 surgical options 742, 742
 Blalock-Taussig (B-T) shunt 622
 hypoplastic left heart syndrome 648, 649
 pulmonary atresia 638
 bleeding
 coagulation tests 234
 craniofacial surgery 836–8
 during extracorporeal life support 973
 during liver transplantation 688–9, 690–1
 hemophilia 235–6
 massive transfusion 246
 postoperative
 cardiopulmonary bypass 614, 702
 interventional cardiology 616–17
 preoperative coagulation tests 233
 tonsillectomy 785
 preoperative history 233, 233–4
 von Willebrand disease 234
 see also blood loss
 bleeding disorders
 adenotonsillectomy and 783
 premature infants 488
 bleeding time (BT) 229–30, 233
 blinding (allocation assignment) 43–4
 blindness, postoperative *see* postoperative visual loss
 blood
 antibody screening 243, 278
 cross-matching 243
 typing 243, 278
 whole *see* whole blood
 blood-brain barrier 546
 blood conservation 251–3
 intraoperative 252–3, 668–9
 postoperative 253
 preoperative 251–2
 spinal surgery 664
 blood gases, arterial
 intraoperative monitoring 406–7, 407
 normal neonates 485
 PICU patients 960
 premature infants 484–5, 485
 reference ranges 1302–3
 see also carbon dioxide tension; oxygen tension; pH
 blood groups 239, 239–40
 cross-matching 243
 determination 243, 278
 screening for antibodies 243, 278
 blood loss
 burn wound surgery 906
 craniofacial surgery 836–8, 976–7
 estimating “allowable” 215, 354
 extramural procedures 938
 intraoperative monitoring 215, 354
 premature infants 490
 minimizing postoperative 253
 reducing intraoperative 252–3
 craniofacial surgery 837–8
 spinal surgery 669–71
 see also bleeding
 blood pressure, arterial
 cerebral blood flow autoregulation 131, 131–3, 132
 extremely premature infants 493, 493–4
 intraoperative monitoring 341
 management
 pheochromocytoma 729
 post cardiac arrest 265–6
 neonates 210–11, 211
 normal values 81, 81
 preterm infants 491, 491
 with patent ductus arteriosus 490, 490
 waveforms 395, 395–6, 396
 see also hypertension; hypotension
 blood products 240–3, 981
 administration 243–4
 collection methods 240–1
 filters 244
 indications/triggers for use 244–6
 infectious disease tests 246, 247
 transmission of infection 246–8, 247
 trauma patients 915
 warming 215, 243
 see also transfusion therapy; specific products
 blood salvage, intraoperative 252, 668–9
 blood urea nitrogen (BUN) 978, 1314
 blood volume
 estimated (EBV) 252, 354, 668
 pediatric 207
 pregnancy-related changes 459
 Blount disease 760–1
 body composition, developmental changes 168, 207, 207
 body mass index (BMI) 276, 534
 body surface area (BSA) 276
 adjusting GFR for 161
 burns assessment 897, 897
 calculation 161
 bodyweight
 formula, central venous catheter placement 387–8, 388
 ideal, calculation 330
 preoperative assessment 276, 330
 bone healing, postoperative NSAIDs and 851
 bone marrow
 donation 6
 transplantation 865, 981
 Bonfils fiberscope 325, 836
 Boston Children’s Hospital, cardiac anesthesia database 1244
 Boyles machine, developing countries 1142, 1144, 1144

brachial artery catheters 390
insertion 390
sizes 389
brachial plexus blocks 431–4
axillary approach 433–4, 434
hand surgery 763
infraclavicular approach 432
interscalene approach 431, 431
outside the operating room 941
parascapular approach 431–2
subclavian perivascular approach 432
supraclavicular approach 432, 432–3
ultrasound guidance 431, 432, 432–4
brachial plexus injury 867
brachiocephalic artery, development 74
brachycephaly 815, 816, 816
intracranial hypertension 823, 823–4
bradycardia
causes 341, 350
Down syndrome risk 1250
during craniofacial surgery 839
during induction 350
during liver transplantation 689
fetal 468–9, 470
monitoring 340
neonatal 514–15
postoperative 371
sinus, ICU patients 953–4
brain
cellular proliferation and migration 120
development 119, 120–2
adolescence 520–1, 521
impact of surgery and anesthesia 24, 1183–218
see also neurodevelopmental outcomes
embryogenesis 117–19, 119
growth 122
malformations 120
manipulation, craniofacial surgery 838
myelination 122
synaptogenesis 120–1
trauma *see* traumatic brain injury
tumors *see* intracranial tumors
vascular anatomy 127–8
vascular physiology 129–34
brain death, organ donation after 679
brain-derived neurotrophic factor (BDNF) 1199
brain stem auditory evoked potentials (BAEP) 137
braking, laryngeal 98, 105, 304
branchial arches 301, 301–2, 813
malformations 819–21
branchial clefts 301, 301, 302
breast milk 157–8
non-protein components 158
preoperative intake 279, 279
proteins 157–8
breast milk jaundice 144
breathing
CPR 260
initiation at birth 103
nasal 303
sleep-disordered *see* sleep-disordered breathing
see also respiration
breathing circuit, heated and humidified 1164
brittle bone disease *see* osteogenesis imperfecta
bronchial arteries, development 98
bronchial blockers 571, 571–2, 572, 666
bronchial hyper-responsiveness (BHR) 283
bronchial vasculature, development 98
bronchiectasis, cystic fibrosis 524
surgery 526
bronchioles, development 100
bronchiolitis obliterans syndrome (BOS) 713, 713–14, 714
bronchodilators
asthma 280, 335
dosing 1297
preoperative wheezing 335, 347

tracheal tube delivery 348
upper respiratory tract infections 283
bronchogenic cyst (BC) 577, 579–80, 583
postnatal management 578
bronchomalacia 498
bronchopulmonary dysplasia (BPD) 108–13, 478
classification of severity 498
ex-premature infants 498
lung compliance 104
lung transplantation 708
old and new patterns 108, 113
preoperative assessment 306
bronchopulmonary sequestration (BPS) 577, 579, 583
postnatal management 578
bronchoscopes
jet ventilation via 791–2
rigid 792, 792
bronchoscopy
fiberoptic (FOB) 791
craniofacial surgery 835–6, 836
difficult airway 322–3, 323
foreign body removal 795
one-lung ventilation 571, 572
tracheo-esophageal fistula repair 509
rigid 792
foreign body removal 794–5
tracheo-esophageal fistula 508–9
bronchospasm
acute severe, treatment 108
anaphylactic reactions 1178, 1180
asthma 106, 107
during anesthesia 347–8
upper respiratory infections and 778–9
see also asthma
Brooke formula, for burns 903, 904
brown fat metabolism 477, 1158–9
BSA *see* body surface area
B-type natriuretic peptide (BNP) 90, 953, 1303
Buck traction, modified 742, 742
buffer solutions, cardiac arrest 263–4
bulbus cordis, development 69–72, 72, 73
Bullard laryngoscope 323
bumetanide 1297
bupivacaine 198
caudal block 428
developmental pharmacology 858–9
dosing 1296
epidural analgesia 430, 861, 863
inguinal hernia repair 503
metabolism 172, 199, 421
pharmacodynamics 201, 422
pharmacokinetics 198, 199, 199, 200
protein binding 170, 171, 421
regional anesthesia 420–1
stereo-specificity 201
toxicity 201–2, 424
buprenorphine 173, 1186
burn encephalopathy 900
burns 896–908
first degree (superficial) 897
second degree (partial thickness) 897–8, 898
third degree 898, 898
fourth degree 898
body surface area affected 897, 897
classification 897–8
depth 897, 897–8
drug pharmacokinetics 907
early wound excision and grafting 903–4, 905
etiologies 896, 897
fluid resuscitation 902–3, 904
full thickness 898, 898
initial evaluation and resuscitation 900–3
intraoperative management 905–7
long-term wound reconstruction 904–5
major, defining criteria 898, 898
outcomes 908
pain 907–8
pathophysiology 898–900, 901
preoperative evaluation 905
survival rates 898
wound dressing changes 904
BURP maneuver 312
C1 esterase inhibitor deficiency 1050–3
CACNA1S gene 1165
caffeine
apnea of prematurity 335, 478–9, 493, 499
bronchopulmonary dysplasia 113
dosing 1298
metabolism 172
caffeine-halothane contracture test (CHCT) 1165, 1168–70
calcineurin inhibitors (CNI) 680, 681, 682
nephrotoxicity 682, 717
see also cyclosporin; tacrolimus
calcitonin gene-related peptide (CGRP) 123, 124
calcium (Ca^{++})
cycling, cardiac myocytes 84–7, 85
acute myocardial dysfunction 91–2
immature heart 87, 88
neonates 210–11
fluid compartments 206, 206
intracellular, malignant hyperthermia 1165
ionized, whole blood 1303
myocardial effects 951
serum
premature infants 481, 488
reference ranges 1304
see also hypocalcemia
therapy 953
cardiac arrest 263, 265
dosing 1295
hyperkalemia 979
liver transplantation 692
neonates 213
premature infants 481
status epilepticus 977–8
urinary 1304
calcium-ATPase pump 84
calcium channels
L-type 84–5
effects of catecholamines 91–2
local anesthetic actions 200
skeletal muscle 1165
calcium chloride 1295
calcium gluconate 1295
call-out communication strategy 1283
calmodulin 85–6
calsequestrin 85, 85
calvarial synostosis 815
campomelic dysplasia 820
canalization, spinal cord development 118, 119
failure of 120
cancer
adolescents 528–9
ICU patients 981
inflammatory bowel disease and 726
long-term effects of childhood 529, 529
opioid side-effects 858
pain management 856, 864–6
preoperative assessment 281–2
transplant recipients 717
see also chemotherapy; radiotherapy
Cantrell pentalogy 1092–3
capnography/capnometry 403–5
applications 404–5
confirming endotracheal intubation 403
during anesthesia 341
during CPR 269
interpretation of tracings 404, 404
mainstream 341, 403
PICU 960–1
postanesthesia 365
sidestream 341, 403
time-based 960–1
volumetric 961
Carbicarb, cardiac arrest 264
carbohydratase enzymes 153–4
congenital deficiencies 155

- carbohydrate
malabsorption 155
metabolism 141
transporters 154–5
- carbon dioxide (CO_2)
absorption, laparoscopic surgery 737
colorimetric detectors, for CPR 260
content 1304
end-tidal *see* end-tidal carbon dioxide
transcutaneous monitoring (TCOM) 960, 961
- carbon dioxide (CO_2) laser 796
- carbon dioxide tension (PCO_2)
arterial (PaCO_2)
alveolar gas equation 962
bronchopulmonary dysplasia 478, 478
capnographic estimation 404
cerebrovascular response 133–4
normal neonates 485
PICU patients 960
pregnant women 460, 461
premature infants 476, 485
see also hypercapnia
reference ranges 1303
- carbon monoxide (CO) poisoning 899, 902
- carboxyhemoglobin 1303
- cardiac anesthesia, history of pediatric 23–4
- cardiac arrest (CA) 255
anaphylactic reactions 1178
arrhythmias 268
current recommendations 269
epidemiology 255–8
extramural procedures 937–8
medications 262–4, 265, 268
no flow phase 259
outcomes 255–8, 256, 257
perioperative 1152–5
causes 1154–5, 1155, 1155
closed claims analysis 1153, 1242–3
local anesthetic toxicity 440
local databases 1244
POCA registry 22–3, 1153, 1243–4
risk factors 1153–4
- phases 258, 258–60
postarrest phase 259–60
prearrest phase 259
resuscitation *see* cardiopulmonary resuscitation
succinylcholine-induced 772, 772
- cardiac arrhythmias *see* arrhythmias
- cardiac catheterization 615–21
anesthesia and sedation 615–16
diagnostic 598–600, 618
Fontan patients 633
interventional cardiology 616–21
in utero 458–9
laboratory environment 616
radiation safety 941, 942
risks and complications 616–17, 618
values in normal children 599
- cardiac cycle length (CCL), during MRI 926–7, 942
- cardiac death, organ donation after 679
- cardiac embryology and development 60–75
defects due to abnormal 75–8
timeline 62
- cardiac index (CI) 391, 393
- cardiac myocytes
adrenergic receptors 81–4
calcium cycling 84–7, 85
acute myocardial dysfunction 91–2
immature heart 87
contraction 86–7, 87
structure 85
thyroid hormone effects 87–8
- cardiac output (CO)
laparoscopic surgery 737
measurement, PICU 949–50
neonates 210–11
perioperative monitoring 397
pregnant women 460
- volatile anesthetic kinetics and 176
see also low cardiac output state
- cardiac pacemakers
MRI safety 924, 942
preoperative assessment 277
- cardiac surgery 608–15
closed procedures 608
EEG monitoring 415
mechanical ventilation 608–10
near infrared spectroscopy 411–14, 412, 413, 414
open 610–14
specific procedures 622–49
spectrum of procedures 621, 621–2
sternal closure and tamponade after 614–15
transcranial Doppler ultrasound 414–15
see also cardiopulmonary bypass; heart transplantation
- cardiac tamponade
after cardiac surgery 614–15
interventional cardiology procedures 620–1
percutaneous drainage 621
trauma patients 912–13
- cardinal veins 66, 66, 67, 68, 141
- cardiogenesis, early 61, 63
- cardiogenic shock 955
- cardiomyopathy
adrenergic receptor signaling 93
heart transplantation 697, 698
- cardiopulmonary bypass (CPB) 610–14
anterior mediastinal mass 581
Bispectral Index (BIS) monitoring 415
cerebral perfusion 130, 131, 131, 132
EEG monitoring 135
failure to wean 973
heart transplantation 700–2
hypoplastic left heart syndrome 649
inflammatory response 611, 611
lung transplantation 710–11
management strategies 613–14
near infrared spectroscopy 411–14, 413
opioid anesthesia 607
tetralogy of Fallot 635
transcranial Doppler ultrasound 414–15
ultrafiltration methods 611–12
weaning from 614
see also cardiac surgery
- cardiopulmonary resuscitation (CPR) 255–72
ABC sequence 260–2
case study 270–1
current recommendations 269
discontinuation 269
extracorporeal (E-CPR) 267
local anesthetic toxicity 440
low-flow phase 259
medications 262–4, 265
neonatal *see* neonatal resuscitation
open chest 262
parental presence 948
phases 258, 258–60
postresuscitation interventions 264–7
postresuscitation phase 259–60
prone patients 673
quality 267
simulation 268–9
techniques 260–4
transport to PICU after 990
trauma 909
vascular access 262
- cardiorespiratory interactions, congenital heart surgery 609–10
- cardiototoxicity, local anesthetics 202, 420–1, 1173
management 423–4, 440
- cardiovascular complications, perioperative 370–1
causing cardiac arrest 1155, 1155, 1155
organ transplantation 718, 718
- cardiovascular disease, chronic kidney disease 166
- cardiovascular system 60–94
benzodiazepine actions 180–1
burn injuries 899, 901
- developmental defects 75–8
developmental physiology and pathophysiology 78–93
embryology and normal development 60–75
end-stage liver disease 683, 683–4
etomidate actions 184–5
functional assessment, PICU 949–50
intensive care 949–60
ketamine actions 185–6
local anesthetic effects 201
muscle relaxant actions 194
neonatal physiology 210–11, 211
opioid actions 187
pharmacology, PICU 950–3, 951
pregnancy-related changes 459–60
premature infants 485–7
preoperative assessment 276, 277
propofol actions 183
thiopental actions 182
volatile agent effects 179
- cardioversion, direct current (DC) 954, 1298
- carnitine disorders 772
- Carpenter syndrome 1012–13
- caseins 157
- caspase-3 1194, 1195, 1197
- Castaneda, Aldo 23
- cataracts 805
- CATCH 22 syndrome *see* velocardiofacial syndrome
- catecholamines
β adrenergic receptor affinity 82
inotropic therapy
acute myocardial dysfunction 91–2
cardiomyopathy 93
immature heart 80, 88
secretion by pheochromocytomas 728
see also dopamine; epinephrine; norepinephrine
- Catel-Manzke syndrome 1014–15
- cat eye syndrome 1014–15
- catheter-associated bloodstream infections (CA-BSI) 989
- catheter-associated thrombosis 237
- cauda equina 656
development 119, 120
caudal block 427–9
dosage regimens 428
ex-premature and term neonates 502–3, 503
outpatient surgery 887
procedure 427–8, 429
ultrasound guidance 428–9
- causalgia 869
- cavernous sinus 128
- cavopulmonary anastomosis
bidirectional 623, 629
total 628–33
see also Fontan procedure
- cavopulmonary artery shunt 622–3
- Ce50 170
inhaled agents 175
intravenous agents 181, 183
muscle relaxants 193, 195
- cefazolin 1296
- cefoxitin 1296
- cefuroxime 1296
- celecoxib 851–2, 852
- celiac artery 141
- central anticholinergic syndrome (CAS) 374
- central aortopulmonary artery shunt 622
- central core disease 771, 1014–15, 1168
- central nervous system (CNS) 117–38
benzodiazepine actions 180
developmental physiology 126–37
embryology and development 117–26, 118
etomidate actions 184
infections 978
inhaled agents, effects 177–8, 541
injury

central nervous system (CNS) (*cont.*)
 burn patients 900, 901
 ex-premature infants 499
 extremely premature infants 493, 493
 premature infants 476–7, 479, 487
see also neurodevelopmental outcomes
 ketamine actions 185
 local anesthetic effects 201
 monitoring 407–16
 post CPR 266–7
see also specific modalities
 muscle relaxant actions 194
 neonatal physiology 211
 opioid actions 187
 PICU patients 974–8
 pregnancy-related changes 461
 preoperative assessment 277, 487
 propofol actions 133, 183
 thermoregulation 1156–7, 1157
 thiopental actions 182
 trauma 916
 airway management 909, 910
see also head injury; traumatic brain injury
 vascular anatomy 127–9
 central neuraxial blocks 427–31
 complications 439–41
 contraindications 426
 fetal interventions 468
 outpatient surgery 887
 sympathetic blockade 426
 thermoregulatory effects 1162
 trends in use 424–5, 425
see also caudal block; epidural anesthesia/
 analgesia; spinal anesthesia
 central retinal artery occlusion 1176
 central venous access
 craniofacial reconstruction 839
 ex-premature infants 500
 heart transplantation 700
 percutaneous 382–6
 central venous catheters (CVC) 382–9
 antibiotic-impregnated 400
 arrhythmias complicating 400
 ascertaining correct position 386–8, 387
 associated infections 988–9
 care bundles 384
 complications 398–401
 height- and weight-based formula 387–8,
 388
 indwelling, radiotherapy patients 941
 infectious complications 400
 insertion checklists 1286, 1286
 insertion techniques 383–6
 malposition/perforation 398–400
 oxygen saturation monitoring 397, 397–8
 peripherally inserted (PICC) 388
 pneumothorax complicating 400
 shock management 958
 sizes and lengths 383
 systemic air embolus complicating 400–1
 thrombotic complications 237, 398
 ultrasound-guided insertion 394, 394–5
 central venous pressure (CVP)
 during liver transplantation 689
 monitoring
 liver transplantation 687
 preterm infants 491
 renal transplantation 695
 spinal surgery 665
 waveforms 396, 396–7
 cephalic index 815
 cerebellar astrocytomas 553
 cerebellar tonsillar herniation, craniostenosis 824
 cerebral aneurysms 562, 562–4, 565
 cerebral angiography 930
 cerebral arteriovenous malformations *see under* arteriovenous malformations
 cerebral blood flow 129–34
 anesthetic agent effects 541–2, 543
 autoregulation 130–3, 131, 132

neonates 211
 post cardiac arrest 265–6
 control mechanisms 129–33
 developmental changes 129, 129
 neurovascular coupling 132, 133
 responses to homeostatic perturbations 133–4
 systemic vasoconstrictive response 130
 velocity (CBFV), monitoring 414–15, 976
 cerebral blood volume index (Crbvi) 409
 cerebral cortex
 cellular proliferation and migration 120
 functional maturation 124, 465
 integration of pain afferent inputs 125, 845
 myelination 122
 cerebral edema
 after arteriovenous malformation surgery 564
 diabetic ketoacidosis 985
 end-stage liver disease 684–5
 osmotic and diuretic therapy 547
 pathophysiology 546
 cerebral emboli, transcranial Doppler ultrasound 415
 cerebral function monitors 136
 cerebral metabolic rate of oxygen (CMRO₂),
 anesthetic agent effects 541–2, 543
 cerebral metabolism
 cerebral blood flow responses 132, 133
 developmental changes 129, 129
 cerebral oxygen saturation, regional (rSO₂)
 factors affecting 410, 410–11
 non-invasive measurement 408, 409, 409–10
 outcome studies 412–14, 414
 pediatric cardiac surgery 411
 treatment of low 411, 412
see also near infrared spectroscopy
 cerebral palsy (CP) 769–70
 extremely premature infants 493, 493, 499
 orthopedic surgery 770
 preoperative assessment 277, 661–2
 regional anesthesia 434
 cerebral perfusion pressure (CPP)
 ICU setting 975–6
 intravenous anesthetic agent effects 542
 traumatic brain injury 911–12
 cerebral protection 566
 anesthetic agents 1213–14
 cardiopulmonary bypass 614
 volatile agents 178
 xenon 174
 cerebral resuscitation 566
 cerebral salt wasting 977
 Cerebral State Index (CSI) 136
 Cerebral State Monitor™ 136
 cerebral tissue oxygen saturation (SCTO₂) 409
 cerebral vascular physiology 129–34
 cerebral vasospasm 564
 cerebral veins 128
 cerebrocostomandibular syndrome 1014–17
 cerebrospinal fluid (CSF) 127
 flux, age-related 201, 201
 pH 133–4
 cerebrovascular anomalies 562–4
 certified pediatric nurse practitioner (CPNP) 935
 ceruloplasmin 1304
 cervical collars 910, 912
 cervical spine injury 912
 airway management 320, 910, 912
 with head injury 558
 spinal cord injury 559, 559
 cervical spine (in)stability
 diagnostic radiology 920
 Down syndrome 331–2, 660–1, 920, 995
 septic arthritis 766
 spinal surgery patients 660–1
 cervical teratoma, case study 472–3, 473
 cesarean delivery, emergency 468
 C-fibers
 nociception 122, 125, 867
 thermal sensation 1158
 CFTR gene mutations 523
 Charcot-Marie-Tooth syndrome 1016–17
 CHARGE syndrome 996–7, 1016–19
 CHD7 gene 997
 check-backs (read-backs) 1283, 1285
 checklists 1286–7
 chemotherapy
 long-term effects 529, 529
 painful side-effects 865
 Wilms tumor 749, 750
 chest closure, after cardiac surgery 614–15
 chest compressions 260–2
 basic tenets 259, 261
 circumferential vs. focal sternal 262
 compression/ventilation ratios 261–2
 current recommendations 269
 depth 261
 duty cycle 262
 laryngospasm management 349–50
 neonatal resuscitation 515
 chest radiography
 anterior mediastinal mass 580, 580
 central venous catheter position 387, 387
 congenital diaphragmatic hernia 511, 511
 foreign body aspiration 793–4
 PICU patients 960
 premature infants 486, 486
 preoperative 279, 333
 wheezing 966
 chest trauma 912–13, 916
 chest wall
 compliance 98, 304
 deformities 581
 development 97–8
 chewing gum 334
 Chiari malformation 1008–11
 anesthetic implications 773
 craniostenosis 824, 828
 myelomeningocele 555
 posterior fossa tumors 553
 postoperative ICU management 977
 Chick fracture table 761, 761–2
 child abuse, suspicion of 12
 Child Behavior Checklist 295
 child mortality, developing countries 1145
 children
 decision-making capacity 3, 3–4, 52
 extracorporeal life support 972–3
 fluids and electrolytes 216–23
 informed consent 3
 involvement in history-taking 275
 pain self-reporting 374, 846–8, 848
 pulmonary function 104–6, 105
see also adolescents; infants
 Children's Hospital of Eastern Ontario Pain Scale (CHEOPS) 375
 chin lift maneuver 308
 chloral hydrate 545, 1186
 chloride
 fetal lung fluid 99, 99
 fluid compartments 206, 206
 reference ranges 1304
 serum, premature infants 488
 chloroform 16
 chlorprocaine
 epidural analgesia 861, 862, 863
 pharmacokinetics 198
 2-chloroprocaine 420
 choledochal cysts 146, 147
 cholestasis 143–8, 144
 acquired 145–6
 metabolic disorders 147–8
 progressive familial intrahepatic *see* progressive familial intrahepatic cholestasis
 structural abnormalities 146–7
 cholesteatoma 780
 cholesterol 1304
 cholinesterases, plasma 194, 195
 chondrocranium 811
 chondrotoxicity, local anesthetics 424
 chordae tendinae, development 71

Christmas disease 235, **1050–1**
 chromosome 5p deletion syndrome *see cri du chat syndrome*
 chronic diseases, adolescents and young adults 522–34
 chronic kidney disease (CKD; chronic renal failure) 165–7
 dialysis 750–4
 etiology **166**
 preoperative assessment **277**
 renal transplantation 683
see also end-stage renal disease; renal failure
 chronic lung disease (CLD)
 ex-premature infants 498
 premature infants 478, 479
 chronotropy 951
 cidofovir 796
 CIOMS (Council for International Organizations of Medical Science) 50
 circle of Willis 127–8
 circulation
 CPR 260–2
 fetal *see fetal circulation*
 mature 79, 79
 pediatric intensive care 949–60
 regulation of vascular tone 88–91, 89
 single ventricle/parallel 624–8
 transitional 79, 79, 103–4
see also pulmonary circulation; systemic circulation
 circulatory overload, transfusion-associated (TACO) 250
 circumcision 745
 cirrhosis, pathophysiology **683, 683–6**
 cisatracurium 194–6
 cerebral effects 543–4
 dosing 196, 1294
 pharmacodynamics 195–6
 pharmacokinetics **193, 195**
 citizenship, good 10, 10–11
 citrate-phosphate-dextrose (CPD) 241
 citrate-phosphate-dextrose-adenine (CPDA-1) 241
 citrate toxicity, transfusion-associated 251
 Clara cells 100
 clathrin 91
 clearance 161–2
 allometric scaling 169, 169
 drugs 171
 intravenous agents **181**
 muscle relaxants **193**
 opioids **189**
 cleft lip and palate 822–3
 airway management **320**
 developing countries 1146
 genetics 813, 823
 LAHSHAL code 822–3
 myringotomy tube placement 779
 premature infants 484
 range of malformations 822
 cleft lip and palate reconstruction 840–1
 anesthetic management 840, 840
 history 810
 pharyngeal flap 833, 833
 postoperative management 840–1
 preoperative evaluation 840
 surgical procedures 832, 832–3
 clevudipine 671
 clindamycin 1296
 clinical data 1241–2
 clinical trials 40–59
 authorship of papers 46, 57
 budgeting issues 57–8
 close-out and termination stage 58–9
 common impediments 41–2
 concept protocol 54
 control groups 42–3
 data management 55–7
 defined 41, 41
 document preparation 55–7
 ethical aspects 49–53

ethical review and approval 50, 50–1
 execution 58
 feasibility assessment 54–5
 funding 46–7
 informed consent document 57
 initial design stage 54–5
 outcomes measures 44–5
 phases of testing new drugs 47, 47–8
 protocol development stage 55–8
 protocols 55, 56
 recruitment planning 55
 registration 58
 research question 42
 safety monitoring plan 57
 sample size and power 45
 single center vs. multicenter 45–6
 stages 53–9, 54
 study design 42–5
 timing 48–9
 validity 43–4
see also research
 clinic procedures, anesthesia and sedation for 931–2
 cloaca 159, 160, 741
 cloacal extrophy 742
 clonazepam 180, **1186**
 clomidine
 emergence agitation 373
 epidural 202, 423, 862, **863**
 premedication 289, 344
 cloning, electronic records 1276
 Closed Claims Project, ASA 1153, 1242–3
 clotting factors *see coagulation factors*
 cloverleaf skull (Klebeblattschädel) 819, 823
 clown doctors 287
 clubfoot (talipes equinovarus) 757–8, 758
 arthrogryposis 768
 cerebral palsy 770
 CNS *see central nervous system*
 coagulation 224–34
 cascade model 225, 226
 cell-based model 225–7, 226, 227
 developmental changes 228, 228–9
 evaluation *see coagulation tests*
 inhibitors 227
 developmental changes 228, 229
 neonates 212, 228, 229
 pathway 224–7
 pregnancy-related changes 460
 preoperative evaluation 232–4, **233**
 regulation 227
 coagulation defects
 adenotonsillectomy 783
 after embolization of vascular malformations 929
 congenital heart disease 597
 during liver transplantation 690–1
 end-stage liver disease 685
 end-stage renal disease 694
 osteogenesis imperfecta 767
 PICU patients 982–3
 preoperative assessment **277**
 coagulation factors 225, **225**
 assays 231–2
 developmental changes 228, 228
 neonates 212, 228
 premature infants 488
 reference ranges 1305
 coagulation tests 229–34, **982**
 clinical use 232–4
 developmental changes 229
 during liver transplantation 690
 neonates 212, 212, 229
 point of care 234, 407
 premature infants 488
 preoperative screening 232–3, 278–9
 spinal surgery 664
 coarctation of aorta 646–7
 Cobb angle 657, 658
 Cobra perilyngeal airway (CobraPLA) 310

cocaine
 abuse 521
 historical aspects 1171, 1173
 nasotracheal intubation 313
 ophthalmological use **801**
 sinus surgery 786
 cochlear implants 781
 MRI safety 924
 Cochrane Library 1277
 Cockayne syndrome **320, 1018–19**
 cockpit resource management *see crew resource management*
 codeine 190–1, 853
 after outpatient surgery 886
 dosing 190–1, **854**
 ear surgery 779–80
 metabolism **172, 172–3, 173, 190–1**
 pharmacokinetics **189, 190–1**
 code sets 1272
 coercion, research participants 53
 cognitive impairment
 adolescents 533–4
 extremely premature infants 493, **493**
 parental presence at induction 343
 premedication 344
 spinal surgery 662
see also developmental delay; neurodevelopmental outcomes
 cold agglutinins 1304
 Cole's formula, modified 314
 colloid solutions, neonates 216
 colon, motor function 156
 colonic atresias 153
 colonoscopy 735, 932
 Color Analog Pain Scale 848, 849
 colostrum 158
 common cardinal vein 66, 66, 67, 68
 common carotid artery, development 74
 Common Rule (45 CFR 46) 50, 51
 communication 1283–4
 barriers to effective 1283–4, 1284
 closed-loop 1283, 1283
 defined 1283
 during hand-offs *see hand-offs*
 high-fidelity simulation 1227–9
 with ICU 947
 mnemonics 364, **364, 365, 1283**
 with PACU 363–4
 performance skills **1223**
 problems, frequency 1284
 strategies 1283
 compartment syndrome 914
 complement, serum 1303
 complex regional pain syndrome (CRPS) 860, 868–9
 case study 871–3
 management 860, 869
 type 1 (CRPS1) 868–9
 type 2 (CRPS2) 869
 compliance
 chest wall 98, 304
 lung 105, 105
 with regulations and guidelines 1273, 1273
 complications, perioperative 1152–82
 outpatient anesthesia 892–4
 risk factors 274
see also specific complications
 computed tomography (CT) 919–21
 anterior mediastinal mass 580, 580, 581
 congenital heart disease 600
 cystic lung lesions 578, 578
 empyema 584, 585
 endovascular neurosurgery 565
 multidetector (MDCT) 920
 radiation exposure 941
 trauma 909, 914, 914
 computer-based simulation systems 1226–7
 computerized physician order entry (CPOE) 378, 1258
 computers 1265
 concurrent controls 43

conduction, heat loss via 1160, 1161
 conduction system of heart, development 66
 confidentiality 4–5, 1271–2
 conflict resolution
 between parents and clinicians 8, 8
 within teams 1283
 Congenital Cardiac Anesthesia Society 24
 congenital heart surgery database 1245, 1246–8
 congenital cystic adenomatoid malformation (CCAM) 455–6, 577, 583
 fetal surgical strategies 456, 578
 open fetal surgery 456, 457
 postnatal management 578, 578, 579
 volume ratio (CVR) 456
 congenital diaphragmatic hernia (CDH) 510–12, 583
 diagnosis 510–11, 511
 fetal surgery/interventions 446–8
 EXIT procedure 447, 449
 fetoscopic tracheal occlusion 447, 447–8, 448, 448
 open tracheal occlusion 446–7
 primary repair 446
 history of management 19
 lung to head ratio (LHR) 447, 448, 510–11
 mortality 446
 postnatal management 511–12
 surgical repair 512, 512
 congenital heart disease (CHD) 588–653
 adolescents and young adults 528
 adrenergic receptor signaling 92–3
 anesthetic agent choice 604–8
 brain immaturity 122
 cardiac catheterization *see* cardiac catheterization
 cardiac surgery 608–15, 621, 621–2
 case study 650–2, 651
 classification of surgical repairs 615, 615
 cyanotic *see* cyanotic congenital heart disease
 database 1245, 1246–8
 developmental mechanisms 60–1, 75–8
 Down syndrome 76, 645, 995
 ductus-dependent 594
 fetal interventions 458–9
 genetic syndromes 994, 998–1000
 heart transplantation 697, 698, 699
 history of anesthesia 19, 23–4
 induction of anesthesia 603–4
 shunt-related delay 604–5, 605
 interventional procedures 615–21
 maintenance of anesthesia 604
 near infrared spectroscopy 410, 411–14, 412, 413, 414
 non-cardiac surgery 615
 pathophysiology 589–97
 arterial desaturation 595–7
 manipulation of vascular resistance 592–4
 pulmonary circulation 594–5
 shunt lesions 589–92
 perioperative cardiac arrest 1154, 1244
 preoperative evaluation 277, 597–602, 598
 history and examination 331, 597–8
 investigations 598–600
 pathophysiological approach 600–2
 spinal surgery 663
 principles of anesthesia 602–4
 shunts *see* shunts, intracardiac
 VACTERL association 996
see also specific lesions
 congenital lobar emphysema (CLE) 577, 579, 583
 congestive heart failure *see* heart failure, congestive
 conotruncal anomalies face syndrome *see* velocardiofacial syndrome
 conotruncal malformations 76–7
 consciousness 290
 development 290–1

consent, informed 2, 2–6
 document, pediatric research 57
 minimal risk research 50, 50
 pediatric research 51–2
 preoperative issues 330
 procedures without direct benefits 6
 temporarily impaired parents 6
 constipation, opioid-induced 857, 858
 context-sensitive half-times 170
 intravenous agents 183, 183
 opioids 183, 186
 volatile agents 176, 177
 continuing medical education (CME) 30
 use of simulation 1225
 continuous positive airways pressure (CPAP)
 history 20
 induction of anesthesia 308
 laryngospasm 317, 786
 nasal (nCPAP)
 obstructive sleep apnea 781
 premature infants 476
 PICU 963
 postoperative period 316
 continuous renal replacement therapy (CRRT) 753
 ICU setting 980–1
 operating room 754
 other dialysis modalities vs 752
 principles 751
 contractures
 arthrogryposis 768
 cerebral palsy 770
 contrast media, intravascular 943–4
 control groups 42–3
 conus arteriosus (infundibulum) 70–1, 73
 defects of development 76–7
 conus medullaris 656
 ascension during development 119, 120
 convective heat loss 1160, 1161
 Cook catheter 327
 Cooley, Denton A. 23
 Cope, Robert 17, 17
 core-rod myopathies 771
 core temperature 406, 1156, 1163
 Cori disease 1042–5
 Cornelia de Lange syndrome 773, 1018–21
 coronal synostosis 814, 814
 coronary arteries
 development 75
 developmental defects 78
 transposition of great arteries repair 641
 vasculopathy, after heart transplant 698, 702–3
 coronary perfusion pressure (CPP), during CPR 259
 corpus callosum, agenesis of 120
 corrugator supercilii, monitoring neuromuscular blockade 192, 192–3
 corticosteroids
 acute lung graft rejection 713
 after outpatient surgery 886
 ALI/ARDS 971
 anaphylactic reactions 1180
 antenatal
 bronchopulmonary dysplasia prevention 113
 congenital diaphragmatic hernia 511
 surfactant synthetic response 102
 anterior mediastinal mass 336
 asthma
 ICU setting 966
 prior to surgery 280
 stepwise approach 111–12
 dosing 1296
 epidural, back pain 869
 mode of action 681
 neurosurgical patients 547
 preoperative assessment 277
 septic shock 957
 spinal surgery patients 664
 stridor 789
 transplant recipients 680, 681–2
see also dexamethasone; hydrocortisone; methylprednisolone
 cortisol, serum 285, 986
 reference ranges 1304–5
 Costello syndrome 1020–1
 co-stimulation blocking antibodies (Co-stim-AB) 681, 682
 Council for International Organizations of Medical Science (CIOMS) 50
 cow's milk, preoperative fasting 279, 279
 CPAP *see* continuous positive airways pressure
 CPR *see* cardiopulmonary resuscitation
 Cppss50 170
 cranial base, development 811
 cranial vault
 development 811
 reconstruction 827
 craniectomy 827
 craniocervical decompression 828
 craniofacial anomalies 813–23
 adenotonsillectomy 782, 825
 airway difficulties 319, 320, 835–6
 airway evaluation 834
 airway management devices 319, 320
 airway obstruction 824–5, 825, 834
 associated anomalies 825
 etiology and pathogenesis 813–14
 hydrocephalus 823–4, 828
 intracranial pressure 823, 823–4
 physiological sequelae 823–5
 premature infants 484
 spinal surgery 660–1
 craniofacial dysostosis *see* Crouzon syndrome
 craniofacial embryology 810–13, 812
 craniofacial reconstruction 825–39
 anesthetic management 833–6
 airway management 835–6, 838–9
 associated conditions 835
 excessive blood loss 836–8
 intracranial procedures 838
 intraoperative 835–9
 monitoring 839
 patient positioning 836, 837
 premedication 835
 preoperative evaluation 833–4
 temperature control 836
 case study 841–3, 843
 complications 839
 history 810
 postoperative ICU management 976–7
 surgical procedures 825–33, 826
 cranial and facial remodeling 826–30
 cranial vault reconstruction 827
 craniectomy 827
 distraction osteosynthesis 828, 831–2
 facial clefts 830–3
 fronto-orbital advancement 827, 827, 828
 hypertelorism and orbital malposition 830
 mandibular reconstruction 831
 midface advancement 828–30
 neurosurgical procedures 828
 timing and preparation for 826–7
 craniopharyngioma 552–3, 553
 craniosynostosis 549, 814–19
 Boston type 814
 etiology and pathogenesis 814, 815
 hydrocephalus 823–4
 multiple suture 814
 nomenclature 814
 raised intracranial pressure 823, 823–4, 835
 single suture 814, 815, 815–16, 816
 surgery
 cranial vault reconstruction 827
 excessive blood loss 836
 fronto-orbital advancement 827, 827, 828
 patient positioning 837
 syndromic 814, 817–19
 C-reactive protein (CRP) 1303
 creatine kinase (CK)
 malignant hyperthermia 1166, 1167

- neuromuscular diseases 771, 772
reference ranges 1305
- creatinine
serum 208, 279, 1305
urine 1305
- creatinine clearance 162, 208, 1305
- Creutzfeldt–Jakob disease (CJD), variant 248
- crew resource management (CRM) 33, 1220, 1225, 1280
- cricoid cartilage 304
- cricoid pressure
contraindications 316
neurosurgical patients 545
rapid-sequence induction 316, 337–8
- cricothyroidotomy 327
angiocatheter technique 327
large catheter Seldinger approach 327
- cri du chat syndrome 773, 1020–3
airway management 320
- Crigler–Najjar syndrome 145
- crisis resource management *see* anesthesia crisis resource management
- crista terminalis 65, 66
- critical care *see* pediatric intensive care
- critical periods in neurodevelopment 121
- Crohn disease 724–6
adolescents 533
management 725–6
- cromolyn 111, 112
- cross-matching
before blood transfusion 243
pre-heart transplant 698–9
- croup (laryngotracheobronchitis) 789, 790
postextubation *see* stridor, postextubation
- Crouzon syndrome 817–19, 1022–3
airway management 825
anesthetic implications 773
case study 841–3, 843
cervical spine instability 660–1
genetics 814
midface advancement 829
physiological sequelae 823, 823
- CRPS *see* complex regional pain syndrome
- cryoprecipitate 242, 981
administration 243–4
during liver transplantation 690–1
- hemophilia A 236
- indications 245
- massive transfusion 246
- preparation 241, 242
units transfused 245, 1298
von Willebrand disease 235
- cryoprecipitate-reduced plasma 242, 245
- cryptorchidism 746, 749
- crypts (of Lieberkühn) 149, 150, 153
- crystalloid solutions
hypotonic vs. isotonic 218–19, 353
intraoperative fluid management 353
neonates 216
- CT *see* computed tomography
- Current Procedural Terminology, 4th edition (CPT-4) 1272
- C wave 396–7
- cyanotic congenital heart disease
capnography 404, 404
pathophysiology 597
preoperative preparation 601
pulse oximetry 402
- cyanotic episodes, tetralogy of Fallot 633, 635
- cyclic adenine monophosphate (cAMP) 83, 951
- cyclo-oxygenase 2 (COX-2) inhibitors, selective 849, 851–2
- cyclo-oxygenase (COX) enzymes 849–50
- cyclopentolate 801
- cyclopropane 17
- cyclosporin (CSA)
inflammatory bowel disease 725
nephrotoxicity 682, 717
transplant recipients 680, 681, 682
- cyproheptadine 871
- cystatin C, GFR estimation 162
- cystic adenomatoid malformation, congenital *see* congenital cystic adenomatoid malformation
- cystic diverticulum 140, 140
- cystic fibrosis (CF) 113–15, 523–8, 1022–5
anesthetic management 527–8
immunosuppressive therapy 680
liver disease 148, 525, 526
lung transplantation 526–7, 706
contra-indications 707
living donor lobar transplant 711
quality of life effects 718
timing of referral 708
- meconium ileus 156, 524
- pain management 528, 866–7
- pancreatic disease 524–5
- portosystemic shunts 526, 527
- preoperative assessment 277
- pulmonary disease 523–4
pathogenesis 114, 114, 115
- pulmonary surgery 526–7
- sinus surgery 526, 786
- treatment 114–15, 525
- cystic fibrosis transmembrane conductance regulator (CFTR) 113–14, 114, 523
- cytochrome P450 (CYP) enzymes 142–3, 171–3
development 143, 172, 172
genetic polymorphism 172–3
isoforms in liver 171–2, 173
local anesthetic metabolism 421
- cytomegalovirus (CMV) 248, 714
- daclizumab 680, 681, 696
- dactylitis, sickle cell disease 866
- Danish registry study, neurotoxicity of anesthetics 1217
- dantrolene 1168
dosing 1296
prophylaxis 1168
treatment 180, 333, 1168, 1169
- data
administrative 1241–2
clinical 1241–2
missing 1276
- repositories *see* databases
retrieval, electronic records 1274, 1276–7
- security 1271–2, 1272
sharing, privacy laws 1242, 1271
see also information
- database management systems 1240
- database models 1240–1
flat file 1241
hierarchical 1241
network 1241
object oriented 1241
relational 1241
- databases 1239–56
analytical 1240
anesthesia 1242–4, 1277–8
current and future research 1244–9
local 1244
classification 1240–1
client/server 1241
defined 1240
electronic anesthesia records 1249–50
limitations 1242
operational 1240
outcomes and effectiveness research using 1252–4
participation requirements 1255, 1256
perioperative 1250–1
privacy laws and 1242
terminology 1240
uses 1242–9
- data dictionary 1240
- Data Dictionary Task Force (DDTF) 1249
- data entry
automated 1276
errors 1276
- data safety monitoring committee (DSMC) 57
- data warehouse 1240
- day surgery *see* outpatient surgery
- DDAVP *see* desmopressin
- D-dimers 232, 982, 1305
- dead space
breathing circuit 404
measurement 405
- dead space/tidal volume (V_D/V_T) ratio 960–1
- 1-deamino-8-D-arginine vasopressin (DDAVP) *see* desmopressin
- death, in PICU 948
- debriefing
after simulation sessions 1222, 1229–31, 1230, 1230
- team training sessions 1281–2
- decerebrate posturing 974
- decision-making 2–4
age of child and 3, 3
disclosure of information 4
inadvisable care and futility 8, 8
parent's role 2, 3, 52
performance skills 1223
- decision support 1275, 1290, 1291
- Declaration of Helsinki 50
- decorticate posturing 974
- decremental conduction 200
- deep brain stimulators (DBS), placement 561–2
- deep hypothermic circulatory arrest (DHCA) 611, 613
- cerebral protection 614
- EEG monitoring 135
- heart transplantation 701
- near infrared spectroscopy 411, 412, 413, 413
- transcranial Doppler ultrasound 414–15
- defibrillation 268, 269, 1298
- dehydration
signs 353
see also hypovolemia
- delirium, emergence *see* emergence agitation/delirium
- dendritic arborization, cortical pyramidal neurons 121, 121
- dental procedures 806–8
anesthetic management 807–8
endocarditis prophylaxis 336, 603, 603
- sedation vs. anesthesia 806–7
- dentition 303, 303
- deoxyribonuclease I (DNase), cystic fibrosis 114, 525
- Department of Health and Human Services (HHS) 57
- depth of anesthesia monitoring 136–7, 342, 415–16
prevention of awareness 294
- volatile agents 176–7, 178
- desflurane 174–7, 175, 1297
cardiovascular effects 179
- central nervous system effects 178–9, 541
- congenital heart disease 605
- context-sensitive half-times 176, 177
- emergence agitation 372–3, 884
- hepatic metabolism 172
- laryngospasm risk 787
- MAC vs. age 352
- maintenance of anesthesia 350–1
- mode of action 175
- neurotoxicity 1186, 1196, 1198
- outpatient anesthesia 884
- pharmacodynamics 176–7, 178
- pharmacokinetics 175–6
- respiratory system effects 179
- desmopressin (DDAVP)
developmental changes in response 209
- diabetes insipidus 553
- hemophilia 236
- spinal surgery 669
- von Willebrand disease 235

developing countries 1140–51
 anesthesia equipment 1142, 1143–5
 case study 1150–1
 follow-up care 1149
 monitoring and drugs 1147–8
 organization of anesthesia 1140–3
 patient evaluation 1145–7
 postoperative pain relief 1148–9
 types of surgery 1147
 development
 cardiovascular system 60–75
 central nervous system 117–26
 craniofacial 810–13
 gastrointestinal tract 149–52, 153–6
 genitourinary system 740–1
 liver 139–43, 140
 renal system 159, 159–61, 160, 740–1
 respiratory system 95–9
 upper airway 301, 301–2
 developmental anesthetic-induced neurotoxicity
 see neurotoxicity, developmental
 anesthetic-induced
 developmental defects
 cardiovascular system 75–8
 central nervous system 119–20
 gastrointestinal tract 150, 151, 152–3, 154
 liver 146–7
 respiratory system 96–8
 urinary tract 161
 developmental delay
 adolescents 533–4
 case study 808–9
 cerebral palsy 769
 dental surgery 807
 genetic syndromes 994
 organ transplant recipients 717–18
 outpatient anesthesia 878
 see also cognitive impairment;
 neurodevelopmental outcomes
 developmental pathophysiology
 cardiovascular system 91–3
 renal system 164–7
 respiratory system 106–15
 developmental physiology
 cardiovascular system 78–93
 central nervous system 126–37
 fluid and electrolyte balance 208–13
 gastrointestinal tract 148–59
 liver 139–48
 pain 122–6, 845–6
 peripheral nervous system 420
 renal system 161–4, 208–10
 respiratory system 99–106
 upper airway 305
 dexamethasone
 adenotonsillectomy 785
 after foreign body removal 795
 dosing 1296
 postextubation stridor 357, 368
 postoperative vomiting prophylaxis 354, 356,
 377–8
 strabismus surgery 802
 dexmedetomidine
 adenotonsillectomy 785
 awake craniotomy 561
 burn patients 907
 cerebral effects 543
 difficult airway intubation 321
 dosing 1294
 emergence agitation 373
 extramural procedures 940
 intranasal
 burn patients 905
 premedication 344
 neuroprotective effects 1216
 neurotoxicity 1186, 1196
 open globe eye injuries 805
 postoperative analgesia 674
 premedication 344
 spinal surgery 672–3
 dextroamphetamine 858

dextrocardia 75–6
 with situs inversus 76
 with situs solitus (isolated) 75–6
 dextrose infusions *see* glucose infusions
 diabetes insipidus (DI)
 craniopharyngioma 553
 ICU management 977
 neurosurgical patients 544
 diabetes mellitus 220–3
 adolescents and young adults 531–2
 cystic fibrosis 524–5
 pancreas transplantation 715–16
 perioperative management 220–3, 532, 533
 longer/complex procedures 222–3
 minor/short procedures 222
 PICU 984–5
 preoperative assessment 277, 280, 332
 type 1 221, 531
 type 2 221, 222, 531–2
 diabetic ketoacidosis (DKA) 984–5
 1,2-diacylglycerol (DAG) 90, 91
 diagnosis-related groups (DRGs) 1254
 all-patient refined (APR-DRGs) 1254
 dialysis 750–4
 catheter placement 753–4
 ICU setting 980–1
 indications 980
 modalities 751–3, 752
 diaphragm, development 97–8
 diaphragmatic hernia, congenital *see* congenital
 diaphragmatic hernia
 diastrophic dysplasia 1024–5
 diathermy, developing countries 1142
 diazepam
 congenital heart disease 607
 dosing 181, 1294
 extramural sedation 940
 local anesthetic-induced convulsions 440
 metabolism 180
 neurotoxicity 1186, 1201
 open globe eye injuries 804
 pharmacodynamics 180–1
 pharmacokinetics 180, 181
 postoperative behavior changes 1206
 diclofenac 885
 dicrotic notch 395
 diencephalon 119, 119
 diethyl ether *see* ether
 differential nerve block 200, 201
 difficult pediatric airway 319–27
 AVAD approach 319, 320
 awake intubation 320–1
 case study 327–9
 craniofacial anomalies 319, 320, 835–6
 digital intubation 326
 equipment 319, 320, 321
 extramural procedures 938
 extubation 327
 fiberoptic bronchoscopy 322–3
 genetic syndromes 993–4
 indirect methods of intubation 322–6
 intubation under general anesthesia 321
 modified optical laryngoscopes 323–4
 optical stylets 325–6
 osteogenesis imperfecta 767
 predictors 319
 preoperative evaluation 306, 307
 sedated intubation 321
 spinal surgery 660–1
 ventilation 321–2
 video laryngoscopes 324–5
 DiGeorge syndrome *see* velocardiofacial
 syndrome
 digital intubation 326
 digoxin 1296
 dilated cardiomyopathy 698
 diluted Russell viper venom test (DRVVT)
 1305
 dimenhydrinate 377
 dipalmitoyl phosphatidylcholine (DPPC)
 101
 diphenhydramine 858
 allergic reactions 943
 dosing 1297
 direct current (DC) cardioversion 954, 1298
 discharge criteria
 day surgery unit 890–2, 892
 PACU 366, 366–7, 890–2, 893
 disclosure
 for informed decision-making 4
 of medical errors 11
 disseminated intravascular coagulation (DIC)
 982–3
 congenital heart disease 597
 scoring system 982–3, 983
 dissociative anesthesia 185
 distraction osteosynthesis (DO), craniofacial
 anomalies 828, 831–2
 distraction techniques 286–7, 343
 practical use 344–5
 distress, preoperative *see* anxiety, preoperative
 distributive shock 955–6
 diuretics
 dosing 1297
 ICU patients 978–9
 neurosurgical patients 547
 d-loop 61, 63
 DNase, cystic fibrosis 114, 525
 dobutamine 951, 952
 dosing 1295
 postarrest myocardial dysfunction 266
 documentation *see* records
 docuscate 858
 do-not-resuscitate orders 6–8
 barriers to honoring 8
 perioperative re-evaluation 7, 7
 dopamine 951, 951
 dosing 1295
 shock 957
 dopaminergic (DA) system 520–1
 Doppler echocardiography 950
 Doppler ultrasound
 congenital heart disease 598
 guidance, central venous cannulation 394,
 394
 transcranial (TCD) 414–15
 dorsal aortae 72, 74, 75
 dorsal horn 122–3
 dorsalis pedis artery catheters 389, 392
 dorsal root ganglia 656
 dorsal roots (posterior roots) 656
 dose-ranging trials 47
 double bubble sign 723
 double-burst stimulation (DBS) 192
 double-lumen tubes (DLTs) 573, 573, 666
 Down syndrome (trisomy 21) 995–6, 1026–7
 adenotonsillectomy 782–3, 995
 airway management 320, 995
 anesthetic implications 774
 bradycardia and hypotension risk 1250
 cervical spine instability 331–2, 660–1, 920,
 995
 congenital heart defects 76, 645, 995
 facial features 995
 lingual tonsillar hypertrophy 782–3, 783
 postextubation stridor 357
 preoperative evaluation 331–2
 upper airway anatomy 304, 305
 Dräger Fabius® anesthesia machine 924–5, 925
 dressing changes, burn wounds 904
 dromotropy, positive 951
 droperidol 377, 378, 802
 drug(s)
 absorption 169–70
 administration errors *see* medication errors
 allergic reactions 332, 1177, 1178
 disposition 170–1
 distribution 170–1
 efflux systems 168
 emergency 340
 history taking 276, 332
 metabolism 171–3

- genetic polymorphism 172–3
 hepatic 142–3, 171–3
 phase 1 reactions 142, 171, 172
 phase 2 reactions 142, 171, 173
 misuse 332, 521
 pediatric anaesthesia 1293–9
 placental transfer 462, 463, 467–8
 preoperative cessation 332
 protein binding *see* protein binding, drugs
 related cardiac arrest 1154–5, 1155, 1155
 renal elimination 171
 safety 1287–9
 supplies, developing countries 1142, 1148
 transport in blood 170
 uptake 169–70
 used in CPR 262–4, 265, 268
see also individual agents and types of agent
 Dubin–Johnson syndrome 143, 144
 Duchenne muscular dystrophy (DMD) 771, 1026–7
 anaesthetic management 334
 preoperative evaluation 662, 663
 ductus arteriosus
 dependent congenital heart disease 594
 development 74, 75
 fetal circulation 79, 79, 103
 maintenance of patency 79, 601, 602, 626
 patent *see* patent ductus arteriosus
 physiological closure 79, 103
 ductus caroticus 75
 ductus venosus
 development 66, 67
 fetal circulation 79
 physiological closure 79
 umbilical vein cannulation 382, 383
 dulcolax 858
 duodenum
 development 151, 153
 stenoses, webs or atresia 153
 Dutch–Kentucky syndrome 1028–9
 dysautonomia, familial 1032–5
 dysrhythmia, total 120
 dystrophinopathies 771
 ear
 development 813
 protection, during MRI 927
 ear, nose and throat (ENT) surgery 779–800
 outpatient anaesthesia 876–8
 Ebstein anomaly 76
 ECG *see* electrocardiography
 echocardiography
 cardiac function assessment 950
 central venous catheter position 387, 387
 congenital heart disease 598
see also transesophageal echocardiography
 echothiophate 801
 ECLS *see* extracorporeal life support
 ECMO *see* extracorporeal life support
 economic benefits, electronic records 1261
 ectopic atrial tachycardia (EAT) 954
 edema
 burn patients 903
 congestive heart failure 486
 edrophonium 193, 196
 education
 continuing medical *see* continuing medical education
 parent and child *see* parent (and child) education
 pediatric anaesthesiology *see* pediatric anaesthesiology education
 use of simulation 1221, 1221–2
 Edwards syndrome (trisomy 18) 1122–5
 EEG *see* electroencephalogram
 egg allergy 332, 346
 Ehlers–Danlos syndrome 773, 1028–31
 eicosanoids 88
 Eisenmenger syndrome 643
 lung transplantation 707, 707, 708
 electrical safety, extramural locations 934
 electrical stimulation, epidural catheters 860–1
 electricity supply, developing countries 1143
 electrocardiography (ECG)
 central venous catheter insertion 384, 386
 during anaesthesia 340
 during MRI 925, 926, 926–7
 intravascular 387
 postanaesthesia 364–5
 electroencephalogram (EEG) 134–7
 amplitude-integrated (aEEG) 136
 cortical mapping, epilepsy surgery 561, 561
 electrode placement 135
 monitoring 134–7, 415–16
 perioperative uses 134–5, 137
 post CPR 266–7
 processed techniques 135–7, 415–16
 waveforms 134, 135
 electrolytes 205–23
 disturbances
 end-stage liver disease 685–6
 end-stage renal disease 694
 ICU patients 978–80
 liver transplantation 691–2
 fluid compartments 206, 206
 maintenance therapy 216–17
 newborn 207–16
 developmental physiology 208–13
 perioperative management 213–16
 renal handling 162, 162–3
 older infant and child 216–23
 plasma 279
 premature infants 481, 488
 electromyography (EMG) 137
 electronic anaesthesia records *see* anaesthesia information management systems
 electronic health records (EHRs) 1257–61
 medico-legal issues 1267–8
 national system 1258
 pace of development 1257–8
 regional networks 1258
 electronic medical records (EMRs) 1267–8
 data retrieval 1274
 defined 1257
 interoperability 1268, 1269
 medico-legal issues 1267–8
 privacy and security 1270–2
 research applications 1276–8
 electrophysiological monitoring, perioperative 137, 137
 Ellis–van Creveld syndrome 773
 emancipated minors 3, 3–4
 embolectomy catheters, as bronchial blockers 571, 571–2
 embolization
 coil, complications 618
 inadvertent, intravascular devices 401, 617
 therapy, endovascular 928, 928–9, 930, 937
 embryology
 cardiovascular system 60–75, 62
 central nervous system 117–19, 118
 craniofacial 810–13, 812
 gastrointestinal tract 149–52
 genitourinary system 740–1
 liver and gallbladder 139–40, 140, 151
 peripheral nervous system 419–20
 renal system 159, 159–61, 160, 740–1
 respiratory system 95–8
 upper airway 301, 301–2
 emergence agitation/delirium (EA or ED) 356, 372–4
 definition 372
 inhaled agents 177, 372–3, 884
 management 373–4
 postoperative behavior changes and 296–7
 risk factors 373
 emergence from anaesthesia 354–5
 case study 358–9
 delayed, causes 355, 356
 no-touch strategy 355
 phases 355
 premature infants 492–3
 stimulation strategy 355
see also postanaesthesia care unit
 emergency care, consent for 5
 emergency carts, postanaesthesia care unit 362, 362
 emergency departments (EDs), age limits 523
 emergency drugs, preoperative preparation 340
 emergency gas cylinders 338
 emergency medical services 989–90
 emergency surgery
 aspiration risk 334
 rapid-sequence induction 337–8
 Emery–Dreifuss muscular dystrophy, anaesthetic management 334
 EMLA® cream 859
 absorption 198
 intravenous induction 346
 EMO vaporizer *see* Epstein Macintosh Oxford vaporizer
 emphysema, congenital lobar (CLE) 577, 579, 583
 empyema 583, 584–5, 585
 enalaprilat 1295
 encephalocele 555
 naso-orbital deformities 821, 821
 encephalotrigeminal angiomas 1116–19
 endobronchial intubation, selective 571, 666–7
 endocardial cushion defects 76, 644–5
 endocardial cushions
 development 69, 72
 fusion 72, 73
 endocarditis prophylaxis 336, 336
 congenital heart disease 603, 603
 endocrine disease, PICU 984–6
 endocrine response, burn injuries 899, 901
 endocrine system, preoperative assessment 277
 endoderm 149
 end-of-life care
 do-not-resuscitate orders 6–8
 inadvisable care and futility 8
 withdrawing mechanical ventilation 9
 endomyocardial biopsy *see* myocardial biopsy
 endoscopic procedures
 gastrointestinal 734–5, 931–2
 respiratory tract 790–2
 endoscopic retrograde cholangiopancreatography (ERCP) 735, 932
 endothelin-1 (ET-1) 89, 89
 endothelin-1 receptors
 A (ETA) 89
 B (ETB; ENDRB) 89, 155
 endothelins 89
 endotoxin 145
 endotracheal intubation *see* tracheal intubation
 endotracheal tubes (ETT) 314–15
 adenotonsillectomy 783–4
 assessing size after insertion 315
 bronchoscope adaptor 323, 323
 burn patients 900
 cleft lip and palate surgery 840, 840
 confirming correct position 403
 cuffed vs. uncuffed 314–15, 339
 diameter 314, 339
 fixation, preoperative assessment 484
 flow rates 965
 intraoperative damage/dislodgement 838, 839
 jet ventilation without 791–2
 laser microlaryngeal surgery 797, 798
 length 315, 339
 neurosurgical patients 545
 one-lung ventilation 315, 571, 571–2
 postoperative mechanical ventilation 316
 RAE 314, 783–4, 799
 removal *see* tracheal extubation
 spinal surgery 661, 665, 665
 tip movement with neck movement 312
 endpoints, study 42
 surrogate 44–5
 end-stage liver disease 683, 683–6

- end-stage renal disease (ESRD)
 dialysis 751–3
 dialysis catheter placement 753
 pathophysiology 694
 posterior urethral valves 744
 renal transplantation 693, 695–6
see also chronic kidney disease
 end-tidal carbon dioxide (ETCO₂)
 common patterns 404, 404
 during CPR 260
 monitoring *see* capnography/capnometry
 PICU 960–1
 energy expenditure
 correlation with weight 217, 217
 resting (REE) 987
 enflurane 175
 neurotoxicity 1186
 postoperative behavior changes 1206
 enteral feeding
 burn injuries 899–900
 gut function and 156
 PICU 986–7
 enteric nervous system (ENS) 155
 enterocytes 149, 150
 development 153
 immune function 156–7
 enterohepatic circulation 143, 155
 Entropy™ monitor 137
 environmental factors, brain development 1215
 environmental modifications, anxiety reduction 287
 ephedrine, dosing 1295
 epidermolysis bullosa (EB) 1000–1, 1030–3
 dystrophic (DEB) 1000, 1000–1
 epidural anesthesia/analgesia 429–30, 860–2
 adjuvants 202, 423, 862
 bladder exstrophy 742–3, 743, 744
 case study 203
 catheter placement 429–30, 860–1, 861
 complications 439–41
 cystic fibrosis 867
 developing countries 1148
 developmental physiology 420
 dosage regimens 430
 fetal surgery 471
 infusion rates 863
 lung transplantation 711
 monitoring 864
 pain management protocols 864
 pregnant women 460, 461
 selection of drugs 861–2
 thoracic surgery 574
 trends in use 424–5, 425
 ultrasound guidance 430
 epidural hematoma 557, 557–8, 914
 epidural space, developmental changes 420
 epidural steroid injections, back pain 869
 epiglottis 303, 304
epiglottitis *see* supraglottitis
 epilepsy
 cerebral palsy 769
 deep brain stimulator placement 561–2
 hemispherectomy 561
 preoperative assessment 277, 280–1
 surgery, awake craniotomy 560–1, 561
see also seizures
 epinephrine 952
 after foreign body removal 795
 anaphylaxis 1180
 β-adrenergic receptor affinity 82
 bradycardia 350
 bronchospasm 348
 burn patients 907
 cardiac arrest 263, 265
 continuous infusion 951, 952
 dosing 1295
 heart transplantation 701
 local anesthetic toxicity 1174
 middle ear surgery 780
 nebulized racemic
 dosing 1297
 foreign body removal 795
 postextubation stridor 317, 357, 368, 789
 neonatal resuscitation 515–6
 ophthalmological 801
 regulation of vascular tone 90
 severe asthma 967
 shock 957
 use with local anesthetics 199, 202
 ventricular fibrillation 268
 epistaxis 308, 313
 epithelial sodium channels (ENaC) 99
 ε-aminocaproic acid (EACA) 253
 dosing 1297
 liver transplantation 691
 spinal surgery 669–70
 Epstein–Barr virus (EBV) 717
 Epstein Macintosh Oxford (EMO) vaporizer 1143, 1144, 1144, 1145
 equilibration half-time (T_{1/2}ke0) 170
 benzodiazepines 180, 181
 inhaled agents 175, 176–7
 intravenous agents 181, 182, 183
 muscle relaxants 193, 195
 opioids 189
 equipment
 airway management 307, 338–9, 339
 anesthesia
 developing countries 1142, 1143–5, 1144
 MRI compatibility 924–7, 934
 neonates 501
 outpatient surgery 876
 preparation 338, 338–40
 trauma 909, 915
 pediatric anesthesia simulation 1228, 1236, 1236–8
 postanesthesia care unit 362, 362
 radiofrequency identification 1291
 equipoise 42–3
 equivalence designs, outcomes research 1254–5, 1255
 erythroblastosis fetalis 240, 444
erythrocytes *see* red blood cells
erythrocyte sedimentation rate (ESR) 1312
erythropoietin (EPO)
 premature infants 481
 recombinant human
 premature infants 481, 500
 preoperative therapy 251–2
 before spinal surgery 664, 668
Escherichia coli, infant gut 158
 esmolol 1296
 esophageal atresia 506–10
 classification and variants 506, 506, 507
 conduct of anesthesia 508–10, 509
 developmental aspects 96–7, 150, 151
 diagnosis 506–7
 postoperative care 510
 preoperative evaluation 507–8
esophageal foreign bodies 795
esophageal motility disorders 307
esophageal pressure monitoring 961
esophago-gastro-duodenoscopy (EGD) 735, 932
estradiol, neuroprotective effects 1216
ETCO₂ *see* end-tidal carbon dioxide
ethacrynic acid 547
ethanol injection, vascular malformations 928, 929, 929
 ether anesthesia
 developing countries 1148
 history 15, 16
 postoperative behavior changes 1206
 ethics 1–14
 pediatric research 9–10, 49–53
 placebo-controlled trials 43
see also consent, informed
 ethics committees 1–2
 consultation services 1–2
 review and approval of clinical trials 50–1
see also institutional review boards
etomidate 184–5
 central nervous system effects 542
 congenital heart disease 608
 dosing 1294
 formulation and dosing 185
 heart transplantation 700
 induction 185, 346
 pharmacodynamics 184–5
 pharmacokinetics 181, 184
 rapid-sequence induction 337
 trauma 910
 European Medicines Agency (EMA) 48, 50, 58
 Eutectic Mixture of Local Anesthetics *see*
 EMLA® cream
 Evans myopathy 1168
 evaporative heat loss 1160, 1161
everolimus 680, 681, 682
 evidence-based medicine (EBM) 1275, 1277
 evoked potentials (EP)
 development 125
 monitoring 137, 137
 spinal surgery 556–7, 672
 evoked stapedius reflex thresholds (ESRT) 781
 exchange transfusion
 heart transplantation 701
 serum bilirubin levels and 482, 482
 sickle cell disease 984
 excitation-contraction coupling
 immature heart 87
 normal mature heart 84–7
 exercise tolerance
 after transposition of great arteries repair 641
 Fontan patients 633
 EXIT procedure *see ex utero intrapartum treatment (EXIT) procedure*
 exomphalos *see* omphalocele
 ex-premature infants 497–519
 abdominal wall defects 503–6
 anesthesia management 335
 case study 516–17, 517–18
 congenital diaphragmatic hernia 510–12
 esophageal atresia and tracheo-esophageal fistula 506–10
 inguinal hernia 502–3, 503
 meningocele 512–13
 muscle biopsy 513
 operating room environment 500–1
 outpatient anesthesia 878–9
 postanesthetic apnea 335, 492, 498–9
 postanesthetic discharge 335, 366–7, 499
 postoperative extubation or ventilation 501–2
 problems and complications 497–500, 498
see also extremely premature infants;
 premature infants
 exstrophy complex 742
 external genitalia, development 741
 external jugular vein, cannulation 382, 386
 extracardiac obstructive shock 955
 extracellular fluid (ECW) compartment
 composition 206, 206
 developmental changes 168, 207, 207
 regulation 206
 extracorporeal cardiopulmonary resuscitation (E-CPR) 267
 extracorporeal life support (ECLS) 971–3
 acute severe asthma 968
 adult outcomes 973
 ALI/ARDS 971, 973
 complications 973
 congenital diaphragmatic hernia 511
 fetal, before delivery 450
 infant outcomes 972
 pediatric indications 973
 pediatric outcomes 972–3
 procedure 972
 rescue, cardiac arrest 267
 Extracorporeal Life Support Organization (ELSO) 972
 extracorporeal membrane oxygenation (ECMO)
see extracorporeal life support
 extramural procedures *see* outside-the-operating room procedures

- extremely premature infants (24–30 weeks)
 (micropremies) 476–7
 anesthesia 493–4, 494
 case study 494–6
 outcomes 493, 493
see also ex-premature infants; premature infants
- extremity trauma 914, 916
 extubation *see* tracheal extubation
- ex utero* intrapartum treatment (EXIT) procedure 445, 448–50
 anesthetic management 448–9, 449, 450, 469–70
 case study 472–3, 473
 congenital diaphragmatic hernia 447, 449
 cystic lung lesions 578
 indications 448
 outcomes 450
 eye(s)
 anatomy 803
 development 813
 injuries, open globe 804–5
 problems
 after surgery in prone position 666
 ex-premature infants 499–500
 protection, laser airway surgery 797–8
 surgery 800–6
 extraocular 800–2
 intraocular 802–6
see also postoperative visual loss
- Fabry disease 1032–3
 face, development 811–13, 812
 facemasks 307, 338
 application techniques 344–5
 epidermolysis bullosa 1001
 oxygen administration 357, 962, 962
 phobias 345
 facemask ventilation
 craniofacial anomalies 835
 difficult airway management 321–2
 fiberoptic intubation 323
 impossible 322
 induction of anesthesia 307–8
 laryngospasm 348
 maintenance anesthesia 309–10
 patient positioning 308
 predictors of difficult 319
 rapid-sequence induction and intubation 316
 two-person, two-handed 309, 309
 Faces, Legs, Activity, Cry, Consolability Scale (FLACC) 375, 375, 846, 847
 Faces Pain Scale – Revised 847, 849
 facet joints 657
 facial anomalies 819–23
 facial clefts 821–3
 surgical reconstruction 830–3
 Tessier's classification 822, 822
see also cleft lip and palate
- facial reconstruction *see* craniofacial reconstruction
- faciocutaneoskeletal syndrome 1020–1
- factor V (FV)
 activated (FVa) 226, 227
 developmental changes 228, 228
- factor V Leiden 236
- factor VII (FVII)
 activated (FVIIa) 226
 recombinant (rFVIIa) 253
 craniofacial surgery 838
 dosing 1297
 heart transplant surgery 702
 developmental changes 228, 228
- factor VIII (FVIII)
 activated (FVIIIa) 227
 deficiency in hemophilia 235
 developmental changes 228, 228
 inhibitory antibodies 236
 replacement therapy 236
 von Willebrand disease 235
- factor IX (FIX)
 activated (FIXa) 226, 227
 deficiency in hemophilia 235
 developmental changes 228, 228
 replacement therapy 236
- factor X (FX)
 activated (FXa) 226, 227
 developmental changes 228, 228
- factor XI (FXI)
 activated (FXIa) 227
 developmental changes 228, 228
- factor XII (FXII), developmental changes 228, 228
- factor XIII (FXIII), developmental changes 228, 228
- FA/FA0 ratio 176
- FA/FI ratio 176
- Fallot's tetralogy *see* tetralogy of Fallot
- familial dysautonomia 1032–5
- familial periodic paralysis (FPP) 1034–5
- family-centered care, PICU 947–8
- family history 275, 330
- famotidine 1297
- Farmar's entrainer 1144
- fascia iliaca compartment block 435
- fasting, preoperative 279, 306–7, 334
 diabetes mellitus 532, 533
 extramural sedation and anesthesia 936
 gastrointestinal physiology and 156
 guidelines 279, 279, 334
 intravenous fluid therapy and 219, 220
 radiation oncology 931
- fast-tracking, day surgery patients 881, 891, 892
- fat
 breast milk 158
 malabsorption, cystic fibrosis 524
 fatigue, opioid-induced 858, 858
- fatty acid metabolism, development 142
- FDA *see* Food and Drug Administration
- febrile non-hemolytic transfusion reactions (FNHTR) 249
- Federal Wide Assurance (FWA) 50
- feedback 1282
- feeding problems, premature infants 476, 481
- fellowship (subspecialty) training
 curriculum 29, 38–9
 data 31
 developing countries 1142–3
 evaluating effectiveness 34
 experience of fellows 29, 30
 history of development 24, 25
- femoral artery catheters 390
 insertion 390
 sizes 389, 390
- femoral epiphysis, slipped capital (SCFE) 761–2
- femoral fractures, supracondylar 764
- femoral nerve block 434–5
 sciatic nerve block with 435
 ultrasound guidance 434, 434–5, 441
- femoral vein catheters 386
 insertion 386
 malposition 399
- fenoldopam 1295
- fentanyl
 analgesia 855
 burn patients 908
 patient and nurse-controlled 857
 postoperative 376
- anesthesia 352
 congenital heart disease 604, 606–7
 extremely premature infants 494, 494
 heart transplantation 699–700
 history 21–2
 outpatient surgery 882, 884
 premature infants 489, 490
 renal transplantation 696
 trauma 915
 cerebral effects 542
 dosing 854, 1294
 epidural 202, 423, 862, 863
 intranasal 780
- metabolism 172, 172
- neurotoxicity 1186
- oral transmucosal 855
- pharmacokinetics 183, 187, 187, 189
- transdermal 855
- ferritin, serum 1305
- ferromagnetic objects, MRI safety 922–4, 941–3
- fetal alcohol syndrome 1036–7
- fetal circulation 78–9, 79, 103
 changes at birth *see* transitional circulation
- drug uptake and 462
- liver 140–1
- persistent 103
- therapeutic maintenance 79
- fetal endoscopic tracheal occlusion (FETO), congenital diaphragmatic hernia 447, 447–8, 448, 448
- fetal interventions/surgery 444–74
 anesthetic management 459–66, 467–71
 case study 472–3, 473
 cystic lung lesions 456, 578
 EXIT procedure *see* *ex utero* intrapartum treatment (EXIT) procedure
- fetal pain and anesthesia 463–6
- future prospects 471
- history 444–5
- interdisciplinary team 467
- minimally invasive or percutaneous 445, 468–9
- open procedures 445, 469, 469–71
- posterior urethral valves 744
- postoperative management 471
- preoperative assessment 466–7
- risks and benefits 467
- specific conditions 445–59
- fetal lung fluid 99, 99
 clearance at birth 99, 102
 retention at birth 102–3
- fibrotic cord coagulation (FCC) 454
- fatigue 1282
- akinesia 768
- anesthesia and analgesia 466, 467–8
- drug uptake 462
- hematopoiesis 140
- immobilization 468
- impact of anesthesia 462–3, 1210, 1212
- myocardial contractility 79–80
- pain perception 463–6, 464
- physiology 462
- respiratory system development 95–9, 96
- urine production 160–1, 208
- FGFR gene mutations 813, 814
- fiberoptic bronchoscopy *see* bronchoscopy, fiberoptic
- fiberoptic lighted intubation stylet 326
- fibrin assays 232
 clot dissolution 227
 clot formation 227
- fibrin degradation products 232
- fibrinogen
 developmental changes 228, 228
 fetal 229
 plasma 230, 982, 1305
- fibrinolysis 227
 developmental changes 228, 229
- evaluation 232
- fibronlytics, intrapleural 584–5
- fibrin split products 982, 1306
- fibrodysplasia ossificans progressiva 320, 1036–7
- FIC gene 144, 148
- Fick method, cardiac output measurement 950
- filum terminale 656
 development 119, 120
- financial benefits, electronic records 1261
- FiO₂ *see* fraction of inspired oxygen
- fire risks
- adenotonsillectomy 784
- laser airway surgery 797, 798
- Five Ps mnemonic 364
- FK-506-binding protein (FKBP) 85

FLACC scale 375, 375, 846, 847
 flight simulation 1220
 floppy infant 513, 772
 flow-volume loops 961, 961
 fluid(s) 205–23
 compartments
 composition 206, 206
 developmental changes 207, 207–8
 volume regulation 206–7
 imbalances, end-stage renal disease 694
 maintenance *see under* intravenous fluid therapy
 therapy
 management *see* intravenous fluid therapy
 newborn 207–16
 developmental physiology 208–13
 perioperative management 213–16
 older infant and child 216–23
 preoperative intake 279, 279
 restriction, premature infants 479, 487
 resuscitation, burns 902–3, 904
see also water
 flumazenil 181
 cerebral effects 542
 dosing 1298
 flunitrazepam, congenital heart disease 607
 Fogarty catheters, as bronchial blockers 571, 571–2
 follicle-stimulating hormone (FSH), serum 1306
 follow-up care, developing countries 1149
 fontanelle, anterior 126
 traditional practices 1141
 Fontan procedure 622, 628–33
 anesthesia for patients after 632–3
 early postoperative complications 631, 632
 fenestration techniques 628, 631
 ideal physiology immediately after 629–31, 630
 modifications 628, 628
 selection criteria 629
 food allergies 332, 346, 1177
 Food and Drug Administration (FDA)
 investigational new drug (IND) application 47, 58
 MRI safety labels 922, 923
 new drug development 47, 47, 48
 placebo-controlled trials 43
 research regulations (21 CFR 50 and 56) 50, 51
 Food and Drug Administration Amendments Act (FDAAA, 2007) 49
 Food and Drug Administration Modernization and Accountability Act (FDAMA, 1997) 49
 foramen magnum stenosis 661
 foramen ovale 61–3, 64
 fetal circulation 79, 79, 103
 functional closure 79, 103
 patent 76
 foramen primum 61, 64
 foramen secundum 61, 64
 Forbes disease 1042–5
 forced expiratory volume in 1 second (FEV₁), scoliosis 662
 forced vital capacity (FVC), scoliosis 662–3
 foregut, development 149, 150–1
 foreign bodies
 airway 792–5, 793
 esophageal 795
 Foresight monitor 409
 fosphenytoin, status epilepticus 978
 fospropofol 939
 fraction of inspired oxygen (FiO₂)
 induction of anesthesia 347
 intracardiac shunting and 595, 596
 neonatal resuscitation 515
 PICU patients 962, 962–3
 premature infants 489, 490
 pulmonary vascular resistance and 592–3
 spinal surgery 673
 fractures 914
 fragile X syndrome 1038–9
 Francois dyscephalic syndrome 1048–51

Frank–Starling relationships 80
 Fraser syndrome 1038–9
 Freeman–Sheldon syndrome 773, 1132–5
 Frei endoscopy mask 323
 fresh frozen plasma (FFP) 242, 981, 1298
 administration 243–4
 during liver transplantation 690–1
 indications 245
 massive transfusion 246
 recipient compatibility 240
 volume transfused 245
 Friedreich ataxia 1038–9
 fronto-orbital advancement 827, 827, 828
 full stomach 336–8
 full-term infants 497–519
see also neonates
 fulminant hepatic failure (FHF) 683, 685
 functional abdominal pain (FAP) 870
 functional magnetic resonance imaging (fMRI) 921, 927
 functional residual capacity (FRC) 105, 105, 963
 one-lung ventilation 570
 premature infants 484, 485, 485
 funding, clinical trials 46–7
 fundoplication, Nissen 735–6
 furosemide
 bronchopulmonary dysplasia 478
 dosing 1297
 ICU patients 978
 neurosurgical patients 547
 futile therapy 8, 948
 GABA_A-agonists
 mechanisms of neurotoxicity 1198–9
 neurotoxicity 1196, 1197, 1198
 GABA_A receptors 180, 182, 184
 gabapentin 674, 868
 gadolinium-based contrast agents 927–8, 943
 galactose metabolism 141
 gallbladder, embryology 140, 140
 Galveston formula, for burns 903, 904
 γ-aminobutyrate *see* GABA
 γ-glutamyl transferase (GGT) 1306
 γ-knife radiosurgery 931
 Gardner decompression 828
 gas cylinders, emergency 338
 gases, anesthetic 174, 175
 monitoring 405
see also inhaled anesthetic agents; nitrous oxide; xenon
 GAS study 1216–17
 gastric band, adjustable 536, 536
 gastric bypass, Roux-en-Y 536, 536, 537–8
 gastric emptying 156, 279
 gastroesophageal reflux disease (GERD)
 after lung transplantation 712
 extramural sedation and anesthesia 936, 937
 fundoplication 735–6
 preoperative evaluation 307, 331
 gastrografin, oral administration 920–1
 gastrointestinal endoscopic procedures 734–5, 931–2
 gastrointestinal problems
 burn injuries 899–900, 901
 Down syndrome 995
 gastrointestinal tract 148–59, 150
 bacterial colonization 158
 closure 158
 embryology 149–52
 end-stage liver disease 683, 685
 functional development 153–6
 immunity 156–7
 motor function 155–6
 physiology 149
 pregnancy-related changes 461
 preoperative assessment 277
 gastroschisis 503–5, 504
 anesthetic management 505
 developing countries 1150, 1150–1
 pathogenesis 152
 gastrostomy
 esophageal fistula and tracheo-esophageal fistula 509
 percutaneous endoscopic (PEG) 735
 Gaumard simulators 1228, 1235, 1236, 1238
 Gawande, Atul 33
 gender differences, upper airway anatomy 303–4, 304
 Genee–Wiedemann syndrome *see* Miller syndrome
 general anesthesia 330–58
 cardiac catheterization 615–16
 case study 358–9
 defined 936
 emergence *see* emergence from anesthesia
 extramural procedures 940–1
 induction *see* induction of anesthesia
 inguinal hernia repair 503
 maintenance *see* maintenance of anesthesia
 monitoring 401–17
 preoperative evaluation 330–8
 preparation of equipment and monitors 338–42
 recovery *see* recovery from anesthesia
 with regional anesthesia 426
 genetic factors, brain development 1215
 genetic syndromes 993–1003, 1004–139
 airway management 993–4
 cardiac manifestations 994
 case study 1002–3
 causing obesity 534
 family history 275
 information resources 994
 management of common 995–1001
 neurodevelopmental abnormalities 994
 orthopedic problems 773, 773–4, 994
 vascular access 994
 genetic testing, ethical issues 6
 genitourinary system
 development 740–1
see also reproductive system; urinary tract
 gentamicin 1296
 germinal matrix, residual, preterm infants 120, 130
 GFR *see* glomerular filtration rate
 Gilbert syndrome 145
 Glanzmann thrombasthenia 230
 Glasgow Coma Scale (GCS)
 head injury 558, 909, 910
 ICU setting 974, 975
 glaucoma 803, 804
 Glenn shunt 622–3
 bidirectional (BDG) 623, 629
 Glidescope® 324, 324–5, 325
 global warming potential, volatile agents 174, 351
 glomerular filtration 161–2, 208
 glomerular filtration rate (GFR)
 developmental changes 162
 initiation of dialysis 751
 measurement 161–2
 neonates 208
 glossopharyngeal 825
 glucagon, interventional radiology 930
 glucocorticoids *see* corticosteroids
 glucose
 cerebrovascular response 134
 control
 diabetes mellitus 221–3, 280, 532, 533
 ICU patients 985–6
 liver transplantation 692
 neurosurgical patients 547
 post-CPR 264–5
 preterm infants 476–7, 482, 490–1, 491, 492
 metabolism/homeostasis 141
 neonates 211–12
 monitoring, diabetic patients 221–2
 reference ranges 1306
 renal excretion 162, 163, 209
see also hyperglycemia; hypoglycemia

- glucose-6-phosphate deficiency 1040–1
 glucose infusions
 cardiac arrest 265
 diabetic patients 222, 532
 dosing 1298
 hyperkalemia 979
 neonates 212
 intraoperative 215, 216, 353
 older infant/child, intraoperative 220, 353
 premature infants 482, 490–1, 491, 492
 status epilepticus 977
 glucuronyl transferase 142, 143
 GLUT-2 154
 GLUT-5 154
 glutamate 123, 124
 glyceryl trinitrate *see* nitroglycerine
 glycogen, hepatic stores 141
 glycogen branching enzyme deficiency 1044–5
 glycogen debrancher deficiency 1042–5
 glycogen storage diseases (GSD) 1038–47
 type 0 1040–1
 type I 1040–1
 type II 1040–3
 type III 1042–5
 type IV 1044–5
 type V 1044–5
 type VI 1044–5
 type VII 1044–5
 type VIII 1046–7
 glycogen synthase deficiency 1040–1
 glycopyrrrolate 197
 congenital heart disease 603, 604
 dosing 1294
 goblet cells 150, 156
 Goldenhar syndrome 820–1, 997, 1046–7
 airway management 320, 825
 anesthetic implications 773
 phenotype 997, 998
 gonads, development 741
 Google searches 1277
 G protein-coupled receptor kinases (GRK) 85, 92
 G protein-coupled receptors (GPCRs) 81–2, 85
 G proteins 81–2
 graft rejection 716
 heart transplantation 702
 lung transplantation 713–14
 therapy for acute 682
 graft-versus-host disease (GVHD), transfusion-associated 249
 granisetron 377, 888, 1297
 great arteries
 development 72–5, 74
 relationships, development 72
 transposition *see* transposition of great arteries
 great radicular artery of Adamkiewicz 128, 656
 great vein of Galen aneurysms 562, 562
 Greeley, W.J. 23
 greenhouse gases 174
 grommets, insertion 779–80
 Gross, Robert M. 16, 18
 growth
 chronic kidney disease 166
 organ transplant recipients 717–18
 premature infants 481
 scoliosis surgery and 658–9
 transplanted lungs 711–12
 growth hormone 163
 grunting *see* laryngeal braking
 gut *see* gastrointestinal tract
 gynecological surgery, adolescents 532
 H2 receptor antagonists 938
Haemophilus influenzae type b
 meningitis 978
 septic arthritis 765
 supraglottitis 789
 Hajdu–Cheney syndrome 1046–8
 half-life ($T_{1/2}$)
 intravenous agents 181, 182
 muscle relaxants 193
 opioids 187, 189
 see also context-sensitive half-times;
 equilibration half-time
 Hallermann–Streiff syndrome 1048–51
 halogenated agents 174–80, 175
 context-sensitive half-times 176, 177
 hepatic metabolism 172
 malignant hyperthermia 179–80
 mode of action 175
 pharmacodynamics 176–9
 pharmacokinetics 175, 175–6
 halothane 174–7, 175
 age-related requirements 22
 cardiovascular effects 179
 congenital heart disease 605, 605
 extremely premature infants 493, 494
 hepatic metabolism 172
 history of introduction 19
 MAC vs. age 352
 mode of action 175
 neurotoxicity 1186
 pharmacodynamics 176–7
 pharmacokinetics 175–6
 postoperative behavior changes 1205–6, 1207
 respiratory system effects 179
 use in developing countries 1148
 hand
 malformations 762, 762–3
 surgery 762–4, 763
 hand hygiene (HH) 987–8, 988
 hand-offs (handovers) 1283, 1284–6
 barriers to effective 1285
 defined 1284
 features of effective 1285
 to ICU 947
 to PACU 363–4, 364, 365
 standardization 1285, 1285–6
 Hansen, D.D. 23
 haptoglobin 1306
 headache 870–1
 cystic fibrosis 866
 post-dural puncture 440
 recurrent or chronic 870–1
 tension-type 870
 head and neck surgery 779–809
 head injury 557–9, 911–12
 airway management 558–9, 909
 case studies 567–8, 917–18
 intracranial hematomas 557, 557–8, 558
 intraoperative management 558–9, 915–16
 see also traumatic brain injury
 Healthcare Cost and Utilization Project (HCUP)
 1252
 Health Care Financing Administration (HCFA)
 1252
 health informatics 1278
 Health Information Technology for Economic and Clinical Health Act 2009 (HITECH)
 1258, 1290
 Health Insurance Portability and Accountability Act (HIPAA) 1271–2
 applied to clinical trials 57, 58
 patients' rights 1271
 Privacy Rule 57, 1242, 1267
 security 1271–2
 standardized transactions 1272
 Health Level 7 (HL7) 1272
 health record
 legal definition 1267
 see also electronic health records
 Health Resources and Services Administration
 699
 heart
 calcium cycling 84–7
 computed tomography 920
 embryology 61–75, 62
 fetal 79–80
 innervation 80, 88
 looping 61, 63
 myocyte receptor function 81–4
 neonatal physiology 80, 84, 87, 88
 perforation, catheter-induced 399
 positioning defects 75–6
 postnatal development 80–1
 trauma 912–13
 heart block
 complete (CHB) 955
 fetal intervention 459
 first degree 954–5
 second degree 955
 heart disease
 congenital *see* congenital heart disease
 genetic syndromes 994, 998–1000
 perioperative cardiac arrest 1154, 1244
 heart failure, congestive (CHF)
 adrenergic receptor signaling 93
 clinical features in neonates and infants
 602
 congenital heart disease 601–2
 intracranial arteriovenous malformations 563, 564
 patent ductus arteriosus 479, 485–6, 486
 pharmacological targets 85
 premature infants 485–7, 486
 pulmonary atresia 638
 radiocontrast media 943
 single-ventricle physiology 625
 heart-hand syndrome *see* Holt–Oram syndrome
 heart-lung transplantation 715
 complications 717, 718
 pulmonary hypertension 707, 707
 heart murmurs
 premature infants 485–6
 preoperative evaluation 277, 281, 331
 heart rate
 local anesthetic sensitivity and 422, 422
 neonates 210–11
 preterm infants with patent ductus arteriosus
 485, 486, 490, 490
 regional anesthesia test dose 426
 variability 80, 211
 heart transplantation 697–704
 ABO-incompatible 704
 anesthesia for graft recipients 703–4
 anesthetic management 699–702
 history 697
 indications 697, 697–8
 morbidity and mortality 702–3, 703, 703, 717, 718
 non-cardiac surgery after 704
 post-transplant rejection surveillance 702
 pretransplant work-up 698–9
 retransplantation 698, 702–3
 surgical technique 701
 ventricular assist devices as bridge to 973–4
 heart tube
 looping 61, 63
 straight 61, 63
 heat and moisture exchangers (HMEs) 318
 heat loss
 burn injuries 899, 906
 conductive 1160, 1161
 convective 1160, 1161
 evaporative 1160, 1161
 mechanisms
 perioperative 1159–60, 1161
 physiological 1158
 minimizing 208, 341–2, 1164
 neonates 500–1
 neurosurgical patients 548
 premature infants 488, 489
 premature infants 477
 radiant 1159, 1161
 routes 341
 see also hypothermia; warming
 heat production
 effects of anesthetics 1161
 physiological 1158–9
 heat transfer, internal 1163–4
 Hecht–Beals syndrome 1028–9
 height-based formula, central venous catheter placement 387–8
 helicopter transport 990

heliox (helium oxygen mixtures)
postextubation stridor 368, 789
severe asthma 967

hemangiomas, interventional techniques 929

hematocrit
ex-premature infants 500
neonates 216, 500
packed red blood cells 241
reference ranges 1307

hematological disorders
burn injuries 900, 901
congenital 234–9
end-stage liver disease 685
PICU 981–4
premature infants 480–1

hematological physiology
neonates 212–13
pregnancy-related changes 459–60

hematological tests
normal values 1300–14
premature infants 487–8
preoperative 277

hematopoiesis, fetal 140

hematopoietic stem cells
donation 6
transplantation 981

hemifacial microsomia 820–1, 997
airway management 825
see also Goldenhar syndrome

hemihypertrophy, Wilms tumor 749

hemispherectomy 561

hemodialysis 750–1, 753
catheter placement 753, 754

ICU setting 980–1
other dialysis modalities vs 752

hemodynamic parameters, derived 391

hemofiltration 751

hemoglobin 237
absorption spectrum 407, 407–8
concentration
neonates 212–13
predicting transfusion-induced rise 244–5
pregnant women 459
premature infants 481, 487–8
preoperative determination 278
reference ranges 1307
transfusion thresholds 244

fractionation 1307

glycosylated 1306

plasma 1310

hemoglobin A 237

hemoglobinopathies 237–9

hemoglobin S 237

hemoglobin S β thalassemia 237, 530

hemoglobin SC (HbSC) disease 237, 335, 530

hemoglobin SD (HbSD) disease 335

hemoglobin SS (HbSS) disease 237, 529–30

hemolytic disease of newborn 240, 444

hemolytic transfusion reactions (HTRs)
delayed 248
immune-mediated 248
non-immune 250

hemophilia 235–6, 1048–50
A 235, 1050–1
B 235, 1050–1
treatment 236, 253

hemorrhage *see* bleeding

hemostasis 224–7
agents 252–3, 1297
congenital disorders 234–9
cyanotic congenital heart disease 597
during liver transplantation 690–1
post cardiopulmonary bypass 614, 702
primary 224–5, 225
evaluation 229–30

secondary 224, 225–7
cascade model 225, 226
cell-based model 225–7, 226, 227
evaluation 230–2

see also coagulation

heparin
dosing 1297
liver transplantation 691
plasma 1307

hepatic artery 141
anastomoses, liver transplantation 688
thrombosis, liver transplantation 691

hepatic encephalopathy 684–5
anesthetic management 686
staging 684

hepatitis A virus (HAV), transfusion-transmitted 248

hepatitis B (HBV), transfusion-transmitted 247, 247

hepatitis C (HCV), transfusion-transmitted 247, 247

hepatoblastoma 683, 729–30

hepatoblasts 139

hepatocellular carcinoma 729–30

hepatopulmonary syndrome (HPS) 684

hepatorenal syndrome 685

hereditary angio-edema 1050–3

hereditary hemorrhagic telangiectasia (HHT) 1086–7

hereditary sensorimotor neuropathy 1016–17

hereditary sensory and autonomic neuropathy, type III 1032–5

hermaphrodites, true 741

heroin, neurotoxicity 1186

Hers disease 1044–5

hetastarch 1298

hexagonal phase phospholipid neutralization test 1307

Hickey, P.R. 23

high-fidelity patient simulation (HFPS) 1222, 1227–9, 1280
creating scenarios 1231, 1232
elements 1229–31
facilitation 1232
high-tech mannequins 1227, 1227, 1228
history of development 1220–1
hybrid simulation 1229
organization 1229–33
pediatric anesthesia 1233–8
scenario environments 1231, 1231–2
standardized patient actors 1227–9, 1229
use in research 1222–4

high-flow humidified nasal cannula (HFHNC)
oxygen 962, 962

high-frequency oscillatory ventilation (HFOV) 964
ALI/ARDS 971
congenital diaphragmatic hernia 511

high-frequency ventilation 964

high molecular weight kininogen (HMWK) 228, 228

high-reliability organizations (HRO) 1220

hindgut, development 149, 150, 152

hip abduction orthotic 759

hip dysplasias/dislocations 758–9, 759

Hirschsprung disease 155

histamine, anaphylactic reactions 1176, 1177, 1179

historical controls 43

history of pediatric anesthesia 15–25, 21, 25

history-taking, preoperative 275–6, 330–2
adolescents 521

HIV infection
developing countries 1146
transfusion-transmitted 246–7, 247

Holt-Oram syndrome 774, 1052–3

homocystine 1307

homocystinuria 1052–3

hospital-acquired infections *see* nosocomial infections

hospital efficiency and economics 274

huddles, team 1281

human chorionic gonadotrophin (HCG)
serum 1306
urine testing 522

human herpesvirus-8, transmission via transfusion 248

human immunodeficiency virus infection *see* HIV infection

human papillomavirus (HPV) infection 796

human performance skills 1221–2, 1223

human serum albumin *see* albumin

human T-lymphotrophic virus (HTLV), transmission via transfusion 247

humidification, inspired gases 1164

Hunsaker Mon-Jet tube 797

Hunter syndrome 782, 1052–5

Hurler syndrome 774, 1054–7
adenotonsillectomy 782

Hutchinson–Gilford syndrome 1098–9

hybrid simulation 1229

hydralazine 371, 1295

hydration status
extremely premature infants 493
premature infants 487
see also hypovolemia

hydrocephalus 549, 549–51
craniofacial anomalies 823–4, 828
intracranial tumors 553, 554
myelomeningocele 555
postoperative management 976
ventricular shunt surgery 550–1, 828

hydrocortisone
adrenal insufficiency 986
dosing 1296
premedication 664

hydrogen ions, renal handling 162, 163

hydrogen phosphate, fluid compartments 206

hydromorphone 853
cancer pain 865
dosing 854, 1294
epidural 862, 863
patient- and nurse-controlled analgesia 857
postoperative pain 376, 674

hydronephrosis
congenital bilateral 456–7, 458
fetal interventions 457–8
posterior urethral valves 744
ureteropelvic junction obstruction 747–8

hydroxyurea, sickle cell disease 530

hyoscine *see* scopolamine

hyperacute rejection, grafted lungs 713

hyperalgesia 867
burn injuries 907
ketamine actions 186
opioid-induced postoperative 188

hyperammonemia, end-stage liver disease 684–5

hyperbilirubinemia
conjugated 145
unconjugated 144–5

hypercapnia
cerebrovascular response 134
neuronal cell death 1199
permissive, premature infants 476

hypercarbia *see* hypercapnia

hypercoagulable state
burn injuries 900
pregnancy 460

hyperventilation, tetralogy of Fallot 633, 635

hyperglycemia
iatrogenic intraoperative 220
liver transplantation 692
PICU 984–5
post cardiac arrest 264–5
stress 985–6
surgical stress response 221

hyperhomocysteinemia 236

hyperkalemia
acute renal failure 979
burn patients 906
during liver transplantation 689–90

end-stage renal disease 694

malignant hyperthermia 1166, 1168, 1169

succinylcholine-induced 194, 772, 772, 907

transfusion-associated 250–1

- hypermetabolic state
anesthesia-induced, in neuromuscular diseases 772, 772–3
burn injuries 899, 901
malignant hyperthermia 1166
PICU patients 987
- hypernatremia
ICU patients 979–80
premature infants 481
- hypopnea, thermal 1159
- hypertelorism, orbital 821, 821
isolated 821
surgical correction 830, 830, 831
- hypertension
end-stage renal disease 694, 695
organ transplant recipients 718, 718
post cardiac arrest 265–6
postoperative 370–1
upper body, coarctation repair 646–7
- hyperthermia
arthrogryposis 769
hyperpnea 1159
malignant *see* malignant hyperthermia
neurosurgical patients 548, 553
osteogenesis imperfecta 767
perioperative 372, 1156, 1163–4
- hypertonic saline (3% NaCl)
dosing 1298
inhaled, cystic fibrosis 114–15, 525
intracranial hypertension 547
- hypertrophic cardiomyopathy 698
- hyperventilation
cerebrovascular response 134
pulmonary vascular resistance and 593
raised intracranial pressure 975
traumatic brain injury 912
- hypnosis 287
- hypocalcemia
burn patients 906
end-stage renal disease 694
ICU patients 953
liver transplantation 691–2
premature infants 481
transfusion-associated 251
- hypoglycemia
liver transplantation 692
neonatal 212
older infant/child 220
post cardiac arrest 264–5
premature infants 476–7, 482
- hypokalemia
liver transplant surgery 690
premature infants 488
- hyponatremia 218–19
end-stage renal disease 694
ICU patients 979–80
intravenous fluids and 218–19, 353
liver transplantation 691
newborn 209
physiology 218
premature infants 481–2
- hypoplastic left heart syndrome (HLHS)
648–9
case study 650–2, 651
fetal interventions 459
near infrared spectroscopy 410, 411–12, 412, 414
neurodevelopmental outcomes 1210
pathophysiology 648
surgical procedures 648–9, 649
- hypoplastic right heart syndrome, fetal intervention 459
- hypospadias 745–6, 749
case study 894–5
- hypotension
controlled
craniofacial surgery 837
spinal surgery 670–1
- Down syndrome risk 1250
during induction 350
liver transplantation 688–9, 690
- post cardiac arrest 265–6
postoperative 370
- premature infants 489, 490
shock 956
supine, pregnant women 460
- hypothalamus, thermoregulatory function 1156–7, 1157
- hypothermia
controlled 19
cardiopulmonary bypass 613
cerebral blood flow responses 133
cerebral protection 566
EEG monitoring 135
heart transplantation 701
neonatal resuscitation 515
postresuscitation 264
see also deep hypothermic circulatory arrest
neuroprotective effects 1216
- perioperative 1156
liver transplantation 692–3
neurosurgical patients 548
PACU 371–2
preventing or treating 1163–4
role of anesthetics 1160
- post cardiopulmonary bypass 614
premature infants 477
redistribution 1163
transfusion-associated 251
see also heat loss; warming
- hypotheses, study 42
- hypothyroidism, Down syndrome 995–6
- hypotonia, infantile 513, 772
- hypotonic fluids 218–19, 353
- hypoventilation, pulmonary vascular resistance and 593
- hypovolemia
arterial pressure waveforms 395, 396
burn patients 902–3
during induction 350
intraoperative fluid management 353
postoperative 370
preoperative correction 219, 220
preterm infants 491
trauma 910
- hypovolemic shock 955, 959
- hypoxemia
ALI/ARDS mortality and 970
aortopulmonary shunt surgery 623
congenital heart disease 595–7, 596
severe 601
during laryngospasm 317
postanesthesia, causes 367–70
single-ventricle physiology 625, 626
see also oxygen desaturation
- hypoxia-ischemia, brain, protective effects of anesthetics 1214
- hypoxic pulmonary vasoconstriction (HPV), one-lung ventilation 570, 573
- hysterotomy
EXIT procedure 449
maternal morbidity 467
twin reversed arterial perfusion sequence 454, 454
- ibuprofen 850, 852
after outpatient surgery 885
dosing 1296
postoperative pain 376
- ICP *see* intracranial pressure
- ICU *see* pediatric intensive care unit
- identifiers 1272
- I/E ratio 963
- IgA *see* immunoglobulin A
- IgE *see* immunoglobulin E
- i-Gel supraglottic airway device 310
- ilioinguinal-iliohypogastric nerve block (II/IH block) 437–8
- outpatient surgery 887
ultrasound guidance 437–8, 438, 441
- illicit drug use 332, 521
- imaging *see* radiology
- immune function
burn injuries 900, 901
ketamine actions 186
modulation by anesthetics 1214
PICU patients 987–9
- immunity, gastrointestinal 156–7
- immunoglobulin A (IgA)
breast milk 158
deficiency, allergic transfusion reactions 249
- gastrointestinal tract 157
- immunoglobulin E (IgE)
mediated hypersensitivity 1177, 1181
serum testing 1179–80, 1181
reference ranges 1307
- immunoglobulin G (IgG), reference ranges 1307–8
- immunoglobulins 1308
- immunomodulation, transfusion-related (TRIM) 250
- immunosuppressive therapy
cellular drug targets 681
inflammatory bowel disease 725
perioperative administration 696, 699
transplant recipients 679–82, 680, 680
acute rejection 682
induction therapy 681
lung transplantation 714
maintenance therapy 681–2
newer agents 682
- imperforate anus 152, 487
- implantable cardioverter-defibrillators (ICD)
MRI safety 924, 942
- preoperative assessment 277
- implanted devices
MRI safety 923, 924, 942–3
- preoperative evaluation 276
- inadvisable care 8, 8
- indometacin
pain management 850
patent ductus arteriosus 479
- inducements, research participants 53
- Induction Compliance Checklist 285, 285
- induction of anesthesia 342–50
- anxiolysis 285–8, 342–4
- assessment of co-operation 285, 285
- benzodiazepines 181
- burn patients 900–2
- case study 358–9
- cleft lip and palate reconstruction 840
- congenital heart disease 603–4
- shunt-related delays 604–5, 605
- craniofacial surgery 835–6
- facemask ventilation 307–8
- full stomach 336–8
- heart transplantation 699–700
- inhalational *see* inhalational induction
- intramuscular 346–7
- intravenous *see* intravenous induction of anesthesia
- neurosurgery 545–6
- outpatient anesthesia 883
- parental presence 287, 342–3
- outpatient surgery 882
- premature infants 489
- problems 347–50
- psychological preparation 285–90
- rapid sequence *see* rapid-sequence induction
- rectal 347
- renal transplantation 695–6
- spinal surgery 665
- techniques 344–7
- tracheostomized children 318
- trauma 910
- see also* anxiety, preoperative
- induction rooms
awareness risk 293
- parental presence 343
- infant formula, preoperative intake 279, 279

infants
 fluids and electrolytes 216–23
 leading causes of death 27, 28
 pain assessment 375, 846
 perioperative cardiac arrest 1154
 pulmonary function 104–6, 105
 thermoregulation 1158–9
see also children; neonates; premature infants
 infection control
 checklists 1286, 1286
 developing countries 1143
 PICU 987–8
 infections
 burn injuries 900, 901
 catheter-related 400
 central nervous system 978
 lung transplant recipients 714
 PICU patients 987–9
 premature infants 479–80
 transplant recipients 716
 upper respiratory *see* upper respiratory tract infections
see also sepsis
 infectious diseases, transfusion-transmitted 246–8, 247
 inferior cardinal veins 66
 inferior mesenteric artery 141
 inferior vena cava (IVC)
 catheters
 femoral vein cannulation 386
 malposition 399
 peripherally inserted 388
 development 66–9, 68
 developmental anomalies 78
 thrombosis 398
 inflammation
 airway, asthma 106–7, 107, 965
 burn injuries 899
 cardiopulmonary bypass-induced 611, 611
 ketamine actions 186
 modulation by anesthetics 1214
 multiple trauma 914–15
 inflammatory bowel disease (IBD) 724–6
 adolescents 533
 management 725–6
 inflammatory mediators
 anaphylactic reactions 1177–8
 burn injuries 899
 cardiopulmonary bypass 611, 612
 infliximab 725
 influenza virus 778
 informatics 1278
 information
 confidentiality, for adolescents 4–5
 disclosure, for decision-making 4
 preoperative provision 274, 287–8
 protected health *see* protected health information
see also data
 informed assent 2, 3
 informed consent *see* consent, informed
 informed permission 2–3
 informed refusal 4
 infraclavicular brachial plexus block 432–3, 441, 763
 infraorbital nerve block 439
 infusion pumps, MRI-compatible 925–6, 927
 inguinal hernia 730–2
 case study 516–17, 517–18
 diagnosis 731, 731
 incarcerated 730, 731, 731
 neonates and ex-premature infants 502–3, 503
 strangulated 730, 731, 731
 inhalational induction 177, 344–6
 congenital heart disease 604
 outpatient surgery 883
 premature infants 489
 tracheostomized children 318
 inhalation anesthesia, developing countries 1143–5, 1144

inhalation burn injuries 896, 899
 airway management 902
 inhaled anesthetic agents 173–80
 anesthetic circuit purging, malignant hyperthermia 333
 asthma 108, 968
 burn patients 907
 cardiovascular effects 179
 central nervous system effects 177–8, 541
 congenital heart disease 605–6
 developmental neurotoxicity 1196, 1197, 1198
 dosing 1297
 emergence delirium and 177, 372–3
 extramural procedures 940–1
 fetal uptake 463
 hepatic metabolism 172
 maintenance of anesthesia 350–1
 malignant hyperthermia 179–80
 mechanisms of action 173–4
 minimum alveolar concentration *see* minimum alveolar concentration monitoring 405
 muscle relaxant interactions 179, 195
 muscle relaxation effects 179
 myocardial preconditioning 93
 outpatient anesthesia 883–4
 pharmacodynamics 176–80
 pharmacokinetics 174, 175, 175–6
 physicochemical properties 175
 respiratory system effects 179
 thermoregulatory effects 1161
 inositol 1,4,5-triphosphate (IP₃) 90, 91
 inotropic agents
 dosing 1295
 PICU 951–2
 postarrest myocardial dysfunction 266
 intotropy, positive 951
 insensible water loss
 neonates 207–8, 213
 minimizing 208
 older infant and child 217
 preterm infants 477
 respiratory 963
in situ simulation 1231–3, 1233
 inspection, anesthetized patient 401
 inspiratory flow 963
 inspiratory impedance threshold device (ITD) 261
 inspiratory time 963
 institutional review boards (IRBs) 50–1
 approval of clinical trials 50–1, 52–3, 58
 central, multicenter trials 51
 safety monitoring 57
see also ethics committees
 insulin therapy
 1500 rule 222
 continuous intravenous infusion 222, 532, 533
 diabetic ketoacidosis 985
 diabetic patients 222, 532, 533
 dosing 222, 1298
 hyperkalemia 979
 intermittent intravenous boluses 222
 preoperative therapy 222
 stress hyperglycemia 985–6
 subcutaneous 222
 intensive care *see* pediatric intensive care
 intensive care unit *see* pediatric intensive care unit
 interatrial septum
 complete absence 76
 defects in development 76
 development 61–3, 64, 72
 intercostal arteries 75
 intercostal nerve blocks 575, 941
 intercostal retractions, premature infants 484
 interleukin-2 receptor (IL-2R) antagonists 680, 681, 696
 internal carotid artery 74, 127
 internal jugular (IJ) veins 128
 catheterization 384–5, 385
 ultrasound-guided puncture 394, 394–5
 International Classification of Diseases, 9th edition, clinical modification (ICD-9-CM) 1272
 International Conference on Harmonisation (ICH) 50
 international development, pediatric anesthesiology 25
 international normalized ratio (INR) 231, 1308
 International Society of Heart and Lung Transplantation (ISHLT) Registry 704–5, 705, 715
 internet resources 33, 36–8
 interscalene brachial plexus blocks 431, 431
 intersegmental arteries 75
 interstitial lung disease, pediatric 707
 interventional cardiology 616–21
 balloon dilation of pulmonary arteries 617–19
 cardiac tamponade 620–1
 heart transplant recipients 703–4
 occlusion device insertion 619–20
 risks and complications 616–17, 618
 transcatheter radiofrequency ablation 620
 interventional neuroradiology (INR) 564–6
 interventional radiology 928–30
 postanesthesia care 937
 interventricular foramen 69, 71, 71, 73
 closure 73
 interventricular septum
 defects *see* ventricular septal defects
 development 69, 71, 72, 73
 intestinal atresias/stenoses 722
 classification 154
 developmental basis 153
 intestinal edema, during liver transplantation 689
 intestinal malrotation 723–4
 developmental basis 152–3, 723
 management 723–4
 intestinal obstruction 722–4
 intestinal pseudo-obstruction 724, 724
 intestinal transplantation 715–16, 717
 intestinal webs 153, 154
 intracellular fluid (ICW) compartment
 composition 206, 206
 developmental changes 207, 207
 volume regulation 206–7
 intracerebral hematoma 558
 intracranial aneurysms 562, 562–4, 565
 intracranial compartment 126–7
 intracranial compliance reserve 126, 127
 intracranial elastance 126
 intracranial pressure (ICP) 126, 127, 974–6
 anesthetic agent effects 178–9, 541–2, 543
 invasive monitoring 976
 muscle relaxant effects 543, 544
 perioperative control 546–7
 raised
 craniosynostoses 823, 823–4, 835
 hepatic encephalopathy 685
 ICU setting 975–6
 induction of anesthesia 545–6
 intracranial tumors 551, 552
 preoperative evaluation 544–5
 trauma patients 910, 912, 913
 volume relationship 974–5, 975
 intracranial tumors 551–5
 craniopharyngioma 552–3, 553
 posterior fossa surgery 553–5, 554, 977
 postoperative ICU management 977
 preoperative assessment 277
 preoperative embolization 565
 stereotactic radiosurgery 931
 supratentorial craniotomy 551–2
 intraepithelial lymphocytes 157
 Intralipid®
 local anesthetic toxicity 202, 423–4, 1173–5
 dosing 1296
 mechanism of action 1174, 1174
 propofol formulations 183–4
 intramedullary nails 764
 intramuscular induction of anesthesia 346–7

- intranasal premedication 344
 intraocular pressure (IOP) 802–4
 control 802–3
 effects of anesthetics 803–4
 glaucoma 804
 open globe eye injuries 804–5
 prone positioning 666
 intraosseous (IO) access 398
 CPR 262
 trauma 911
 intrathoracic pressure, congenital heart surgery 609
 intravascular monitoring
 new techniques 397–8
 pulmonary artery catheters 391, 393, 393–4
 intravascular pressure waveforms 395–7
 intravenous access *see* venous access
 intravenous anesthetic agents 180–6
 central nervous system effects 541–2
 congenital heart disease 606–8
 context-sensitive half-times 183
 hepatic metabolism 172
 outpatient anesthesia 884–5
 pharmacodynamics 182, 183, 184–6
 pharmacokinetics 181, 181–3, 184, 185
 thermoregulatory effects 1161
 intravenous fluids
 warming 215, 1163–4
 see also crystalloid solutions
 intravenous fluid therapy 206, 352–4
 asthma 966–7
 bolus 219, 220
 burn patients 902–3, 904, 907
 craniofacial surgery 837, 839
 developing countries 1145
 diabetes 222, 532, 533
 diabetic ketoacidosis 985
 elective surgery 353–4
 extremely premature infants 493, 494, 495–6
 hyponatremia and 218–19
 intracranial hypertension 976
 liver transplantation 686–7, 689
 maintenance 216–17, 217
 4–2 formula 217, 217, 353
 hypotonic vs. isotonic fluids 218–19
 intraoperative 219–20, 353–4
 neonates 213–16
 intraoperative 214, 215–16, 353
 preoperative evaluation 213–15
 neurosurgical patients 546–7
 older infant and child 216–23, 220, 353
 PACU 370
 premature infants 481
 intraoperative 488, 490–2, 491, 492
 renal transplantation 696
 shock 956, 957, 958
 trauma 910
 volume replacement, during surgery 354
 intravenous induction of anesthesia 346
 congenital heart disease 604
 outpatient surgery 883, 884
 trauma 910
 intravenous local anesthetic (Bier block) 763
 intraventricular hemorrhage (IVH) 479
 intubation *see* tracheal intubation
 intussusception 720–1
 case study 738–9
 intussusceptive microvascular growth 98
 inulin clearance 162
 investigational new drug (IND) application 47, 58
 investigations, preoperative 276–9, 333
 Investigators' Brochure 54
in vitro muscle contraction test 1165, 1168–70
 Invivo Precess® monitor 925
 INVOS cerebral oximeter 408–9
 iodinated contrast agents 943, 944
 iohexol, GFR estimation 162
 iontophoresis, local anesthetics 859–60
 I PASS the BATON communication tool 364, 365
 ipratropium bromide 966
 iron
 therapy, preoperative 663, 668
 total 1308
 I-SBAR communication tool 364, 364
 isoflurane 174–7, 175, 1297
 asthma 968
 cardiovascular effects 179
 central nervous system effects 541
 congenital heart disease 605
 context-sensitive half-times 177
 hepatic metabolism 172
 MAC vs. age 352, 352
 maintenance of anesthesia 350–1
 mode of action 175
 neurotoxicity
 experimental studies 1187–9, 1196, 1197, 1198
 interspecies comparisons 1200
 mechanisms 1198, 1199
 outpatient anesthesia 884
 pharmacodynamics 176–7, 178
 pharmacokinetics 175–6
 postoperative behavior changes 1205, 1206
 respiratory system effects 179
 thoracic surgery 573
 isolated forearm technique 291
 isoniazid, metabolism 173
 isoproterenol
 β-adrenergic receptor affinity 82
 dosing 1295
 heart transplantation 701
 inotropic responses, acute myocardial dysfunction 91
 use in PICU 951, 952
 isotonic fluids 218–19, 353
 Jackson-Rees, G. 18
 Jackson-Rees T-piece 18
 Jackson table 660, 660, 666
 Jackson–Weiss syndrome 814
jagged1 gene mutations 147
 jaundice
 breast milk 144
 neonatal 144–5
 physiological 144
 jaw thrust maneuver 308
 laryngeal mask insertion 310
 laryngospasm 348–9, 368
 Jehovah's Witnesses, children of 5–6
 case study 12–14
 jejunooileal atresias 153, 723
 classification 154
 Jervell–Lange–Nielsen syndrome 1062–3
 jet propulsion injectors, local anesthetics 859
 jet ventilation
 laser microlaryngeal surgery 797
 without an endotracheal tube 791–2
 Jeune syndrome 1056–7
 joint aspiration, septic arthritis 765
 Joint Commission (on Accreditation of Healthcare Organizations)
 acute pain services 862
 communication during hand-offs 364, 1283, 1284–5
 MRI hazards 921, 922, 924
 sedation policies 935
 sedation terminology 933
 sentinel events 1284
 J-tip system 859
 junctional ectopic tachycardia (JET) 954
 juncophilin 85
 juvenile rheumatoid arthritis (JRA) 773
 Kasabach–Merrit syndrome, coagulopathy of 929
 Kasai portoenterostomy 146, 722
 Kayexalate 979
 ke0 170
 muscle relaxants 195
 see also equilibration half-time
 Kearns–Sayre syndrome 1056–9
 Keats, Arthur S. 23, 23
 Kell antigens, transfusion-related alloantibodies 250
 keloids 1141
 kernicterus 144, 482
 ketamine 185–6
 asthma 967
 burn patients 907, 908
 cerebral effects 542–3
 congenital heart disease 603, 604, 606
 dental surgery 807
 difficult airway intubation 321
 dosing 184, 186, 1294
 epidural 202, 423
 extramural procedures 940
 formulations 186
 heart transplantation 700
 induction 332
 intramuscular
 congenital heart disease 606
 induction 346–7
 premedication 289–90, 332
 intraocular pressure effects 803
 metabolism 172, 185
 neurotoxicity 24, 185
 experimental studies 1185–96, 1189–91, 1195
 interspecies comparisons 1200, 1201
 mechanisms 1198, 1199
 oral, premedication 289, 344
 outpatient anesthesia 882
 pharmacodynamics 185–6
 pharmacokinetics 181, 185
 postoperative behavior changes 1204, 1206, 1207
 premedication 289–90, 344
 pulmonary vascular responses 593
 rapid-sequence induction 337
 rectal induction 347
 trauma 910, 915
 use in developing countries 1148
 ketogenic diet 281
 ketorolac 851, 852
 after outpatient surgery 885–6
 dosing 1296
 postoperative pain 376
 kidneys 159–67
 agenesis 161
 blood supply 160
 developmental pathophysiology 164–7
 developmental physiology 161–4, 208–10
 drug excretion 171
 dysplastic 161, 744
 ectopic 161
 embryology and development 159, 159–61, 160
 glomerular function 161–2, 208–9
 hypoplastic 161
 migration 160
 transplantation *see* renal transplantation
 tubular function 162, 162–4, 208–9
 urine production 160–1
 Kids' Inpatient Database (KID) 1253
 King–Denborough syndrome 771, 1058–9, 1164, 1168
Kingella kingae 765
 Kleebattschädel 819, 823
 Klippel–Feil syndrome 1058–61
 airway management 320
 Klippel–Trenaunay–Weber syndrome 1060–1
 Koop, C. Everett 18
 Kugelberg–Welander disease 1114–15
 kyphosis 655
 labetalol 371, 1295
 laboratory tests
 pediatric normal values 1300–14
 preoperative 276–9
 lactase 153–4
 congenital deficiency 155
 lactate 1308
 lactate dehydrogenase (LDH) 1308–9

lactated Ringer's solution 353
 lactic acidosis, propofol infusion syndrome 351, 1171, 1173, 1173
 lactose intolerance 154
 Ladd, William E. 16, 18
 Ladd procedure 724
 Ladd's bands 153
 Laerdal simulators 1228, 1238
 lambdoidal synostosis 816
 lamellar bodies, alveolar cells 100–1
 laminae, vertebral arch 657
 laparoscopic surgery 736, 736–8
 bariatric surgery 536, 537–8
 complications 737–8
 gynecological 532
 pathophysiology 737
 peritoneal dialysis catheter placement 754
 ureteropelvic junction obstruction 748
 LaPlace's law 101
 large bowel obstruction 722
 laryngeal atresia 320, 798
 laryngeal braking 98, 105, 304
 laryngeal chemoreflexes (LCR), development 305
 laryngeal manipulation, optimal external (OELM) 312, 312
 laryngeal mask airway (LMA) 310–11
 classic (cLMA) 338–9
 complications 310, 339, 787
 craniofacial surgery 835–6
 extramural anesthesia 938
 fiberoptic bronchoscopy 323, 323
 insertion 310, 311
 sizes available 338–9, 339
 strabismus surgery 802
 timing of removal 311, 355
 upper respiratory infections and 778
 laryngeal microdebrider 796
 laryngeal nerve paralysis 788
 laryngeal papillomas, recurrent 795–7, 796
 laryngeal reconstruction 799–800, 800
 Laryngeal Tube 311
 laryngeal webs 320
 laryngomalacia 788
 laryngoscopes
 blades 312, 338
 blade sizes 339
 jet ventilation via 791–2
 modified optical 323, 323–4
 video 324, 324–5, 325
 laryngoscopy
 direct 312, 312, 791
 craniofacial anomalies 835
 hemodynamic response 312
 intraocular pressure during 803
 laryngospasm 316–17, 348–50, 786–7
 cardiac arrest due to 1155
 definitions 348
 management 317, 348–50, 349
 negative pressure pulmonary edema 357, 787
 postoperative 356, 368–9
 risk factors 348
 upper respiratory infections and 778
 laryngotracheal separation, traumatic 911
 laryngotracheobronchitis 789, 790
 laryngotracheoplasty 799–800, 800
 larynx
 anatomy 304–5, 314
 congenital anomalies 798
 development 302
 developmental physiology 305
 foreign bodies 793
 post-intubation injury 798
 traumatic injuries 910–11
 laser microlaryngeal surgery 795–8
 anesthesia for 796–7
 indications 795–6, 796
 safety precautions 797–8

laser surgery
 retinopathy of prematurity 806
 twin reversed arterial perfusion sequence 454
 twin-twin transfusion syndrome 452–3, 453
 lateral decubitus position, thoracic surgery 570
 latex allergy 332, 1180–2
 historical aspects 22, 1180–1
 prevention 1181–2, 1182
 laxatives, opioid-treated patients 857, 858
 leadership, team 1223, 1281–2
 Leapfrog Group 1258
 learning
 adult 31
 lifelong 30
 Le Fort I osteotomy 828, 828, 829
 Le Fort II osteotomy 828, 828, 829
 Le Fort III osteotomy 828, 829, 830
 left atrial pressure
 after Fontan procedure 630, 631
 waveforms 396–7
 left atrium, development 69, 70
 left coronary artery, anomalous origin 78
 left heart outflow obstruction, preoperative care 602
 left-to-right (L-R) shunts 589
 arterial desaturation 595, 595, 596
 increased pulmonary blood flow 597
 quantification 598–600
 transitional neonatal circulation 594, 595
 left ventricular (LV) function
 after tetralogy of Fallot surgery 636
 congenital heart surgery 610
 left ventricular stroke work index (LVSWI) 391
 Leigh, M. Digby 17, 17–18
 Lejeune syndrome *see cri du chat syndrome*
 LEOPARD syndrome 1060–3
 Lesch–Nyhan syndrome 774
 leukemia 528, 996
 leukotriene receptor antagonist (LTRA) 112
 levabuterol 108, 966
 dosing 1297
 levobupivacaine
 case study 203
 developmental pharmacology 858–9
 dosing 1296
 inguinal hernia repair 503
 pharmacodynamics 201, 422, 422
 pharmacokinetics 198, 199, 421
 regional anesthesia 420–1
 toxicity 202, 424
 levocardia 75
 levosimendan 953
 continuous infusion 951, 953
 dosing 1295
 postarrest myocardial dysfunction 266
 lidocaine 198
 absorption 169
 cardiac arrest 265, 268
 case study 203
 developmental pharmacology 858–9
 dosing 1296
 epidural analgesia 862
 fiber-optic laryngoscopy and bronchoscopy 791
 heart transplantation 701
 iontophoresis 859–60
 laryngospasm 787
 metabolism 172
 nasotracheal intubation 313
 pharmacodynamics 201
 pharmacokinetics 198, 199–200
 regional anesthesia 420
 sinus surgery 786
 toxicity 201
 transdermal patches 868
 lifelong learning 30
 life-sustaining therapy (LST)
 barriers to honoring perioperative limitations 8
 forgoing 6–8

goal-directed approaches 7–8
 withdrawing 9

ligamentum arteriosum 74, 103
 ligamentum teres 141
 ligamentum venosum 141
 Liggins, G.C. 444
 lighted stylet 326, 326
 lighting, extramural locations 934
 Liley, Sir Albert William 444
 lingual tonsillar hypertrophy 320, 782–3, 783
 lipase
 bile salt-activated 158
 gastric 158
 serum/plasma 1309
 lipid emulsions
 local anesthetic toxicity 423–4, 1173–5, 1174
 see also Intralipid®
 lipids
 breast milk 158
 metabolism 142
 Lipsyn, local anesthetic toxicity 1174
 lissencephaly 120
 literature search strategies, online 1277
 lithium, neuroprotective effects 1216
 lithium dilution cardiac output (LiDCO) 397
 liver 139–48
 circulation, development 140–1
 development 139–43, 140
 developmental pathophysiology 143–8
 drug metabolism 142–3, 171–3
 embryology 139–40, 140, 151
 enlargement, congestive heart failure 486–7
 functional development 141–3
 neonatal physiology 211–12
 structural abnormalities 146–7
 tumors 683, 729–30
 liver disease
 burn injuries 899, 901
 cystic fibrosis 148, 525, 526
 end-stage, pathophysiology 683, 683–6
 preoperative assessment 277
 liver glycogen phosphorylase deficiency 1044–5
 liver-lung transplantation 707, 713
 Liverpool technique 18
 liver transplantation 682–93
 anesthetic management 686–7
 donor organ care 686, 688
 hemostasis 690–1
 hypertension after 718
 indications 682–3, 683
 intraoperative hemodynamics 688–90
 living related 693
 metabolic control 691–2
 pathophysiology 683, 683–6
 preoperative evaluation 686
 reduced-size grafts 693
 retransplantation 693
 surgical procedure 687–8
 temperature maintenance 692–3
 l-loop 61, 63
 l-looped ventricles 61, 63
 local anesthetics (LA) 197–202, 198, 858–62
 absorption 198–9
 adjuvants 202, 422–3
 anaphylactic reactions 1178
 developmental pharmacology 858–9
 distribution 199
 dosing 202, 1296
 elimination 199–200
 epidural analgesia 430, 861–2
 fetal uptake 463
 formulation 202
 infiltration
 after outpatient surgery 887
 fetal interventions 468
 iontophoresis 859–60
 jet propulsion injectors 859
 metabolism 172, 199–200, 421
 pharmacodynamics 200, 200–2, 421–2, 422
 pharmacokinetics 198–200, 199, 421

- regional anesthesia 420–4
 ex-premature and term neonates 502–3, 503
stereo-specificity 201
topical *see* topical anesthesia
toxicity 201–2, 420–1, 1171–5
 incidence 441
 local tissue 424
 management 202, 423–4, 440, 1173–5, 1296
 seizures 374, 440
 systemic 423–4
 see also regional anesthesia; specific agents
- Long, Crawford 15, 16
- long QT syndrome 1062–3
 type 7 1034–5
- loop diuretics, neurosurgical patients 547
- lorazepam
 dosing 1294
 pharmacokinetics 180
 postoperative behavior changes 1203
 status epilepticus 977, 978
- lordosis
 cervical 655
 lumbar 655
- Lovenox level 1309
- low cardiac output state
 after Fontan procedure 631, 632
 after tetralogy of Fallot surgery 635
- lower esophageal sphincter (LES) 156
- lumbar plexus blocks 434–6
- lumbar venous plexus, inadvertent catheterization 399
- lung(s)
 compliance 105, 105, 963
 development 96
 alveolar stage 97, 104
 bulk alveolarization stage 104
 canalicular stage 97
 late alveolarization stage 104
 microvascular maturation stage 104
 postnatal 96, 104
 prenatal 95–7, 96
 pseudoglandular stage 97
 saccular stage 97
- disease *see* pulmonary disease
- fluid, fetal *see* fetal lung fluid
- growth 104
- injury
 acute *see* acute lung injury
 congenital heart surgery 610
- mechanics by age 105, 105
- physiological changes at birth 102–3
- resection 576–7
 cystic fibrosis 526
 lobectomy 576–7
 pneumonectomy 577
- resistance 105
- transbronchial biopsy 714
- traumatic injury 912
- volumes 105–6, 609
- lung buds 95–7
- lung-liver transplantation 707, 713
- lung to head ratio (LHR), congenital
 diaphragmatic hernia 447, 448, 510–11
- lung transplantation 704–15
 anesthetic management 709–10
 cardiopulmonary bypass 710–11
 complications 712, 712–14, 717
 cystic fibrosis *see under* cystic fibrosis
 donor lung availability 708–9
 graft rejection 713–14
 history 704–6, 705
 indications 706, 706–7
 listing criteria and contraindications 707–8, 708
 living donor lobar (LDLT) 711
 outcomes 714–15, 715
 physiology and growth of grafts 711–12
 postoperative care 711
 preoperative evaluation 709
 primary graft dysfunction (PGD) 710, 712–13
 surgical technique 711
 surveillance 714
- lupus anticoagulant 231, 236–7
- luteinizing hormone (LH) 1309
- lymphatic malformation 928
- lymphoblastic lymphoma 336
- lymphocytes, gastrointestinal tract 157
- lymphoma 336, 528
- MAC *see* minimum alveolar concentration
- MACBAR 176
- MACEXT 176
- machines, anesthesia *see* anesthesia machines
- MACINT 176
- Macintosh, Sir Robert 326
- magnesium
 fluid compartments 206, 206
 reference ranges 1309
- magnesium sulfate
 asthma 967
 cardiac arrest and arrhythmias 265
 dosing 1296
 fetal surgery 471
 heart transplantation 701
 spinal surgery 673
- magnetic resonance angiography (MRA) 600, 921
- magnetic resonance imaging (MRI) 921–8, 934
 cardiac function assessment 950
 cardiorespiratory arrest 937–8
 case study 944–5
 compatible anesthetic equipment 924–7, 925, 926, 927
 congenital heart disease 600
 endovascular neurosurgery 565
 functional (fMRI) 921, 927
 gadolinium-based contrast agents 927–8, 943
 intraoperative 560, 560, 921
 labeling of implants and devices 922, 923
 monitoring during 925, 926
 neurosurgical patients 544–5
 noise exposure 927
 patient preparation and screening 936
 safety issues 921–4, 922, 927–8, 941–3
 safety zones 922, 922
 vaporizer performance 940–1
- magnetic resonance therapy (MRT) 921
- magnetoencephalography (MEG) 561
- maintenance fluids *see under* intravenous fluids
- maintenance of anesthesia 350–4
 age vs. MAC 352
 case study 359
 congenital heart disease 604
 facemask or natural airway 309–10
 fluid management 352–4
 methods 350–2
 premature infants 489–92
 supplemental analgesics 352
- Maintenance of Certification in Anesthesiology (MOCA) 30, 1225
- malaria, in developing countries 1146–7
- malignant disease *see* cancer
- malignant hyperthermia (MH) 179–80, 1164–70
 acute management 180, 333, 1168, 1169, 1296
 acute presentation 1165–6, 1167
 at-risk patients 1166–8
 anesthetic management 333, 1170
 diagnostic testing 1168–70
 myopathies 334, 771–2, 773, 1167–8
 outpatient anesthesia 880
 PACU care 372
 strabismus 801
 database 1249
 epidemiology 1165
 genetics 1165
 historical aspects 20–1, 1164–5
 late presentation 372, 1166
 pathogenesis 1165, 1166
 succinylcholine-induced 194
- Malignant Hyperthermia Association of the United States (MHAUS) 1249
- malpractice claims, ASA closed claims project 1153, 1242–3
- malrotation of bowel 723–4
 developmental basis 152–3, 723
- management 723–4
- mammalian target of rapamycin (mTOR) inhibitors 680, 681, 682
- mandibular hypoplasia
 airway management 835
 Robin sequence 820
 upper airway obstruction 824, 825
- mandibular malformations
 distraction osteogenesis 831
 oculo-auriculovertebral spectrum 821
 surgical reconstruction 831
- mandibular space, reduced 319
- mandibulofacial dysostosis *see* Treacher Collins syndrome
- Manley multivent ventilator 1143
- mannequins
 high tech 1227, 1227, 1228, 1234–5
 history of development 1220–1
- mannitol 547, 1297
- Mapleson system 18–19
- Marfan syndrome 774, 1064–5
- marijuana use 521
- Maroteaux-Lamy syndrome 1064–7
- martensite 924
- masking (allocation assignment) 43–4
- masks *see* facemasks
- masseter spasms
 malignant hyperthermia risk 1166–7
 strabismus surgery 801
 succinylcholine-induced 194
- massive transfusion 246
 burn patients 906
 trauma 915
- mastoid surgery 780–1
- mature minors 3, 3–4
- maxillary hypoplasia, distraction osteogenesis 831–2, 832
- maxillary osteotomies
 airway management 838–9
 Le Fort 828, 828, 829
- maximal tolerated dose (MTD) 48
- Mayo clinic, quality assurance database 1244
- McArdle syndrome 1044–5
- M-cells 157
- McQuiston, Robert 18
- MDConsult 1277
- MDR3 144, 148
- mean arterial pressure (MAP)
 controlled hypotension 670
 premature infants 491
 traumatic brain injury 911–12
- mean corpuscular hemoglobin (MCH) 1309
- mean corpuscular hemoglobin concentration (MCH) 1309–10
- mean corpuscular volume (MCV) 1310
- mechanical ventilation
 asthma 968
 bronchopulmonary dysplasia 108–13, 478, 478
 congenital heart surgery 608–10
 PICU 963–4
 postoperative 316
 esophageal atresia and tracheo-esophageal fistula 510
 neonates and ex-premature infants 501–2
 spinal surgery 663, 673–4
 premature infants 490
 respiratory function assessment 960–3, 961, 962
- tracheostomy insertion 317–18
- ventilator-associated pneumonia 988
- ventilator modes 963–4
- weaning from 964–5
- withdrawing 9
 see also positive pressure ventilation
- Meckel's diverticulum 152
- meconium ileus 156, 524
- pain management 867

Medialipid, local anesthetic toxicity 1174
 median nerve 763
 mediastinal mass, anterior *see* anterior mediastinal mass
 mediastinal neoplasms 583
 medical education
 high-fidelity patient simulation 1227–9
 use of simulation 1221
 see also continuing medical education; pediatric anesthesiology education
 medical emergency teams (METs) 259
 medical errors 1291
 apology for 11
 disclosure of 11, 948
 simulation-based training and 1221
 see also medication errors
 medical history, past 275, 330–2
 medical informatics 1278
 medical records 1267–8
 see also electronic medical records
 medication errors 1287–9
 incidence 1288
 PACU 378
 prevention 1289, 1290
 risk factors 1289
 types 1288–9, 1289
 medications *see* drug(s)
 medication safety 1287–9
 medico-legal issues, electronic records 1267–8
 Medrad Continuum Infusion System® 925
 Medrad Veris® monitor 925
 medulloblastoma 553, 554
 megacystis-microcolon intestinal hypoperistalsis syndrome 152
 MELAS syndrome 1066–9
 melatonin
 emergence agitation 374
 neuroprotective effects 1216
 premedication 290
 MELD (model for end-stage liver disease) score 682
 meloxicam 851–2
 memory 290–1
 development 290–1
 implicit 290
 during anesthesia 294
 meninges, spinal cord 420, 656
 meningitis, bacterial 978
 meningocele 555
 meningocele *see* myelomeningocele
 Menkes kinky hair syndrome 1068–71
 mental retardation *see* cognitive impairment
 meperidine 854, 855–6
 for shivering 1162, 1294
 mepivacaine 198
 regional anesthesia 420
 stereo-specificity 201
 6-mercaptopurine (6-MP) 725
 MERRF syndrome 1070–1
 mesencephalon 118, 119, 119
 mesoderm, cardiogenesis 61
 mesonephric duct (Wolffian duct) 159, 159, 160, 741
 mesonephros 159, 159, 740
 metabolic acidosis
 congenital heart disease 602, 630, 648
 CPR 264
 end-stage renal disease 694
 liver transplantation 692
 propofol infusion syndrome 1170, 1171, 1173
 metabolic alkalosis, end-stage lung disease 709–10
 metabolic derangements
 burn injuries 899, 901, 906
 during liver transplantation 691–2
 end-stage renal disease 694
 transfusion-associated 250–1
 metabolic diseases
 liver transplantation for 683
 preoperative assessment 277
 metabolic myopathy 772

metabolic rate, correlation with weight 217, 217
 metanephric diverticulum *see* ureteric bud
 metanephros 159, 740
 metencephalon 119, 119
 metenkephalin 123, 124
 metformin 222, 280
 methadone 853–5
 cancer pain 865
 dosing 854, 855
 neurotoxicity 1191
 methemoglobin 1310
 methohexitol
 dosing 1294
 extramural anesthesia/sedation 939
 outpatient anesthesia 884–5
 postoperative behavior changes 1206
 rectal induction 347
 methotrexate 725
 methylnaltrexone 857
 α-methyl-para-tyrosine (metyrosine) 729
 methylphenidate
 clonidine interaction 289
 opioid-induced fatigue 858, 858
 methylprednisolone
 acute lung graft rejection 713
 asthma 280, 966
 dosing 1296
 spinal cord injury 912
 transplant recipients 680
 methylxanthines 967
 METI simulators 1228, 1236, 1236–8
 metoclopramide 802, 858
 dosing 1297
 extramural anesthesia 938
 pregnant women 461
 metopic craniostenosis 815, 816, 816
 Meyer–Overton theory 173–4
 MH *see* malignant hyperthermia
 microalbumin, urinary 1310
 Microcuff® tube 339
 micrognathia syndromes 819–21, 997, 998
 micropremies *see* extremely premature infants
 microseptostomy 452
 midazolam
 burn patients 905
 congenital heart disease 603, 604, 607
 difficult airway intubation 321
 dosing 181, 1294
 extramural sedation 940
 heart transplantation 699–700
 intranasal 344
 local anesthetic-induced convulsions 440
 metabolism 172, 180
 neurotoxicity 1191, 1196, 1201
 open globe eye injuries 804, 805
 outpatient anesthesia 881–2
 pharmacodynamics 180–1
 pharmacokinetics 180, 181, 183
 postoperative behavior changes 297, 1203, 1206
 premedication 288, 289, 343–4
 rectal induction 347
 middle cerebral artery (MCA), transcranial Doppler ultrasound 414
 middle ear
 fluid drainage 779–80
 surgery 780–1
 midface advancement 828–30, 829, 830
 airway management 838–9
 midgut
 development 149, 151–2
 malrotation 152–3
 rotation 151, 151
 miglustat 525
 migraine 870–1
 migrating motor complex (MMC) 156
 Miller laryngoscope blade 312, 338
 Miller syndrome 820, 1070–3
 milrinone 953
 after Fontan procedure 631
 continuous infusion 951, 953
 dosing 1295
 heart transplantation 701
 postarrest myocardial dysfunction 266
 minimal-risk research 9, 9, 51, 52
 waiver of consent 50, 50
 minimum alveolar concentration (MAC) 175, 176–7, 352
 age and 176, 178, 352, 352
 awareness and 293
 EXIT procedure 449
 extremely premature infants 493, 494
 factors influencing 352
 fetal surgery 461, 469–70
 historical aspects 22
 minors
 emancipated 3, 3–4
 mature 3, 3–4
 minute ventilation 105, 106
 pregnant women 460
 mirror syndrome, sacrococcygeal teratoma 456
 mistransfusion 251
 mitochondrial myopathies 772
 anesthetic management 334
 propofol infusions 1171
 mitochondrial myopathy–encephalopathy–lactic acidosis–stroke (MELAS) syndrome 1066–9
 mitochondrial permeability transition pore (MPTP) 93
 mitral valve
 defects in development 76
 development 69, 71
 mivacurium 194–6
 dosing 196
 pharmacodynamics 195–6
 pharmacokinetics 193, 195
 Mobitz type I/II heart block 955
 model for end-stage liver disease (MELD) score 682
 modified Aldrete score 366, 366, 890, 890
 Moebius (Möbius) syndrome 774, 1072–3
 Mohr syndrome 1084–5
 molecular genetic testing, ethical issues 6
 monitoring
 burn patients 906
 cardiac catheterization 616
 case study 416–17, 418
 central nervous system 407–16
 craniofacial surgery 839
 developing countries 1147–8
 epidural analgesia 864
 fetal, *during fetal surgery* 470–1
 general anesthesia 401–17
 intraoperative 340–2
 intravascular 391, 393, 393–4, 395–8
 MRI compatibility 925, 926
 neonates 501
 neuromuscular blockade 191–3, 192, 407
 neurosurgery 545
 outpatient anesthesia 883
 point-of-care tests 406–7, 407
 postanesthesia 364–5
 regional anesthesia 426
 respiratory 401–6, 405
 temperature 342, 371, 406
 urine output 215, 406
 montelukast 111
 Montgomery tube 319
 morphine 188–90
 analgesia 853
 after spinal surgery 674
 continuous infusions 856
 dosing 854
 patient- and nurse-controlled 857
 postoperative 376
 anesthesia 352
 congenital heart disease 606
 cancer pain 865
 codeine metabolism to 190–1
 dosing 189–90, 1294
 epidural use 202, 423

- intrathecal use 423
metabolism 143, 172–3, 173, 188, 853
neurotoxicity 1191–2
pharmacodynamics 189
pharmacokinetics 187, 188, 188, 189
morphine-6-glucuronide (M-6-G) 188
pharmacokinetics 188, 188
renal excretion 171
Morquio syndrome 774, 1074–7
mortality, anesthesia-related 1152–3, 1153
developing countries 1140, 1141
Morton, William T.G. 15, 16
motor evoked potentials (MEP) 137, 137
spinal surgery 556, 557, 672
mouth care, ventilated patients 988
mouth gags 840, 840, 841
MRI *see* magnetic resonance imaging
MRIdium® infusion pump 925, 927
MRP1 170
MRP2 143
MSX2 gene mutations 813, 814
mTOR inhibitors 680, 681, 682
mucopolysaccharidoses
adenotonsillectomy 782
airway management 320
type I *see* Hurler syndrome
type II (Hunter) 782, 1052–5
type IV (Morquio) 774, 1074–7
type VI (Maroteaux-Lamy) 1064–7
mucositis, cancer patients 865
mucoviscidosis *see* cystic fibrosis
mucus, gastrointestinal 156
Muenke craniostenosis 814
multicenter clinical trials 45–6
institutional review board approval 51
Multicenter Perioperative Outcomes Group (MPOG) 1250, 1277–8
multiple drug resistance protein 1 (MRP1) 170
multiple drug resistance protein 2 (MRP2) 143
multiple lentigenes syndrome 1060–3
multiple organ dysfunction syndrome (MODS) 959–60
multivisceral transplantation 715–16
Munchausen by proxy 12
murinomab (OKT3) 681, 696
muscle biopsy
infants 513, 513, 772
malignant hyperthermia testing 1165
muscle glycogen phosphorylase deficiency 1044–5
muscle phosphofructokinase deficiency 1044–5
muscle relaxants *see* neuromuscular blocking agents
muscle relaxation, effects of volatile agents 179
muscular dystrophies 771
anesthetic management 334
congenital 771
malignant hyperthermia risk 771, 1168
preoperative assessment 277, 663
progressive 771
music therapy 286
Mustard procedure 639, 641
mutual support, team working 1282–3
mycophenolate mofetil (MMF) 680, 681, 682, 1298
mycophenolic acid (MPA) 681, 682
myelencephalon 119, 119
myelination
brain 122
peripheral nervous system 420
spinal nociceptive tracts 123–4
myelomeningocele 120
myelodysplasia 555–6
myelomeningocele (MMC) 512–13, 555–6
anesthetic management 513, 555–6
developmental basis 120
fetal surgery 454–5, 455
latex allergy risk 1181
myocardial biopsy
after heart transplantation 702, 703–4
complications 618
myocardial contractility
arterial pressure waveforms and 395, 396
developmental changes 80, 88
effects of volatile agents 179
fetus 79–80
myocardial dysfunction
acute
adrenergic receptor signaling 91–2
postresuscitation 266
scoliosis 663
trauma 912–13
ventricular assist devices 973–4
myocardial infarction/ischemia, after arterial switch procedure 641
myocardial perfusion pressure (MPP), during CPR 260–1
myocardial preconditioning 93
myocardial stunning, postarrest 266
myoclonic epilepsy with ragged red fibers (MERRF) syndrome 1070–1
myoclonus, postoperative 374
myopathies 771–2
anesthetic management 334
congenital 771
local anesthetic toxicity 201–2
malignant hyperthermia risk 334, 771–2, 773, 1167–8
metabolic 772
myosin, cardiac muscle contraction 86–7, 87
myositis ossificans progressiva *see* fibrodysplasia ossificans progressiva
myotonias 771
myotonic dystrophy type I 1076–9
myotoxicity, local anesthetics 424
myringotomy 779–80
N-acetylcysteine (NAC), cystic fibrosis 525
N-acetyltransferase type 2 (NAT2) 173
naftcilin 1296
Nager syndrome 820, 1078–91
airway management 320, 825
Na⁺-K⁺-ATPase pump
renal tubules 162–3, 209
sodium balance 218
nalbuphine
epidural opioid side-effects 423, 862
opioid-induced pruritus 857, 858
naloxone
CPR 265
dosing 1298
opioid side-effects 857, 858, 858
naproxen 852
Narcotrend index 136–7, 176
Narcotrend™ monitor 136–7
nasal breathing 303
nasal cannula oxygen, PICU patients 962
nasal polypsis, cystic fibrosis 524, 526
nasal prongs 316, 357
nasogastric tubes (NGT), premature infants 484
nasolacrimal duct obstruction 800–1
nasopharyngeal airways 308–9, 309
dental surgery 807
intubation of difficult airway 321
modified 309, 309
postoperative use 316
nasotracheal intubation 313–14, 314
craniofacial surgery 838
dental surgery 807
pharyngeal flap patients 833
nasotracheal tubes
length 315
securing 314, 314
National Anesthesia Clinical Outcomes Registry (NACOR) 1249, 1278
National Association of Children's Hospitals and Related Institutions (NACHRI) 1254
National Center for Clinical Outcomes Research (NCCOR) 1249
National Guidelines Clearing House 1277
national health information network 1258
National Institutes of Health (NIH) 46
national provider identifier (NPI) 1272
National Surgical Quality Improvement Program (NSQIP) 1250–1
pediatric 1251
Nationwide Emergency Department Sample (NEDS) 1253–4
Nationwide Inpatient Sample (NIS) 1252–3
natural rubber latex (NRL) 1180
allergy *see* latex allergy
nausea
opioid-induced 857–8, 858
postoperative *see* postoperative nausea and vomiting
NAVA® (Neurally Adjusted Ventilatory Assist) 964
near infrared spectroscopy (NIRS) 407–14
heart transplantation 700
ICU setting 976
outcome studies 412–14
parameters monitored 410–11
pediatric cardiac surgery 411
somatic 410, 410
clinical uses 411–12, 412
technical concepts 407, 407–10, 408, 409
necrotizing enterocolitis (NEC) 158–9, 480
neurodevelopmental outcomes 1202, 1208–9
patent ductus arteriosus and 479
nedocromil 112
needle phobias 345
negative inspiratory force (NIF) 965
negative pressure pulmonary edema (NPPE) 356–7, 369–70
Neill-Dingwall syndrome *see* Cockayne syndrome
neonatal intensive care, history 20
neonatal intensive care unit (NICU)
surgery in 489, 494
transport to 358
neonatal resuscitation 513–16
algorithm 514
assessment and initial care 514–15
chest compressions 515
drugs 515–16
oxygen vs. air 515
premature infants 476
therapeutic hypothermia 515
ventilation 515
Neonatal Resuscitation Program (NRP) 514–15
neonates
abdominal wall defects 503–6
birth data in US 27, 28
cardiovascular physiology 210–11, 211
coagulation 212, 228, 229
congenital diaphragmatic hernia 510–12
developing countries 1147
esophageal atresia and tracheo-esophageal fistula 506–10
extracorporeal life support 972
fluids and electrolytes 207–16, 353
hematological physiology 212–13
hepatic physiology 211–12
history of anesthesia 21–2
inguinal hernia repair 502–3, 503
intracardiac shunting 594, 595
jaundice 144–5
lung physiology 102–3
meningocele 512–13
muscle biopsy 513
neurodevelopmental effects of anesthesia 1202–12, 1208–10
nociception 1184–5
operating room environment 500–1
opioid treatment 852, 853
outpatient anesthesia 878–9
pain assessment 846
pain-related stress 1184–5
perioperative cardiac arrest 1154
postoperative extubation or ventilation 501–2
thermoregulation 1158–9
transitional circulation 79, 79, 103–4

- neonates (*cont.*)
 upper airway anatomy 303
see also ex-premature infants; premature infants
 Neo-puff™ 515
 neostigmine 193, 196, 368
 dosing 1294
 nephroblastoma *see* Wilms tumor
 nephrogenic rests 161, 749
 nephrology, PICU 978–81
 nephronophthisis (NPH) 166
 nephrons, development 160
 nephrotoxicity
 acute kidney injury 165
 calcineurin inhibitors 682, 717
 nerve injuries, perioperative 1175–6, 1176
 lung transplantation 712
 nerve stimulators 426, 427
 nesiritide 951, 953
 dosing 1295
 neural crest cells
 anomalous development 813–14
 cardiac development 69–70, 71
 craniofacial development 811
 enteric nervous system 155
 nervous system development 117–18, 655–6
 neural tube 117–19, 655–6
 brain development 118, 118–19, 119
 spinal cord development 119, 656
 neural tube defects 119–20
 surgical repair 555–6
 see also myelomeningocele
 neuraminidase 778
 neuraxial anesthesia *see* central neuraxial blocks
 neuroblastoma 726–8, 730
 neurodevelopmental delay *see* developmental delay
 neurodevelopmental outcomes
 anesthesia and surgery 1202–13
 alleviating strategies 1215–16
 confounders 1213–15
 critically ill neonates 1202–12, 1208–10
 epidemiological studies 1210–11, 1212–13
 ongoing and future research 1216–17
 protective effects 1213–14
 environmental influences 1215
 extreme prematurity 493, 493
 genetic predisposition 1215
 twin–twin transfusion syndrome 452
 see also central nervous system (CNS), injury
 neuroendocrine bodies (NEB), pulmonary 100
 neuroendocrine hyperplasia of infancy (NEHI)
 100
 neurofibromatosis 774, 1080–3
 type I 1080–3
 type II 1082–3
 neuroleptic analgesia, awake craniotomy 561
 neurological complications
 capnographic 476
 cardiopulmonary bypass 614
 end-stage renal disease 694
 hyponatremia 218, 219
 regional blocks 439–41
 sickle cell disease 238, 984
 neurological examination
 PICU patients 974
 premature infants 487
 neurological toxicity *see* neurotoxicity
 neuromonitoring *see* central nervous system (CNS), monitoring
 neuromuscular blockade
 intubation of difficult airway 321
 monitoring 191–3, 192, 407
 residual postoperative 368
 reversal agents 196–7
 tracheal intubation without 313
 neuromuscular blocking agents (NMBAs) 191–6
 anaphylactic reactions 195–6, 1178
 anticonvulsant-treated patients 662
 burn patients 900, 907
 cerebral effects 543–4
 congenital heart disease 607
 cystic fibrosis 528
 depolarizing 191, 193–4
 developing countries 1148
 dosing 1294
 extremely premature infants 494
 fetal procedures 468, 470
 intracocular pressure effects 803–4
 laryngospasm 786–7
 liver transplantation 687
 mode of action 191, 191
 neuromuscular blockade monitoring 191–3,
 192
 non-depolarizing 191, 194–6
 pharmacokinetics 193, 193–5
 premature infants 489
 renal transplantation 695–6
 reversal agents 196–7
 spinal surgery 665
 trauma 910
 volatile agent interactions 179, 195
 neuromuscular diseases 770–3
 anesthetic complications 772, 772–3
 preoperative assessment 277
 see also myopathies
 neuromuscular transmission 191, 191
 neuronal apoptosis, anesthetic-induced 24
 alleviation 1216
 experimental studies 1194, 1195, 1196, 1197
 interspecies comparisons 1200, 1200
 mechanisms 1198–9
 neuronavigation 560
 neuropathic pain 867–9
 neuropeptide Y 123, 124
 neuropharmacology 540–4
 neuroprotection *see* cerebral protection
 neuroradiology
 interventional 564–6
 pre-, intra- and postoperative 560
 sedation and anesthesia 549
 neurosurgery 540–68
 anesthetic management 544–59
 case study 567–8
 cerebral protection, resuscitation and outcome
 566
 cerebrovascular anomalies 562–4
 craniofacial reconstruction 828
 endovascular 564–6
 fluid management 546–7
 induction of anesthesia 545–6
 intracranial pressure control 546–7
 monitoring 545
 newer procedures 559–62
 patient positioning 545
 pharmacology 540–4
 postoperative ICU management 976–7
 premedication 545
 preoperative assessment 544–5
 specific conditions/procedures 549–59
 stereotactic 560
 temperature homeostasis 548
 venous air embolism 548–9
 neurotoxicity
 bilirubin 144, 482
 developmental anesthetic-induced 24,
 118–218
 alleviating strategies 1215–16
 clinical evidence 1202–13
 confounders 1213–15
 experimental evidence 1185–98, 1186–94,
 1195, 1197, 1198
 historical perspective 1183–4
 interspecies comparisons 1199–201, 1200,
 1201
 ongoing and future research 1216–17
 putative mechanisms 1198–9
 local anesthetics 202, 420–1, 440, 1173
 neurotransmitters, pain pathway 123, 124
 neurovascular coupling, cerebral 133
 neurolulation 117, 118, 118
 failure 120
 neutral thermal environment 207–8
 Newborn HAL, Gaumard 1228, 1235
 new drug application (NDA) 48
 new drugs, phases of testing 47, 47–8
 nicardipine
 dosing 1295
 postoperative hypertension 371
 spinal surgery 671
 nicotine 522
 nicotinic acetylcholine receptors (nAChR) 191,
 191
 NICU *see* neonatal intensive care unit
 nil per os (NPO), preoperative *see* fasting,
 preoperative
 NIRO 200 cerebral oximeter 409
 NIRS *see* near infrared spectroscopy
 Nissen fundoplication 735–6
 nitric oxide (NO)
 inhaled (iNO) 1297
 ALI/ARDS 971
 bronchopulmonary dysplasia 113
 congenital diaphragmatic hernia 511
 respiratory distress syndrome 478
 pulmonary vasodilation 88–9, 89
 systemic vasodilation 91
 nitroglycerine
 cerebral angiography 930
 dosing 1295
 EXIT procedure 449
 open fetal surgery 470
 nitroprusside
 dosing 1295
 postoperative hypertension 371
 spinal surgery 670–1
 nitrous oxide (N₂O) 174, 175, 1297
 central nervous system effects 541
 congenital heart disease 605, 606
 cylinders 338
 developing countries 1144, 1144, 1148
 environmental concerns 351
 induction of anesthesia 344–6
 maintenance of anesthesia 351
 middle ear surgery 780
 monitoring 405
 neurotoxicity 1192, 1196
 postoperative behavior changes 1206, 1207
 strabismus surgery 802
 trauma patients 916
 NMBAs *see* neuromuscular blocking agents
 N-methyl-D-aspartate (NMDA) receptor
 antagonists
 developmental neurotoxicity 1185–96, 1198,
 1199
 methadone as 855
 nociception 122
 neonates 1184–5
 nociceptors
 development 122, 463–5
 maturation of responsiveness 125
 noise
 during MRI scans 927
 postanesthesia care unit 361–2
 non-compliance 520
 non-convulsive seizures (NCS), post CPR 266
 non-depolarizing muscle relaxants 191, 194–6
 burns patients 907
 dosing 196
 eye surgery 803, 804–5
 pharmacodynamics 195–6
 pharmacokinetics 193, 194–5
 renal transplantation 696
 non-inferiority designs, outcomes research
 1254–5, 1255
 non-invasive ventilation (NIV)
 asthma 967
 bronchopulmonary dysplasia 108
 cystic fibrosis 524, 528
 PICU 962, 962–3
 postoperative period 316
 see also bilevel positive airway pressure;
 continuous positive airways pressure

- non-rebreathing systems (NRBS) 18, 18–19
 non-steroidal anti-inflammatory drugs (NSAIDs)
 850–2, 863
 after adenotonsillectomy 784, 850–1, 886
 after outpatient surgery 885–6
 after spinal surgery 674, 851
 cystic fibrosis 867
 dosing 852, 1296
 metabolism 173
 perioperative dosing 664
 platelet function testing 230
 postoperative pain 376
 protein binding 170
 side-effects 850
 non-technical skills 1222, 1223, 1279–80
 Noonan syndrome 774, 999, 1082–5
 norepinephrine (NE)
 β-adrenergic receptor affinity 82
 dopamine-induced release 951
 dosing 1295
 inotropic responses, acute myocardial dysfunction 91–2
 regulation of vascular tone 90
 shock 957
 use in PICU 951, 952
 normal saline (0.9% NaCl) 353
 nortriptyline, neuropathic pain 868
 Norwood operation 648–9
 nose
 anatomy 302–3
 development 811–13
 nosocomial infections
 PICU patients 988–9
 prevention 987–8, 988
 noxious stimuli
 fetal stress response 463, 464, 465–6
 long-term neurodevelopmental effects 466
 NSAIDs *see* non-steroidal anti-inflammatory drugs
 nuclear medicine 930
 null hypothesis 45
 nurse-controlled analgesia (NCA) 190, 856–7
 acute postoperative pain 864
 cancer pain 865
 starting doses 857
 nurses
 administration of sedation 935–6
 postanesthesia care unit 363, 365
 nursing standards, postanesthesia care 365
 Nuss procedure, pectus excavatum 583
 nutrition, premature infants 481, 482
 nutritional deficiencies, end-stage renal disease 694
 nutritional support
 burn injuries 899–900
 inflammatory bowel disease 725–6
 PICU patients 986–7
 see also enteral feeding; parenteral nutrition
 obesity
 adolescent 534, 534–6
 bariatric surgery 535, 535–6, 536
 case study 537–8
 anesthetic management 534–5
 diabetes risk 532
 outpatient anesthesia 879
 preoperative assessment 276, 277, 330
 slipped capital femoral epiphysis 761
 objectives, study 42
 obstructive cardiac lesions 589
 complete, intracardiac shunting 592, 592
 partial, intracardiac shunting 590–2, 592, 592
 obstructive shock, extracardiac 955
 obstructive sleep apnea (OSA)
 adenotonsillectomy 781–3, 876–7, 879
 after palatoplasty or pharyngoplasty 841
 anatomical predisposition 301
 craniofacial anomalies 824–5, 825, 834
 diagnosis 781–2, 782
 grading of severity 782
 neurodevelopmental sequelae 1215
 obese adolescents 535
 outpatient anesthesia 879
 postoperative apnea 369
 preoperative assessment 277, 281, 331
 obstructive uropathy 164
 congenital 456–8, 458
 posterior urethral valves 744–5
 ureteropelvic junction obstruction 747–8
 occipital sinus 128
 oculo-auriculovertebral spectrum (OAVS) 820–1,
 997
 airway management 825
 see also Goldenhar syndrome
 oculocardiac reflex 801–2
 oculodento-osseous dysplasia, airway management 320
 Office for Civil Rights (OCR) 57
 Office for Human Research Protections (OHRP) 50, 57
 office procedures, anesthesia and sedation for 931–2
 off-label prescribing 41, 49
 off-site procedures *see* outside-the-operating room procedures
 oligohydramnios, fetal urinary tract obstruction 457
 oligohydramnios sequence 160–1
 fetal urinary tract obstruction 457, 458
 posterior urethral valves 745
 oliguria 979, 979, 980
 OLV *see* one-lung ventilation
 omega-3 fish oils, retinopathy of prematurity and 483
 Omnibus Budget Reconciliation Act 1989 (OBRA) 1252
 omphalocele 505, 505–6
 anesthetic management 506
 pathogenesis 152
 OMV *see* Oxford miniature vaporizer
 oncology
 PICU 981
 see also cancer
 ondansetron
 dosing 1297
 extramural anesthesia 938
 opioid-induced vomiting 858, 858
 prophylactic 354, 356, 377–8, 888
 side-effects 888
 one-lung ventilation (OLV) 569, 571–3
 anesthetic techniques 573
 bronchial blockers 571–2, 572, 666
 devices available 571
 double-lumen tubes 573, 573, 666
 endobronchial intubation 571, 666–7
 indications 571
 lung isolation techniques 315, 571, 571–3
 pathophysiology 570
 spinal surgery 659, 666–7
 thoracoscopic surgery 576
 Univent tube and blocker 572, 573
 ventilation during 570
 open-chest cardiopulmonary resuscitation 262
 operating room (OR)
 checklists 1286–7, 1287, 1288
 environment, for neonates 500–1
 handover to PACU 363–4
 heat loss mechanisms 1159–60
 medication safety 1287–9, 1290
 preparation 338–42
 relationship with ICU 947
 safe systems 1289–92
 simulation-based systems evaluation 1225, 1226
 teamwork and communication 1279–86
 temperature 341, 488, 500–1
 transport of premature infants to/from 488–9,
 489
 transport to ICU from 357–8
 transport to PACU from 357–8, 363
 trauma centers 915
 see also outside-the-operating room procedures
 ophthalmological drugs, anesthetic effects 801
 ophthalmological examination, PICU patients 974
 ophthalmological surgery 800–6
 opioid(s) 186–91
 acute tolerance 673
 analgesia 852–8, 863–4
 administration methods 856–7
 after spinal surgery 674
 burn patients 907, 908
 cancer pain 865–6
 continuous infusions 856
 cystic fibrosis 867
 dosing guidelines 854
 extramural procedures 939–40
 intermittent bolus dosing 856
 neuropathic pain 868
 outpatient surgery 886
 patient- and nurse-controlled 856–7, 857
 postoperative 376
 anesthesia 352
 cerebral effects 542
 congenital heart disease 606–7
 ex-premature infants 501
 extremely premature infants 493–4, 494
 fetal procedures 468, 470
 liver transplantation 687
 neonates 21–2, 501
 renal transplantation 696
 spinal surgery 672–3
 context-sensitive half-times 183, 186–7
 developmental neurotoxicity 852, 1196–8
 dosing 1294
 epidural 202, 423, 862, 863
 fetal uptake 463
 hepatic metabolism 172
 intrathecal 423
 ontogeny of actions 852–6
 pharmacodynamics 187, 189, 190
 pharmacokinetics 186–7, 187, 188, 189,
 190
 phenylpiperidines 186–8
 pulmonary vascular responses 593
 side-effects and treatment 857–8, 858, 862
 thermoregulatory effects 1161–2
 opioid receptors 126, 852
 opportunistic infections, transplant recipients 716
 optical stylets 325–6
 optic neuropathy, ischemic 1175–6
 optimal external laryngeal manipulation (OELM) 312, 312
 oral airways 308, 308, 338
 intubation of difficult airway 321
 modified 309, 309
 oral antihyperglycemic drugs 222
 oral cavity, anatomy 303, 303
 oral-facial-digital syndrome (OFDS) 1084–5
 orbital malposition 821, 821
 surgical correction 830, 830, 831
 orchiocepsy 746
 organ donors, care of 679
 organic anion transporters (OATs) 169
 organic anion transporting polypeptides (OATPs) 169
 organic cation transporters (OCTs) 169
 Organ Procurement and Transplant Network (OPTN) 699, 708
 organ transplantation *see* transplantation, organ
 orofacial clefts *see* facial clefts
 opharynx
 anatomy 303–4
 gender differences 303–4, 304
 orosomucoid (ORM) *see* α1-acid glycoprotein
 orthodontic devices 306
 otracheal intubation *see* tracheal intubation
 orthodromic reciprocating tachycardia (ORT) 954
 orthopedic problems, genetic syndromes 773,
 773–4, 994

orthopedic surgery 757–76
 case study 774–6
 postoperative NSAID use 851
see also spinal surgery
 Ortolani sign 758
 OSA *see* obstructive sleep apnea
 Osler-Weber-Rendu syndrome 1086–7
 osmolality
 fluid compartments 206
 reference ranges 1310
 urine 209
 osmotic agents, intracranial pressure control 547
 osteogenesis imperfecta (OI) 766, 766–8, 1086–9
 case study 774–6
 osteoporosis, cystic fibrosis 525
 ostium primum defects 76
 ostium secundum defects 76
 otitis media
 chronic, neurological impairment 1215
 myringotomy tube placement 779–80
 otolaryngeal surgery 779–800
 Oucher scale 374, 375, 846, 848
 outcome measures 44–5, 1240
 outcomes and effectiveness research 1252–5
 defined 1252
 study designs 1254–5, 1255
 using databases 1252–4
 outflow resistance, intracardiac shunts 590, 590
 complex lesions 590–2, 592
 simple lesions 590, 591
 outpatient anesthesia 875–95
 anesthetic agents and techniques 883–5
 appropriate procedures 876–8, 877
 case study 894–5
 complications 892–3
 design and settings 876
 fast-tracking 891, 892
 pain management 885–7
 patient selection 878
 postoperative nausea and vomiting 887–90,
 889
 preoperative evaluation 878, 878–81
 preoperative preparation 881–3
 recovery and discharge 890–2, 892
 unplanned admission 893–4
 outpatient assessment clinics 275
 Outpatient Surgery Admission Index (OSAI)
 893–4
 outside-the-operating room procedures 919–45
 anesthetic management 932–41
 blood loss 938
 difficult airway 938
 organization 933–4
 postanesthesia care 936–7
 practitioners 934–5
 resuscitation 937–8
 scheduling and preparation of patients
 935–6, 937
 standards and guidelines 933, 933
 techniques and agents 938–41
 clinic and office 931–2
 diagnostic radiology 919–28
 history 22
 interventional radiology and angiography
 928–30
 nuclear medicine 930
 numbers of cases 919, 920
 radiation oncology 930–1
 range 919, 920
 safety issues 941–4
 simulation 1235
 ovaries, development 741
 Oxford inflating bellows (OIB) 1143, 1144
 Oxford miniature vaporizer (OMV) 1143, 1144,
 1144, 1145
 oxycephaly 814
 intracranial hypertension 823, 824
 oxycodone 853
 after outpatient surgery 886
 cancer pain 865
 dosing 854

oxygen (O_2)
 cylinders, emergency 338
 fraction of inspired *see* fraction of inspired oxygen
 monitoring 405
 pulmonary toxicity 108, 113
 retinal toxicity 483
 oxygen administration
 asthma 966
 carbon monoxide (CO) poisoning 902
 during recovery 357, 367
 laryngospasm 348
 neonatal resuscitation 515
 non-invasive delivery methods 962, 962–3
 PICU patients 962, 962
 post CPR 266–7, 269
 premature infants 489
 transport to PACU 358
 oxygen concentrators 1143, 1145
 oxygen consumption (V_O_2)
 pregnant women 460
 premature infants 477
 shock 955
 oxygen consumption index 393
 oxygen content
 arterial (CaO_2) 393, 955
 premature infants 487–8
 arteriovenous difference 393, 955
 cardiac catheterization 598, 599
 mixed venous 393
 pulmonary capillary 393
 oxygen delivery (DO_2)
 cerebrovascular response 134
 shock 955
 oxygen delivery index 393
 oxygen desaturation
 after Fontan procedure 631
 congenital heart disease 595–7, 596
 at induction 347
 laryngospasm 349
 postextubation 357
 see also hypoxemia
 oxygen extraction ($O_2\text{EX}$) 955
 oxygen saturation (SO_2)
 arterial (SaO_2)
 central venous monitoring 397, 397–8
 PICU patients 960
 retinopathy of prematurity and 483
 cardiac catheterization 598, 599
 central venous ($ScvO_2$), shock management
 957–8, 958
 decreased *see* oxygen desaturation
 fetal, EXIT procedure 449–50
 jugular venous bulb ($SjvO_2$) 409–10
 postoperative monitoring 357
 pulse oximeter-derived (SpO_2) 341, 402, 403
 see also pulse oximetry
 regional cerebral *see* cerebral oxygen
 saturation, regional
 regional somatic 411–12
 single-ventricle physiology 625, 626, 627
 oxygen tension (PO_2)
 arterial (PaO_2)
 alveolar gas equation 962
 normal neonates 485
 PICU patients 960
 premature infants 484–5, 485
 pulmonary vascular resistance and 593, 593
 retinopathy of prematurity and 483
 see also hypoxemia
 reference ranges 1303
 oxymetazoline 313, 786
 Oxyscope™ 338
 oxytocin, EXIT procedure 450
 ozone-depleting agents 174, 351
 pacemakers *see* cardiac pacemakers
 pachygryia 120
 packed red blood cells (PRBCs) 241–2
 dilution 244
 irradiation 241–2
 leukocyte reduction 242
 preparation 241
 storage lesions 251
 transfusions 243–4, 981, 1298
 burn patients 906
 compatibility 240
 cross-matching 243
 ex-premature infants 500
 indications/triggers 244–5, 354
 intraoperative 354
 massive 246
 neonates 216
 PICU patients 982
 postoperative 370
 sickle cell disease 238, 336
 volume calculations 244–5
 washing 241
 PaCO_2 *see under* carbon dioxide tension
 PACU *see* postanesthesia care unit
Paediatric Anaesthesia (journal) 25
 pain
 adverse effects on neonates 1184–5
 assessment 374–5, 846–8, 863
 developing countries 1148–9
 burns 907–8
 central integration of afferent inputs 125, 125,
 845
 definitions 463
 developmental physiology 122–6, 845–6
 fetal perception 463–6, 464
 history 275
 interneuronal connections 125
 molecular basis of perception 125–6
 negative behavioral sequelae 297, 846
 neuropathic 867–9
 pathways, development 122–4, 463–5, 845
 perceptual changes, ex-premature infants 500
 physiological signs 375
 postoperative 374–7
 outpatient surgery 893
 responses, development 124–6
 pain management 845–74
 acute pain services 862–4
 adenotonsillectomy 784–5, 850–1, 886
 burn patients 908
 cancer 856, 864–6
 case study 871–3
 cystic fibrosis 528, 866–7
 dental surgery 808
 developing countries 1148–9
 ear surgery 779–80
 lung transplantation 711
 neurosurgical patients 976
 non-pharmacological methods 376–7
 outpatient surgery 885–7
 PACU 375–7
 pharmacological 375–6, 848–62
 protocols 863–4
 renal transplantation 697
 sickle cell disease 238, 530–1, 866
 specific conditions 864–71
 spinal surgery 674–5, 851
 thoracic surgery 573–5
 see also analgesics; regional anesthesia
 palate, development 813
 palatoplasty *see* cleft lip and palate
 reconstruction
 Pallister-Hall syndrome 1088–91
 palonosetron 888
 pancreas
 annular 153
 development 140, 151
 dysfunction, cystic fibrosis 524–5
 transplantation 715–16
 pancreatic enzyme supplements 524
 pancuronium 194–6
 cerebral effects 543–4
 congenital heart disease 604, 607
 dosing 196, 1294
 extremely premature infants 494
 fetal procedures 468

- pharmacodynamics 195–6
 pharmacokinetics 193, 194
 premature infants 489
 PANDA study 1217
 panel reactive antibody (PRA) screen 698–9, 713
 Paneth cells 150, 153
 immune function 157
 panting response, hyperthermia 1159
 PaO_2 *see under* oxygen tension
 papillary muscles, development 69, 71
 Papillon-Leage syndrome 1084–5
 paracetamol *see* acetaminophen
 paragangliomas, extra-adrenal 728
 parainfluenza virus 778
 parallel circulation physiology 624–8
 paranasal sinus surgery 785–6
 cystic fibrosis 526, 786
 paraplegia, after coarctation repair 646–7
 parascleene brachial plexus block 431–2
 parasitic diseases, transmission via transfusion 248
 parasym pathetic nervous system
 neonatal heart innervation 80
 regulation of vascular tone 89–90
 paravertebral block (PVB) 439
 thoracic surgery 574–5
 ultrasound guidance 439
parens patriae, doctrine of 5
 parent(s)
 acupuncture 287
 of adolescents, confidentiality issues 4–5
 anxious 284
 apologies to 11
 conflicts about appropriate care 8, 8
 of critically ill children 947–8
 decision-making role 2, 3, 52
 disclosure of errors to 11
 history-taking from 275
 preoperative education 274
 preoperative preparation programs 882–3
 temporarily impaired/intoxicated 6
 parental presence
 at CPR/PICU procedures 948
 during MRI 924
 at induction 287, 342–3
 outpatient surgery 882
 PACU 365–6
 simulation of 1236
 parent-controlled analgesia 856
 parent (and child) education
 anxiety reduction 287–8
 preoperative 274
 parenteral nutrition (PN)
 cholestasis secondary to 145–6
 PICU 986–7
 premature infants 481
 Parkland formula, for burns 903, 904
 partial thromboplastin time *see* activated partial thromboplastin time
 part task trainers 1226, 1226
 Patau syndrome (trisomy 13) 1120–3
 patent ductus arteriosus (PDA) 645
 ex-premature infants 500
 heart rate 485, 486
 history of anesthesia 21–2
 maintenance of anesthesia 490, 490
 neurodevelopmental outcomes of surgery 1202, 1208
 pathophysiology 645
 premature infants 103–4, 479, 485
 preoperative evaluation 485–6, 486
 pulmonary atresia 637
 surgical closure 645
 transcatheter device closure 619–20
 treatment options 104, 479
 widened pulse pressure 479, 479
 patent foramen ovale 76
 patient-controlled analgesia (PCA) 189–90, 856–7
 acute postoperative pain 864
 cancer pain 865
 PACU 376
 spinal surgery 674
 starting doses 857
 patient-controlled regional analgesia 436
 patient education *see* parent (and child) education
 patient positioning *see* positioning, patient
 patient simulation, high-fidelity *see* high-fidelity patient simulation
 Patient State Index (PSI) 136
 Pavlik harness
 hip dysplasia/dislocation 758–9, 759
 supracondylar femoral fractures 764
 pay-for-performance (P4P) initiatives 1289, 1290
 payments, research participants 53
 PDA *see* patent ductus arteriosus
 peanut allergy 332, 346
 pectus carinatum 581
 pectus excavatum 581–4, 583, 584
 PediasIM, METI 1228, 1236–8
 Pediatric Advanced Life Support (PALS) 957, 958
 Pediatric Anesthesia and NeuroDevelopmental Assessment (PANDA) study 1217
 Pediatric Anesthesia Emergence Delirium (PAED) score 356, 372, 372
 pediatric anesthesiologists
 developing countries 1141–3
 ethical obligations 10, 10–11
 fellowship training *see* fellowship training
 perioperative cardiac arrest risk and 1154
Pediatric Anesthesiology (Leigh and Belton) 17
 pediatric anesthesiology, subspecialty status 25
 pediatric anesthesiology education 27–39
 adequacy 29–30
 curriculum 28–9, 38–9
 developing countries 1142–3
 evaluating effectiveness 34
 fundamental principles 30–4
 history 24, 25
 needs assessment 27–8
 subspecialty *see* fellowship training
 use of simulation 1221, 1221–2
see also teaching, pediatric anesthesiology
 pediatric end-stage liver disease (PELD) score 682
 Pediatric Index of Mortality (PIM) 949
 pediatric intensive care 946–92
 case study 990–1
 central nervous system 974–8
 circulation 949–60
 endocrine disease 984–6
 extracorporeal life support 971–3
 gastroenterology and nutrition 986–7
 hematology/oncology 981–4
 history 20
 immunity and infection 987–9
 nephrology 978–81
 organ system function and failure 949–60
 psychological consequences 297–8
 respiration 960–71
 ventricular assist devices 973–4
 pediatric intensive care unit (PICU; ICU) 946–9
 after spinal surgery 673
 checklists 1286
 continuous quality improvement 949
 death in 948
 disclosure of medical errors 948
 family-centered care 947–8
 relationship with operating room 947
 transport to/from 357–8, 492, 989–90
see also neonatal intensive care unit
 Pediatric Logistic Organ Dysfunction (PELOD) 949, 959–60, 960
 Pediatric Perioperative Cardiac Arrest (POCA) registry 22–3, 1153, 1243–4
 Pediatric Regional Anesthesia Network (PRAN) 1245
 Pediatric Research Equity Act (PREA, 2003) 49
 Pediatric Risk of Mortality Score (PRISM) 949
 Pediatric Sedation Research Consortium (PSRC) 1245
 Pedi HAL, Gaumard 1228
 PEEP *see* positive end-expiratory pressure
 PELD (pediatric end-stage liver disease) score 682
 PELOD (Pediatric Logistic Organ Dysfunction) 949, 959–60, 960
 penicillin allergy 1177, 1178
 penile nerve block 437, 437
 penis, development 741
 pentology of Cantrell 1092–3
 pentobarbital
 dosing 1294
 neurosurgical patients 545
 neurotoxicity 1192
 postoperative behavior changes 1203, 1206
 sedation at extramural sites 939
 percutaneous endoscopic gastrostomy (PEG) 735
 percutaneously inserted central catheters (PICC) 388
 performance skills, human 1221–2, 1223
 pericardial effusions, percutaneous drainage 621
 periclavicular brachial plexus blocks 431–3
 perinatal mortality 1146
 periodic breathing 478
 periodic paralysis, familial (FPP) 1034–5
 peripherally inserted central catheters (PICC) 388
 peripheral nerve blocks 431–9
 case study 442
 complex regional pain syndrome 869
 complications 439–41
 continuous 436
 contraindications 426–7
 pharmacology 200, 200–1
 trends in use 424–5, 425
 peripheral nerve injuries, perioperative 1175, 1176
 peripheral nervous system
 developmental physiology 420
 embryology 419–20, 656
 peripheral perfusion, pulse oximetry and 402, 403
 peripheral vascular resistance *see* systemic vascular resistance
 peripheral venous access 381–2
 CPR 262
 ex-premature infants 500
 preoperative site evaluation 276
 systemic air embolus complicating 400–1
 trauma 911, 915
 peritoneal dialysis (PD) 751–3
 catheter placement 753–4
 complications 754
 ICU setting 980
 other dialysis modalities vs 752
 periventricular white matter injury 479
 permission, informed 2–3
 peroneal muscular atrophy 1016–17
 perphenazine 377
 persistent fetal circulation 103
 pethidine *see* meperidine
 Peyer's patches 157
 Pfeiffer syndrome 1092–5
 airway management 825
 cervical spine instability 660–1
 clinical phenotype 817
 genetics 814
 midface advancement 829
 PFIC *see* progressive familial intrahepatic cholestasis
 P-glycoprotein (P-gp) 169–70
 pH
 arterial blood
 normal neonates 485
 premature infants 485
 pulmonary vascular resistance and 593, 593
 reference range 1302–3
 cerebrospinal fluid 133–4
 gastric 158, 169

- PHACE association 1094–5
phantom pain 865
pharmacodynamics
 benzodiazepines 180–1
 inhaled anesthetics 176–80
 intravenous anesthetics 182, 183, 184–6
 local anesthetics 200, 200–2, 421–2, 422
 opioids 187, 189, 190
pharmacokinetics
 benzodiazepines 180, 181
 burn patients 907
 inhaled anesthetics 174, 175, 175–6
 intravenous anesthetics 181, 181–3, 184, 185
 local anesthetics 198–200, 199, 421
 muscle relaxants 193, 193–5
 opioids 186–7, 188, 189, 190
pharmacology 168–204
 analgesics 848–9
 local anesthetics 858–9
 neuropharmacology 540–4
pharyngeal flap 833, 833
pharyngeal pouches 301, 302
pharyngoplasty
 postoperative management 840–1
 see also cleft lip and palate reconstruction
pharynx
 anatomy 303–4
 development 149–50
 developmental physiology 305
phase I trials 47, 47
phase II trials 47, 47–8
phase III trials 47, 48
phase IV trials 48
phenobarital
 neurotoxicity 1192–3
 postoperative behavior changes 1204
 status epilepticus 978
phenoxybenzamine 729, 1295
phenotolamine 1295
phenylephrine 952–3
 continuous infusion 951
 dosing 1295
 eye drops 801, 801
 for priapism 755
 sinus surgery 786
phenylpiperidines 186–8
pheochromocytoma 728–9
PHI *see* protected health information
phosphate
 fluid compartments 206
 renal excretion 162, 163
phosphatidylcholine, surfactant 101
phosphatidylinositol 4,5 biphosphate (PIP₂) 90, 90–1
phosphodiesterase 85
phosphodiesterase (PDE) III inhibitors 953
phosphoinositide signaling system 90, 90–1
phospholamban 85, 85
phospholipase C (PLC) 90, 91
phospholipids, surfactant 101–2
phosphorus, inorganic 1310
phosphorylase kinase deficiency 1046–7
physical examination, preoperative 276, 332–3
Physician Quality Reporting Initiative (PQRI)
 1240, 1289, 1290
physiology, developmental *see* developmental physiology
physostigmine 374
PICU *see* pediatric intensive care unit
Pierre-Robin (Robin) sequence (PRS) 820, 997, 1094–7
 airway management 319, 320, 324
 airway obstruction 825
 anesthetic implications 774
 case study 327–9
pilocarpine, neuroprotective effects 1216
piperacillin/tazobactam 1296
pKa values, local anesthetics 198, 198
PKD1 gene 166
PKD2 gene 166
PKHD1 gene 166
- placebo controls 43
placenta
 circulatory pathways 78–9, 103
 drug transfer 462, 463, 467–8
 monochorionic 450–2, 451
 normal vascular anatomy 450, 450
 physiology 462
plagiocephaly
 anterior 815, 815, 816
 intracranial hypertension 823, 824
 posterior 816
planning, perioperative 274
plasma
 cryoprecipitate-reduced 242, 245
 platelet-rich 241
 for transfusion 242
 indications 245
 preparation 241, 242
 recipient transfusion 240
 see also fresh frozen plasma
plasmin 227
plasminogen 227, 228, 229
 activity 1310
plasminogen activator inhibitor 1 (PAI-1) 227, 228
platelet(s)
 functional defects, congenital heart disease 597
 microparticles, congenital heart disease 597
 primary hemostasis 224–5, 225
 random donor 242
 secondary hemostasis 226, 226–7
 single donor 242
platelet counts 228, 229, 982
 burn injuries 900
 point-of-care testing 234
 premature infants 488
 preoperative 233
 reference range 1310
 transfusion thresholds 245
platelet function analyzer (PFA-100) 229, 230
 closure time 230
 preoperative use 233
platelet function tests 229–30, 1310
platelet-rich plasma 241
platelet transfusions 245–6, 981, 1298
 during liver transplantation 691
 indications 245
 massive transfusion 246
 platelets for 241, 242–3
 premature infants 488
 recipient compatibility 240, 243
 septic transfusion reactions 250
 volumes administered 245–6
pleural effusions, after Fontan procedure 628, 628, 631
plicae circulares 150
PLUG concept, congenital diaphragmatic hernia 446
pneumonectomy 577
pneumonia
 premature infants 484
 ventilator-associated (VAP) 988
pneumoperitoneum, laparoscopic surgery 737
pneumothorax
 catheter-related 400
 cystic fibrosis, surgical treatment 526
 laser-induced 798
 postoperative 370
 tension 912
 traumatic 912
POCA registry *see* Pediatric Perioperative Cardiac Arrest registry
point-of-care testing
 coagulation status 234, 407
 intraoperative 406–7, 407
Poiseuille's law 105
polycystic kidney disease 166
polycystins 166
polycythemia
- congenital heart disease 597
 premature infants 481
polydactyly 762, 763
polyductin 166
polymicrogyria 120
polysomnography, sleep 782, 782
Pompe disease 1040–3
popliteal nerve block 435–6
pores of Kohn, development 97
porphyria 182
portal hypertension 685
 cystic fibrosis 526
portal vein, development 141
portacaval shunts, liver transplantation 688
portopulmonary hypertension (PPH) 684
portosystemic shunts, cystic fibrosis 526, 527
positioning, patient
 craniofacial surgery 836, 837
 facemask ventilation 308
 injuries related to 1175–6
 middle ear surgery 780
 neurosurgery 545
 posterior fossa tumor surgery 554
 postoperative airway management 316
 pregnancy 460
 spinal surgery 659, 660, 660, 665–6
 tracheal intubation 312
 transport to PACU 357–8, 363, 363
 see also prone positioning; recovery position
positive airway pressure *see* bilevel positive airway pressure; continuous positive airways pressure
positive end-expiratory pressure (PEEP)
 asthma 968
 bronchopulmonary dysplasia 478
 congenital cardiac surgery 610
 laryngospasm 348
 negative pressure pulmonary edema 370
 pulmonary vascular resistance and 593
 retinopathy of prematurity 483
 venous air embolism 549
positive pressure ventilation (PPV)
 after Fontan procedure 630–1
 arterial pressure waveforms 395, 396
 congenital cystic lung lesions 578, 579
 developing countries 1144
 neonatal resuscitation 514–15
 oral or nasal airways 309
 see also mechanical ventilation
positron emission tomography (PET) 930
postamputation pain 865
postanesthesia care unit (PACU) 361–80
 case study 379–80
 complications and problems 356–7, 367–78
 day surgery 890–2
 design 361–2
 discharge criteria 366, 366–7, 890–2, 893
 equipment 362, 362
 extramural procedures 936–7
 handover and assessment 363–4, 364, 365
 monitoring 364–5
 parental presence 365–6
 patient safety 364–5
 staffing 362–3
 transport to 357–8, 363
 see also recovery from anesthesia
Post Anesthetic Discharge Scoring System (PADSS) 366, 366
postaxial acrofacial dysostosis syndrome *see* Miller syndrome
posterior cardinal vein 67, 68
posterior cerebral arteries 127
posterior fossa tumors 553–5, 554
 postoperative ICU management 977
posterior spinal arteries 128, 129, 656
posterior tibial artery catheters 389, 392
posterior urethral valves (PUV) 744–5
Post-Hospital Behavior Questionnaire (PHBQ) 295–6, 890, 891
postintubation croup 317

- postmarketing surveillance 48
postoperative behavior disorders (POBD) 295–7, 1202, 1203–7
 effects of premedication 288
 incidence and duration 296
 measuring 295–6
 risk factors 296–7, 365
postoperative nausea and vomiting (PONV) 354, 356
 management algorithm 889
 middle ear surgery 780
 outpatient surgery 887–90, 893
 PA_CU 377–8
 prophylaxis 354, 377–8, 887–8, 1297
 propofol for prevention 351, 802
 risk factors 275, 354, 377, 887
 risk score 377, 888
 strabismus surgery 802
 treatment 378, 888–90
postoperative visual loss (POVL) 666, 1175–6
 research using databases 1253
postpneumonectomy syndrome 577
post-tetanic stimulation 192
post-thoracotomy pain 573–4
 analgesia 574–5
post-tonsillectomy hemorrhage 785
post-transfusion purpura (PTP) 249–50
post-transplant lymphoproliferative disease (PTLD) 717
post-traumatic stress disorder (PTSD) 297–8
 after awareness 291–2, 293
 after PICU admission 297–8
 diagnostic criteria 297
potassium (K⁺)
 disturbances, liver transplant surgery 689–90, 691–2
 fluid compartments 206, 206
 maintenance requirements 217
 reference ranges 1310–11
 renal excretion 162, 163, 209
 serum, premature infants 488
 succinylcholine-induced release 194
 see also hyperkalemia; hypokalemia
potassium channels, local anesthetic actions 200
potassium chloride 1298
Potter facies 161, 745
Potts shunt 622
power (of a study) 45
Powerject system 859
Prader–Willi syndrome 1096–7
pre-albumin 1311
prednisone, transplant recipients 680
pregabalin 674, 868
pregnancy
 adolescents/young adults 522
 anesthetic exposure during 1185
 confidentiality issues 5
 MRI safety 924
 physiological changes 459–61
 preoperative testing 277, 333, 522
 services in developing countries 1146
 see also fetus
prekallikrein (PK) 228, 228, 229
premature atrial contractions (PACs) 954
 central venous catheter insertion 384, 386
Premature Infant Pain Profile (PIPP) 846, 847
premature infants 475–96
 apnea *see* apnea, prematurity
 borderline (36–37 weeks) 476
 brain development 120, 122, 125
 bronchopulmonary dysplasia 108, 478
 cardiovascular physiology 210–11, 211
 central nervous system physiology 130, 131, 211
 cerebral vasculature 130
 coagulation function 212, 228, 229
 common problems 477–83
 extremely *see* extremely premature infants
 fluid balance 207, 487
 gut motor function 156
 induction of anesthesia 489
 laboratory investigations 481–2, 487–8
 maintenance of anesthesia 489–92
 minimum alveolar concentration (MAC) 176, 178
 moderately (31–36 weeks) 476
 neonatal jaundice 144
 neurodevelopmental outcomes of anesthesia 1202–12, 1213
 outpatient anesthesia 878–9
 pain assessment 846
 pain perception 465, 466
 pain-related stress 1184–5
 parenteral nutrition 145
 patent ductus arteriosus 103–4, 479, 485
 postanesthetic discharge 366–7
 preoperative assessment 277, 483–8
 preoperative plan 488–9
 recovery from anesthesia 492–3
 renal function 208, 209
 surfactant composition 102
 upper airway anatomy 303
 see also ex-premature infants; neonates
premature ventricular contractions (PVC) 954
premedication 288–90, 343–4
 benzodiazepines 180, 181
burn patients 905
 commonly used drugs 289–90
congenital heart disease 603
craniofacial reconstruction 835
goals 288
history of development 19
liver transplantation 686
neurosurgical patients 545
outpatient anesthesia 881–2
 pros and cons 288–9
 spinal surgery 664
Premie HAL, Gaumard 1228, 1236
preoperative autologous blood donation (PABD) 252, 664, 667–8
preoperative evaluation 273–83, 330–8
 adenotonsillectomy 331, 781–2
 airway 276, 305–7
 burn patients 905
 case study 298
 cleft lip and palate reconstruction 840
 coagulation tests 232–3, 278–9
 congenital heart disease 277, 331, 597–602, 598
 craniofacial reconstruction 833–4
 developing countries 1146–7
 extramural sedation and anesthesia 935, 937
 fetal interventions/surgery 466–7
 goals 273–4
 heart transplantation 698–9
 history taking 275–6, 330–2
 investigations 276–9, 333
 liver transplantation 686
 neurosurgical patients 544–5
 organizational aspects 275
 outpatient anesthesia 878, 878–81
 physical examination 276, 332–3
 premature infants 277, 483–8
 renal transplantation 694–5
 specific conditions 280–3, 331–2, 333–8
 spinal surgery 660–4
preoperative preparation
 anesthetic equipment 307, 338, 338–40
 anesthetic machine 338
 congenital heart disease 597–602
 craniofacial surgery 826–7
 emergency drugs 340
 extramural anesthesia and sedation 935–6
 monitors 340–2
 operating room 338–42
 outpatient anesthesia 881–3
 pheochromocytoma 729
 premature infants 488–9
 psychological 283–90
 spinal surgery 667
preoptic anterior hypothalamus (POAH) 1156–7, 1157
pressure autoregulation, cerebral blood flow 130–3, 131, 132
pressure-controlled ventilation 340, 963–4
 asthma 968
 congenital heart surgery 609
pressure reactivity index 132
pressure-regulated volume control (PRVC)
 ventilation 340, 964
pressure support ventilation 964
 laryngeal mask 311
pressure–volume loops 961, 961–2, 962
pressure waveforms, intravascular 395–7
presurgical nasal alveolar molding (PNAM)
 appliance 832
preterm delivery, after fetal surgery 445, 467
preterm infants *see* premature infants
preterm labor, after fetal surgery 471
preterm rupture of membranes, after fetal surgery 445
Preverbal, Early Verbal Pediatric Pain Scale (PEVPPS) 375
priapism 754–5
 case study 755
 sickle cell disease 238, 755, 866
 treatment algorithm 756
procaine 198
 pharmacokinetics 198
 stereo-specificity 201
primary pulmonary hypertension of the newborn (PPHN) 103
primary survey, trauma patients 909
PRIS *see* propofol infusion syndrome
privacy laws 57, 1242, 1270–1
procainamide 265, 954
 dosing 1296
procaine 198
process measures 1240
production pressure 11–12
professional evaluation, use of simulation 1225
professionalism, development of 24–5
progeria 1098–9
progressive familial intrahepatic cholestasis (PFIC) 148
 type 1 (PFIC1) 144, 148
 type 2 (PFIC2) 143, 144, 148
 type 3 (PFIC3) 144, 148
prolactin, serum 1311
promethazine 1297
pronephros 159, 159, 740
prone positioning
 airway obstruction after 673–4
 ALI/ARDS 971
 anesthetic management 665, 665–6
 CPR 673
 craniosynostosis surgery 837
 posterior scoliosis surgery 660, 660
 postoperative visual loss 666, 1176
 preoperative evaluation 663
 tracheostomized patients 661
propofol 182–4
 anaphylactic reactions 1177, 1178
 awake craniotomy 561
 cerebral effects 133, 183, 542
 congenital heart disease 604, 607–8
 cystic fibrosis 528
 dosing 184, 1294
 extramural anesthesia/sedation 939
 fetal uptake 463
 fiber-optic laryngoscopy and bronchoscopy 791
 formulations 183–4
 induction 346
 infusion dosing 184, 351, 1171
 laryngeal mask insertion 311
 laryngospasm 349, 369, 786
 metabolism 172, 173
 neurotoxicity 1193, 1196, 1200, 1201
 outpatient anesthesia 884
 pharmacodynamics 183

propofol (*cont.*)
 pharmacokinetics 181, 182–3, 183
 postoperative behavior changes 1204, 1206
 premature infants 489
 protein binding 170, 171, 182
 rapid-sequence induction 337
 spinal surgery 672–3
 strabismus surgery 802
 target-controlled infusion 351–2
 thermoregulatory effects 1161
 total intravenous anesthesia 351–2
 propofol infusion syndrome (PRIS) 183, 351, 1170–1
 evolution over time 1171, 1173, 1173
 outside-the-operating room anesthesia 939
 pathogenesis 1170–1, 1172
 risk factors 772, 1171
 propranolol 1296
 ProSeal laryngeal mask 311
 prosencephalon 118, 119, 119
 prostacyclin (PGI2)
 dosing 1295, 1297
 pulmonary vasodilation 88, 89
 prostaglandin E1 (PGE1)
 dosing 1295
 hypoplastic left heart syndrome 648
 hypoxic congenital heart disease 601
 interrupted aortic arch 647
 left heart outflow obstruction 602
 pulmonary vasodilation 88
 single-ventricle physiology 626
 prostaglandins
 ontogeny of synthesis 849–50
 renal production 209
 vasodilating 88
 protected health information (PHI) 1261
 patients' rights 1271
 privacy 1242, 1267, 1271
 security 1271–2, 1272
 protective lung ventilation (PLV) 570
 protein, reference ranges 1311
 protein binding, drugs 170–1, 171
 benzodiazepines 180, 181
 halogenated agents 175
 intravenous anesthetics 181, 182, 184
 local anesthetics 198, 198, 421
 muscle relaxants 193
 opioids 189
 protein C 227, 1311
 activated 227
 developmental changes 228, 229, 229
 inherited deficiency 236
 protein-drug adducts 170–1
 protein kinase A (PKA) 83
 protein-losing enteropathy (PLE) 633
 protein S 227, 1311
 developmental changes 228, 229
 inherited deficiency 236
 proteus syndrome 1098–101
 prothrombin (factor II) 228, 228
 prothrombin G20210A mutation 236
 prothrombin time (PT) 230–1, 231, 982
 coagulation factor assays 231–2
 neonates 212, 212, 229
 point-of-care testing 234
 preoperative testing 233, 278, 279
 reference range 1311
 prune belly syndrome (PBS) 152, 1100–3
 dialysis 752
 urinary tract anomalies 166–7
 pruritus, opioid-induced 857, 858, 862
 Psaume syndrome 1084–5
 pseudocholinesterases 194
Pseudomonas aeruginosa, cystic fibrosis 523–4, 525
 psoas compartment block 434
 psychiatric interviews 932
 psychological preparation 283–90
 non-pharmacological programs 285–8
 pharmacological 288–90

psychological problems
 after awareness 291–2, 293
 burn-injured children 908
 childhood cancer survivors 529
 inflammatory bowel disease 726
 postoperative 295–9
 preoperative 274, 283–90
PTPN11 gene 999
 published papers, authorship 46, 57
 PubMed 1277
 pulmonary arteries
 atresia 637
 balloon dilation 617–19
 development 74, 75, 98–9
 disruption, iatrogenic 619
 hypoplastic, pulmonary atresia 638
 muscularization 98–9
 pressure measurement 393
 surgical shunts 622–4
 pulmonary artery banding 624
 pulmonary artery (PA) catheterization 392–4
 indications 392
 lung transplantation 710
 parameters measured 391, 393, 393–4
 shock 957
 technique 392–3
 pulmonary artery stenosis
 after transposition surgery 642
 balloon dilation and stenting 617–19
 pulmonary aspiration *see* aspiration of gastric contents, pulmonary
 pulmonary atresia 637–8
 pulmonary blood flow (Qp)
 after Fontan procedure 630, 631
 decreased, single-ventricle physiology 626
 determination 598
 developmental changes 594
 effective (Qp_{eff}) 600
 excessive, congenital heart defects 594, 594, 597
 preoperative care 601–2
 pulmonary artery banding 624
 single-ventricle physiology 625–6, 626
 normal child 599
 obstructed, surgical shunts 622–4
 pulmonary blood flow/systemic blood flow (Qp/Qs) ratio
 hypoplastic left heart syndrome 648
 preoperative determination 599–600
 single-ventricle physiology 624–6, 626, 627
 pulmonary capillary wedge pressure (PCWP) 393
 pulmonary cells 100–2
 development 100–1
 surfactant release 101–2
 types 100–1
 pulmonary circulation
 congenital heart disease 594
 regulation of vascular tone 88–9, 89
 transition from fetal to mature 79, 103
 pulmonary disease
 congenital cystic 577–80, 583
 cystic fibrosis 523–4
 pathogenesis 114, 114, 115
 surgery 526–7
 diffuse parenchymal 708
 premature infants 477–8, 484–5
 preoperative assessment 306
 restrictive, scoliosis 662–3
see also chronic lung disease
 pulmonary edema
 negative pressure (NPPE) 356–7, 369–70, 787
 neurogenic 544
 postoperative 369–70
 pulmonary function *see* respiratory function
 pulmonary function tests (PFTs)
 age-related values 104–6, 105
 anterior mediastinal mass 580
 asthma 107–8
 cystic fibrosis 524
 scoliosis 662–3
 pulmonary hypertension
 congenital diaphragmatic hernia 511, 512
 end-stage liver disease 684
 liver transplantation 690
 lung transplantation 706–7, 707, 710
 primary (PPH)
 lung transplantation 707, 707, 708
 of the newborn (PPHN) 103
 ventricular septal defects 643, 644
 pulmonary hypoplasia
 congenital diaphragmatic hernia 446, 510
 cystic lung lesions 578
 fetal urinary tract obstruction 457, 458, 458
 lung to head ratio (LHR) 447, 448, 510–11
 posterior urethral valves 744–5
 pulmonary neuroendocrine cells (PNEC) 100
 pulmonary perfusion, during one-lung ventilation 570
 pulmonary regurgitation (PR), after tetralogy of Fallot repair 636
 pulmonary shunt fraction 393
 pulmonary stenosis
 critical 637
 transposition of great arteries 639, 641
see also pulmonary artery stenosis; pulmonary valvular stenosis
 pulmonary valve
 atresia 637
 development 72
 pulmonary valvular stenosis
 critical 637
 fetal intervention 458–9
 pulmonary valvoplasty, *in utero* 459
 pulmonary vascular obstructive disease
 congenital heart disease 594–5, 596
 ventricular septal defect 643
 pulmonary vascular resistance (PVR)
 after Fontan procedure 629–30, 631
 congenital heart disease
 complex shunts 591–2, 592
 manipulation 592–3, 593, 593
 simple shunts 590, 591
 developmental changes 594, 594
 fetus 78–9, 103
 mature circulation 79
 neonatal transition 79, 103, 594, 595
 regulation 88–9, 89
 pulmonary vascular resistance index (PVR) 391
 pulmonary vasculature, development 98–9
 pulmonary veins
 development 69, 70
 developmental defects 78
 pulmonary venous drainage, anomalous
 partial 78, 643
 total 78, 642
 pulse-contour analysis of arterial waveform (PiCCO) 397
 pulse oximetry 341, 401–3
 developing countries 1147–8
 EXIT procedure 449, 449
 MRI compatible 925, 926
 newer developments 402–3
 PICU patients 960
 pitfalls, problems and artifacts 402
 postanesthesia 364
 pupillary reflexes 974
 PVR *see* pulmonary vascular resistance
 pyeloplasty 748
 pyloric stenosis, idiopathic hypertrophic (IHPS) 732–3, 733
 pyloromyotomy 732, 733
 pyridostigmine 196
 Qp *see* pulmonary blood flow
 Qp/Qs *see* pulmonary blood flow/systemic blood flow ratio
 Qs *see* systemic blood flow
 quality care initiatives, ethical obligations 11
 quality improvement
 American College of Surgeons program 1250–1

- electronic records for 1275–6
PICU 949
- quality of care
benefits of electronic records 1261, 1268
evaluation 1239–40
outcome measures 1240
process measures 1240
see also outcomes and effectiveness research
- quality of life, organ transplant recipients 718
- question, research 42
- Rackow, Herbert 18
- radial aplasia-thrombocytopenia (TAR) 774, 1118–19
- radial artery catheters 389–90
cutdown technique 392
insertion 389–90
sizes 389
ultrasound-guided insertion 395
- radial club hand (RCH) 762–3
- radial nerve 763
- radiant heat loss 1159, 1161
- radiation, ionizing, safety 941, 942
- radicular arteries 128, 129, 656
- radiocontrast media (RCM), intravascular 943–4
- radiofrequency ablation (RFA)
transcatheter, congenital heart lesions 618, 620
twin reversed arterial perfusion sequence 454
- radiofrequency identification (RFID) 1291
- radiology
cystic lung lesions 578, 578
diagnostic 919–28
interventional 928–30
preoperative 279, 333
stereotactic neurosurgery 560
see also neuroradiology; specific modalities
- radiosurgery, stereotactic 931
- radiotherapy 930–1
adolescents 528
difficult intubation after 306
indwelling central catheters 941
long-term effects 529, 529
painful side-effects 865
retinoblastoma 805
- RAE tracheal tubes 314, 783–4, 799
- rales, premature infants 484
- randomization 43–4
- randomized controlled trials (RCT) 40–1
common impediments 41–2
new drug development 48
see also clinical trials
- ranitidine 1297
- rapamycin 1313
- rapid-sequence induction (and intubation) (RSI; RSII) 315–16, 336–8
classic technique 337, 337
liver transplantation 686
modified/with cricoid pressure 316, 337–8
- neurosurgical patients 545
- open globe eye injuries 804–5
- post-tonsillectomy hemorrhage 785
- pregnant women 461
- renal transplantation 695–6
- Rapid Shallow Breathing Index (RSBI) 964–5
- RAP index 126, 127
- Rastelli procedure 641, 642
- Ravitch procedure, pectus excavatum 583
- read-backs 1283, 1285
- reasonable person standard 4
- records
anesthesia *see* anesthesia information management systems
paper vs. electronic 1258, 1258–61, 1259–60
see also electronic health records; electronic medical records
- recovery from anesthesia 354–7
complications 356–7
extramural procedures 936–7
- fast-tracking 891, 892
outpatient surgery 890–2
premature infants 492–3
scoring systems 890, 890, 891
see also postanesthesia care unit
- recovery position
postanesthesia 367–8
transport to PACU 357–8, 363, 363
- rectal induction of anesthesia 347
- rectus sheath block 438–9, 441
- recurrent laryngeal nerve paralysis 788
- red blood cell count (RBC) 1312
- red blood cells (RBC)
intraoperative salvage 252, 668–9
packed *see* packed red blood cells
storage lesions 251
- red cell distribution width 1312
- reflex sympathetic dystrophy 868–9
- refusal, informed 4
- regional anesthesia 419–42, 858–62
advantages 424
cancer pain 865–6
case study 442
choice of procedure 424–5, 425
complications 439–41
continuous 436
contraindications 426–7
developing countries 1148
disadvantages 424
ex-premature infants 335
fetal interventions/surgery 468
with general anesthesia 426
hand surgery 763, 763
- inguinal hernia repair 502–3, 503
- local anesthetics and toxicity 420–4
- lung transplantation 711
- nerve stimulators 426, 427
- outpatient surgery 886–7
- outside the operating room 941
- patient-controlled 436
- patient monitoring 426
- post-thoracotomy pain 574–5
- skin preparation 426
- spinal surgery 674–5
- sympathetic blockade 426
- test dose 426
- thermoregulatory effects 1162
- ultrasound guidance 427, 428, 441, 441
without general anesthesia 425–6
- regional low flow perfusion (RLFP) 613
- regurgitant cardiac lesions 589
- rejection *see* graft rejection
- remifentanil 187–8
cerebral effects 542
congenital heart disease 607
dosing 1294
maintenance phase of anesthesia 352
- pharmacodynamics 187
- pharmacokinetics 186, 187–8, 189
- spinal surgery 672–3
- remote ischemic preconditioning (RIPC) 93
- renal agenesis 161
- renal arteries 160
- renal blood flow 164
acute kidney injury 165
- renal cysts 166
- renal disease 164–7
acute renal failure 979
end-stage *see* end-stage renal disease
- preoperative evaluation 331
see also chronic kidney disease
- renal dysplasia 161, 744
- renal failure
acute *see* acute kidney injury
chronic *see* chronic kidney disease
end-stage liver disease 685
- established (ERF) 166, 166
- gadolinium-based contrast agents 928
- morphine clearance 188
- organ transplant recipients 717, 717
- pathophysiology 694
- radiocontrast media 943
- renal function 161–4
burn injuries 899, 901
- newborn 208–9
- posterior urethral valves 744, 745
- renal-pancreatic transplantation 715–16
- renal replacement therapy (RRT) 750–4
see also continuous renal replacement therapy; dialysis
- renal system 159–67
developmental pathophysiology 164–7
developmental physiology 161–4, 208–10
embryology and development 159, 159–61, 160, 740–1
- PICU 978–81
- preoperative assessment 277
- renal transplantation 693–7
- anesthetic management 695–7
- complications 717, 718
- graft survival rates 694
- indications 693
- pathophysiology 694
- preoperative evaluation and care 694–5
- surgical technique 695
- renal tubular function 162, 162–4, 208–9
- renal veins 160
- renin 164, 209
newborn 210
- renin-angiotensin-aldosterone system
newborn 209–10
- vasomotor control 90
- Reoplex tube 507
- reproductive system
congenital anomalies 741
development 741
preoperative assessment 277
- reptilase 232
- rescue breathing, CPR 260
- research
benefits 52–3
coercion and undue inducements 53
ethics 9–10, 49–53
federal classification 9, 9–10, 51
federal regulations 50
funding 46–7
greater than minimal risk 9, 9–10, 51, 52
levels of acceptable risk 9–10, 52
minimal risk *see* minimal-risk research
outcomes and effectiveness 1252–5
pediatric anesthesia, history 20–5
question, defining 42
use of simulation 1222–4
using databases 1242–9, 1252–5
using electronic anesthesia records 1249–50, 1276–8
- see also* clinical trials
- respiration
insensible water loss 963
- monitoring 401–6, 405
- PICU 960–71
- see also* breathing; ventilation
- respiratory care, PICU patients 962–4
- respiratory compliance, total 963
- respiratory complications, perioperative
cardiac arrest 1154–5, 1155, 1155
- cigarette smokers 522
- closed claims analysis 1243
- PACU 367–70
- regional blocks 440
- risk factors 274
- scoliosis surgery 663
- upper respiratory infections and 778–9
see also airway complications
- respiratory depression, opioid-induced 187, 189
- respiratory disease
pathophysiology 106–15
- PICU 965–71
- preoperative assessment 306, 331
- preterm infants 477–9
- see also* pulmonary disease

respiratory distress
congenital diaphragmatic hernia 511, 512
postextubation stridor 368
signs 960
supraglottitis 790
see also acute respiratory distress syndrome
respiratory distress syndrome (RDS), neonatal
476, 477–8
bronchopulmonary dysplasia 108, 478
history of care 20
management 477–8
preoperative evaluation 484, 486
respiratory disturbance index (RDI) 782
respiratory failure, extracorporeal life support
972–3
respiratory function
assessment, PICU 960–2
end-stage liver disease 683, 684
laparoscopic surgery 737
osteogenesis imperfecta 767
pregnancy-related changes 460–1
scoliosis 662–3
respiratory rate 105, 106, 963
premature infants 484
respiratory syncytial virus (RSV) infection 106
respiratory system 95–116
benzodiazepine actions 180–1
burn injuries 899, 901
developmental pathophysiology 106–15
developmental physiology 99–106
embryology and development 95–8
etomidate actions 184–5
ketamine actions 185–6
premature infants 484–5, 486
preoperative assessment 276, 277
propofol actions 183
thiopental actions 182
volatile agent effects 179
respiratory tract endoscopy 790–2
respiratory tract infections
inciting/exacerbating asthma 106
lung transplant recipients 714
see also upper respiratory tract infections
resting energy expenditure (REE) 987
restrictive cardiomyopathy 698
resuscitation
burn patients 900–3
cardiopulmonary *see* cardiopulmonary resuscitation
cerebral 566
do-not-resuscitate orders 6–8
extramural locations 937–8
fetal 468–9, 470
neonatal *see* neonatal resuscitation
resuscitation cart, PACU 362, 362
reticulocyte count 1312
retinoblastoma 805
retinopathy of prematurity (ROP) 482–3
anesthesia management 483, 806
eye surgery 805–6
residual problems 499–500
stages 482
RET proto-oncogene 155, 728
retrogressive differentiation 118, 119
Rett syndrome 1102–3
rhabdomyolysis (RHA) 771, 772, 1168
Rhesus (Rh) blood group 239–40
transfusion compatibility 240
transfusion-related alloantibodies 250
typing 243
Rhesus (Rh) incompatibility 240, 444
rheumatic heart disease 1146
rheumatoid arthritis, juvenile (JRA) 773
rheumatoid disease 320
rhinitis, allergic 777
rhinosinusitis, chronic, cystic fibrosis 526
rhombencephalon 118, 119, 119
rib fractures 912
right atrial pressure
measurement 393
waveforms 396–7

right atrium
catheter-induced perforation 399
central venous catheter position 387, 398–9
right-to-left (R-L) shunts 589
arterial desaturation 595–6, 596
delayed induction 604–5, 605
quantification 598–600
transitional neonatal circulation 594, 595
right ventricle (RV), hypoplastic, pulmonary atresia 637–8
right ventricle-to-pulmonary artery (RV-to-PA) shunt 648, 649
right ventricular (RV) function/dysfunction
after tetralogy of Fallot surgery 635, 636, 636
balloon dilation of pulmonary arteries 619
congenital heart surgery 609–10
liver graft reperfusion 690
right ventricular (RV) outflow obstruction, after tetralogy of Fallot repair 636
right ventricular outflow tract (RVOT) reconstruction
anesthetic management after 636, 636–7, 638
pulmonary atresia 637–8
tetralogy of Fallot 634–5
right ventricular stroke work index (RWSWI) 391
rigidity, malignant hyperthermia 1166
Riley-Day syndrome 1032–5
Ring-Adair-Elwyn (RAE) tracheal tubes 314, 783–4, 799
risk adjustment 1241–2
risk assessment, pediatric research 9–10
risk-taking behavior 520–1
Robin sequence *see* Pierre-Robin sequence
robotic surgery, thorax 576
Robson, Charles 17, 17
rocuronium 194–6
cerebral effects 543
dosing 196, 1294
liver transplantation 687
pharmacodynamics 195–6
pharmacokinetics 193, 195
premature infants 489
rapid-sequence induction 337
trauma 910
rofecoxib 851
Romano-Ward syndrome 1062–3
ropivacaaine 198
caudal block 428
developmental pharmacology 858–9
dosing 1296
epidural analgesia 862, 863
inguinal hernia repair 503
metabolism 172, 172, 199
pharmacodynamics 201, 422, 422
pharmacokinetics 198, 199, 199, 200, 421
regional anesthesia 420–1
stereo-specificity 201
toxicity 202, 424
rosiglitazone 48
rotational thromboelastography (ROTEM) 232, 234
Roux-en-Y gastric bypass 536, 536, 537–8
Rubinstein-Taybi syndrome 1102–5
Russell-Silver syndrome 1104–5
ryanodine receptors 84–5, 85, 1165, 1166
sacroccygeal teratoma (SCT), fetal surgery 456
Saethre–Chotzen syndrome 814, 817, 818
safety 1284–91
benefits of electronic records 1261, 1290
checklists 1286–7
ethical obligations 11
hand-offs 1284–6
medication 1287–9
systems, operating room 1289–91
sagittal synostosis (scaphocephaly) 815, 815
intracranial hypertension 823, 823
salbutamol *see* albuterol
saline
hypertonic *see* hypertonic saline
normal (0.9% NaCl) 353
salmeterol, cystic fibrosis 525
SALTED mnemonic 338
SAMBA Clinical Outcomes Registry (SCOR) 1248
sample size 45
Sanders device, jet ventilation 791–2
Sano (RV-to-PA) shunt 648, 649
saphenous vein cannulation 382
sarcoplasmic reticulum (SR), cardiac myocytes 84, 86
calcium release 84–5
calcium reuptake and sequestration 85–6
immature heart 87
sarcoplasmic reticulum calcium-ATPase (SERCA) 85, 85
SBAR communication 1283
hand-offs 1285, 1285
S-Caine patch 859
scaling factors 168–9, 169
scaphocephaly (sagittal synostosis) 815, 815, 816
intracranial hypertension 823, 823
scavenging systems, extramural locations 934
Scheuermann kyphosis 655
Schilder disease 1004–5
schizencephaly 120
Schmid-Fraccaro syndrome 1014–15
Schmorl nodes 655
Schwartz formula, GFR estimation 162
Schwartz–Jampel syndrome 1106–9
sciatic nerve block 435–6
ultrasound guidance 436, 436, 441
Scirus 1277
sclerotherapy, vascular malformations 928, 929, 929
scoliosis 583, 655, 657–60
anterior surgery 658, 659
case study 675–6
Cobb angle determination 657, 658
etiologies 655, 657
induction of anesthesia 665
posterior surgery 658, 659–60, 660
preoperative evaluation 661–4
surgical decision making 657–9
video-assisted thoracoscopic surgery 659
scopolamine 801
dosing 1294
postoperative behavior changes 1206
trauma 916
search strategies, online literature 1277
secondary survey, trauma patients 909
security, data 1271–2, 1272
sedation
burn wound procedures 908
cancer-related procedures 864–5
cardiac catheterization 615
deep 936
dental procedures 806–7
depth continuum 933, 934–5, 936
depth monitoring 137
difficult airway intubation 321
endomyocardial biopsy 703–4
fiber-optic laryngoscopy and bronchoscopy 791
minimal 936
moderate (conscious) 807, 936
open globe eye injuries 804
opioid-induced 858, 858
outside the operating room *see* outside-the-operating room procedures
preoperative *see* premedication
red flags 936, 937
terminal cancer 866
see also anxiolysis
sedative agents
dosing 1294
tolerance to, ex-premature infants 500
SEDLine™ monitor 136
segmental vertebral arteries 656

- seizures
 cerebral malaria 1147
 local anesthetic-induced 374, 440
 neurosurgical treatment 560–2
 perioperative EEG monitoring 135
 post CPR 266
 postoperative 374
 ICU management 977
 neurosurgical patients 552, 553
 preoperative evaluation 280–1
 sevoflurane-induced 177
 status epilepticus 977–8
see also epilepsy
- Seldinger technique
 cricothyroidotomy 327
 percutaneous vascular access 384
- selective fetoscopic laser photocoagulation (SFLP) 452–3, 453
- selective serotonin reuptake inhibitors (SSRIs),
 neuropathic pain 868
- semi-lunar valves
 defects in development 76–7
 development 72
- Senning procedure 639, 641
- sensory responses, changes in ex-premature infants 500
- sentinel events 1284
- separation, parent-child 343
- sepsis
 catheter-related 400
 cholestasis 145
 oncology patients 981
 premature infants 479–80
 transfusion-associated 250
see also infections
- septic arthritis 764–6
- septic shock 956
 case study 990–1
 definitions 957, 957
 extracorporeal life support 973
 therapy and outcomes 956–8, 958
- septum primum 61, 64
- septum secundum 61, 64
- septum spurium 71
- serious adverse events (SAEs), clinical trials 57
- Serious Complication Repository Project (SCORE) 1248–9
- serotonin (5HT3) antagonists
 prophylactic 377–8, 888
see also ondansetron
- sevoflurane 174–7, 175, 1297
 cardiovascular effects 179
 case study 203
 central nervous system effects 177, 541
 congenital heart disease 605–6
 context-sensitive half-times 176, 177
 emergence agitation 372–3
 extramural procedures 940
 extremely premature infants 493
 hepatic metabolism 172
 induction of anesthesia 345–6
 laryngeal mask insertion 311
 MAC vs. age 352
 maintenance of anesthesia 350–1
 mode of action 175
 myocardial preconditioning 93
 neurotoxicity 1194, 1196, 1198, 1198
 outpatient anesthesia 883–4
 pharmacodynamics 176–7, 178
 pharmacokinetics 175–6
 postoperative behavior changes 1205–6
 premature infants 490
 renal transplantation 696
 respiratory system effects 179
 sex chromosome anomalies 741
 sexual differentiation 741
 SGLT-1 154–5
 shared mental model concept 1224–5
 shellfish allergy 943
 Shikani Optical Stylet (SOS) 325
 shivering 1158
- anesthetized patients 1161
 non-thermoregulatory 1162
 postoperative 1162
 thermoregulatory 1162
 treatment of unwanted 1162
- shock 955–8
 classification 955–6
 compensatory mechanisms 956
 definitions 957
 diagnosis 956
 etiologies 959
 therapy and outcomes 956–8, 958
- short-gut syndrome, bowel transplants 715
- shoulder roll, during laryngoscopy 312, 338
- SHP-2 phosphatase 999
- shunts
 intracardiac 589–92
 anatomical 589
 arterial desaturation 595–7, 596, 596
 complex 590–2, 592, 592
 delayed induction 604–5, 605
 determinants 590, 590
 localization 598
 manipulation 592–4
 outflow resistance *see* outflow resistance, intracardiac shunts
 physiological 589
 quantification 598–600
 simple 590, 591, 591
 transitional neonatal circulation 594, 595
see also left-to-right shunts; right-to-left shunts
- intrapulmonary 598
 orifice size 590, 590
 complex shunts 591–2, 592
 simple shunts 590, 591, 591
- surgical
 congenital heart disease 622–4
 cystic fibrosis liver disease 526, 527
 fetus 456, 457–8
 hydrocephalus 550–1, 828
see also specific shunts and procedures
- SIADH *see* syndrome of inappropriate secretion of antidiuretic hormone
- sickle cell crises 238, 335, 983
- sickle cell disease (SCD) 237–9, 1108–11
 adenotonsillectomy 783
 adolescents and young adults 529–31
 complications 238, 530, 983–4
 pathophysiology 237, 531
 perioperative management 238–9, 530–1, 532
 PICU setting 983–4
 preoperative assessment 277, 278, 335–6
 priapism 238, 755, 866
 radiocontrast media 943
 treatment 530
 vaso-occlusive crises *see* vaso-occlusive crises, sickle cell
- sickle cell trait (SCT) 237, 335, 529
- sickledex test 335
- sick sinus syndrome 954
- Siemerling-Creutzfeldt disease 1004–5
- sigmoid sinus 128
- sildenafil 1295
- silk glove sign 731
- Silver-Russell dwarfism 1104–5
- SimBaby, Laerdal 1228
- SimNewB, Laerdal 1228
- Sim One Anesthesiological Simulator 1220
 simulation 33–4, 1219–38
 applications 1221–5, 1280–1
 computer-based systems 1226–7
 CPR 268–9
 effectiveness 1222, 1224
 high-fidelity patient *see* high-fidelity patient simulation
 history of development 1220–1
 hybrid 1229
 in situ 1231–3, 1233
 part task trainers 1226, 1226
 pediatric anesthesia 1233–8
- applications 1233
 centers and activities 1233–4
 creating scenarios 1237, 1238
 equipment 1228, 1236, 1236–8
 scenario topics 1234
 specialized nature 1234–6
 types 1226–9
- simulation centers 1231, 1231
- pediatric anesthesia 1233–4
- single photon emission computed tomography (SPECT) 930
- single-ventricle heart/physiology 624–33
 anatomy and surgical procedures 624, 625
 anesthetic management 626–8, 627
 case study 650–2, 651
 heart transplantation 698
 pathophysiology 624–6, 626
 staged repair 628–33
see also Fontan procedure
- sinoatrial node, development 66
- sinus arrhythmia 953
- sinus bradycardia 953–4
- sinusitis, chronic 785–6
- sinus surgery, endoscopic (ESS) 785–6
 cystic fibrosis 526, 786
- sinus tachycardia 953
- sinus venarum 65, 66
- sinus venosus 63–6, 141
 defects in development 76
 development 63, 65, 67
 fate 63–5, 65
- sirolimus 680, 681, 682
 reference range 1313
- sitosterolemia 144
- situation awareness 1223, 1282, 1282
- situation monitoring 1282, 1282
- skeletal muscle toxicity, local anesthetics 424
- skin blood flow, temperature control 1158
- skin grafts, burn wounds 904, 905
- skin preparation, regional anesthesia 426
- skin temperature 406, 1163
- skin testing, allergies 1179–80, 1181
- skull
 anatomy 302
 congenital abnormalities 549
 development 811
 fractures 557, 557
 radiographs 544
- SLC transporters 169
- sleep
 fetal 466
 polysomnography 782, 782
- sleep-disordered breathing 781
- neurodevelopmental sequelae 1215
see also obstructive sleep apnea
- slipped capital femoral epiphysis (SCFE) 761–2
- small bowel
 atresias, stenoses and webs 153, 154
 development 151–2
 motor function 156
 obstruction 722
 transplantation 715, 718
- SmartTots collaboration 1216
- Smith, Robert M. 18, 18, 19
- Smith–Lemli–Opitz syndrome 1110–13
- smoke inhalation 896, 899
 airway management 902
- smoking, cigarette 522
- sniffing position 312
- snoring 781
- Snow, John 15–16, 16
- social workers, ICU 948
- Society for Ambulatory Anesthesia (SAMBA) 1248
- Society for Obstetric Anesthesia and Perinatology (SOAP) 1248–9
- Society for Pediatric Anesthesia (SPA) 25, 30
- Wake Up Safe initiative 1245–8
- Society for Thoracic Surgeons (STS), Congenital Database 1245, 1246–8

sodium
 disturbances, ICU patients 979–80
 fluid compartments 206, 206
 fractional excretion (FE_{Na}) 162
 maintenance requirements 217
 perioperative management, newborn 213
 physiology 218
 reference ranges 1313
 renal handling 162, 162–3, 209
 serum, premature infants 481–2, 488
see also hypernatremia; hyponatremia
 sodium amobarbital, intravenous 932
 sodium bicarbonate
 asphyxiated premature infants 476
 cardiac arrest 263–4, 265
 dosing 1297
 hyperkalemia 979
 liver transplantation 692
 as local anesthetic adjuvant 423
 neonatal resuscitation 516
see also bicarbonate
 sodium–calcium (NaO-Ca^{2+}) exchanger 84
 sodium channels
 epithelial (ENaC) 99
 local anesthetic actions 200
 sodium citrate 1297
 sodium co-transporter for glucose and galactose (SGLT-1) 154, 155
 sodium nitroprusside *see* nitroprusside
 sodium-potassium pump *see* Na^+-K^+ -ATPase pump
 solute carrier (SLC) transporters 169
 somatosensory evoked potentials (SSEPs)
 development 125
 perioperative monitoring 137, 137
 spinal surgery 556–7, 672
 somatostatin 123, 124
 sonic hedgehog gene 811
 Sonoclot® 232, 234
 sore throat, postoperative 310
 soy allergy 332, 346
 spica casts 759–60, 760, 764
 spina bifida, open *see* myelomeningocele
 spinal anesthesia 430–1
 adjuvants 423
 agents and doses 430–1
 cancer pain 865–6
 complications 439–40
 developmental physiology 420
 ex-premature and term neonates 502–3, 503
 outside the operating room 941
 perioperative cardiac arrest 1242–3
 procedure 430
 total, inadvertent 440
 trends in use 424–5, 425
 ultrasound guidance 431
 spinal cord
 embryology and development 119, 119, 420, 655–6
 injury 559, 912, 916
 ischemia, coarctation repair 646–7
 malformations 120
 meninges 420, 656
 monitoring, intraoperative 556–7, 671–2
 pain pathways
 development 122–4
 modulatory influences 122, 123
 myelination 123–4
 neurotransmitters 123, 124
 surgery 556, 556–7
 vascular anatomy 128–9, 129, 656
 spinal muscular atrophy (SMA)
 type I and II 1112–15
 type III 1114–15
 spinal nerves 655–6
 spinal surgery 654–77
 case study 675–6
 induction of anesthesia 666
 intraoperative anesthetic care 672–3
 one-lung ventilation 659, 666–7
 patient positioning 659, 660, 660, 665–6

postoperative care and analgesia 673–5, 851
 postoperative visual loss 666
 premedication 664
 preoperative evaluation and care 660–4
 procedures 657–60
 reducing need for transfusion 663–4, 667–71
 spinal cord monitoring 671–2
 temperature control 664–5
 spine
 deformities 655
 developmental and gross anatomy 420, 655–7
 preoperative examination 276
 sphenopore 525
 splanchnic plexus 69, 70
 spondylolisthesis 870
 spondylosis 657, 869–70
 sports injuries 28
SRY gene 741
 staffing
 pediatric intensive care unit 947
 plans, electronic support 1275
 postanesthesia care unit 362–3
Staphylococcus aureus, septic arthritis 765
 Starling equation 206–7
 state ambulatory surgery database (SASD) 1253–4
 state emergency department databases (SEDD) 1253
 state inpatient databases (SID) 1253
 status asthmaticus 966–8
 status epilepticus (SE) 977–8
 Steinert disease 1076–9
 STEP mnemonic 1282, 1282
 stereo-specificity, local anesthetics 201
 stereotactic neurosurgery 560
 stereotactic radiosurgery 931
 sternal closure
 after cardiac surgery 614–15
 after heart transplantation 702
 steroids *see* corticosteroids
 stethoscope 401
 Steward Postanesthetic Recovery Score 890, 891
 Stickler syndrome 1114–17
 Still disease 773
 stomach
 breast milk digestion 158
 development 150–1
 full 336–8
 motor function 156
 pH 158, 169
 stomatitis, gangrenous 320
 storage areas, extramural locations 934
 Storz video laryngoscope (SVL) 325
 strabismus surgery 801–2
 case study 808–9
Streptococcus pneumoniae meningitis 978
 stress, preoperative *see* anxiety, preoperative
 stress hyperglycemia 985–6
 stress responses
 cardiopulmonary bypass 611, 611
 congenital heart surgery 604, 607
 fetal 463, 464, 465–6
 neonates 1184–5
 stridor 787–9
 anesthesia for patients with 788
 during laryngospasm 348
 expiratory 787
 inspiratory 787
 postextubation 317, 356–7, 368, 788–9
 stroke
 after Fontan procedure 632–3
 sickle cell disease 238, 984
 stroke volume, arterial pressure waveforms and 395
 stroke volume index (SVI) 391
 student-teacher relationships 32
 Studies in Pediatric Liver Transplantation (SPLIT) group 693
 Sturge–Weber syndrome 1116–19
 stylets, optical 325–6
 subarachnoid hemorrhage (SAH) 563, 564
 subarachnoid space 656
 subcardinal veins 66, 68
 subclavian artery, development 74, 75
 subclavian perivascular brachial plexus block 432
 subclavian vein
 catheterization 385–6
 development 68
 subdural hematoma 558, 558
 subdural space 656
 subglottic stenosis 498, 798–800
 anterior cricoid split 799, 799
 laryngeal reconstruction 799–800, 800
 submucosal glands, airway 100
 subspecialty status, pediatric anesthesiology 25
 subspecialty training *see* fellowship training
 substance abuse 332, 521
 substance P 123, 124
 succinylcholine (SCh) 193–4
 burn patients 907
 cerebral effects 194, 543
 cerebral palsy 770
 dosing 194, 196, 1294
 fetal uptake 463
 induced cardiac arrest 772, 772
 intraocular pressure effects 803–4
 laryngospasm management 317, 349, 368, 786–7
 local anesthetic-induced convulsions 440
 neuroanesthesia 545
 neuromuscular diseases 771, 772
 pharmacokinetics 193, 193–4
 rapid-sequence induction 337
 renal transplantation 695–6
 side-effects 194
 spinal surgery 665
 sucking period 157–8
 sucrase/isomaltase 153–4
 suction, wall 339–40
 sudden, unexpected cardiac death 269
 sudden death, after tetralogy of Fallot repair 636
 sudden infant death syndrome (SIDS) 305
 sufentanil
 case study 203
 congenital heart disease 606–7
 dosing 1294
 epidural 423
 as epidural block adjuvant 202
 intranasal, premedication 344
 metabolism 172
 pharmacokinetics 183, 187, 189
 sugammadex 193, 197
 dosing 1294
 sulfonamides, metabolism 173
 sulfotransferase (SulfoT) 173
 superior cardinal veins 66
 superiority designs, outcomes research 1254–5
 superior mesenteric artery 141, 151
 superior sagittal sinus 128
 superior vena cava (SVC)
 catheters 383
 ascertaining correct position 386–8
 insertion techniques 383–6, 385
 malposition 398–9
 peripherally inserted 388
 development 66, 67
 developmental anomalies 78
 persistent left 383
 thrombosis 398
 supine hypotension, pregnancy 460
 supracardinal veins 66, 68
 supraclavicular brachial plexus block 432, 432–3
 ultrasound guidance 441
 supracondylar femoral fractures 764
 supraglottic airway devices 310–11
 supraglottitis (epiglottitis) 789–90
 airway management 320, 789–90
 clinical features 789, 789, 790
 supratentorial brain tumors 551–2

- supraventricular tachycardia (SVT) 954
 surfactant, pulmonary 101–2
 disorders of metabolism 707, 708
 phospholipids 101–2
 synthesis 101–2
 therapy 113, 477–8
 ALI/ARDS 971
 congenital diaphragmatic hernia 511
 surfactant proteins (SP-A, -B, -C and -D) 102
 surgery
 pediatric, historical aspects 16, 18
 previous history 275
 surgical airway, emergency techniques 327, 911
 surgical safety checklists 1286–7, 1287, 1288
 surgical site infections (SSIs), after spinal surgery 673
 surrogate endpoints 44–5
 suxamethonium *see* succinylcholine
 SVR *see* systemic vascular resistance
 swallowing, development 155–6
 Swiss cheese defects 76
 symbrachydactyly 762
 sympathetic blockade, central neuraxial blocks 426
 sympathetic nervous system
 neonatal heart innervation 80
 regulation of vascular tone 89–90
 shock 956
 synaptogenesis 120–1, 121
 synchondroses 811
 syndactyly 762
 syndrome of inappropriate secretion of antidiuretic hormone (SIADH) 209
 ICU patients 977
 neurosurgical patients 544, 551–2
 Synera® 346, 859
 syphilis, transfusion-transmitted 248
 systemic blood flow (Qs)
 determination 598–9
 effective ($Q_{s,eff}$) 600
 hypoplastic left heart syndrome 648
 normal child 599
 systemic circulation
 regulation of vascular tone 89–91
 transition from fetal to mature 79, 103
 systemic inflammatory response syndrome (SIRS) 958–9, 959
 case study 990–1
 systemic intravascular coagulation (SIC) 929
 systemic-to-pulmonary collateral vessels, pulmonary atresia 637, 638
 systemic vascular resistance (SVR)
 arterial pressure waveforms and 395, 396
 congenital heart disease
 complex shunts 591–2, 592
 manipulation 593–4
 simple shunts 590, 591
 neonatal transition 103
 systemic vascular resistance index (SVRI) 391
 systemic vasoconstrictive response, maintaining cerebral perfusion 130
 Systemized Nomenclature of Human and Veterinary Medicine (SNOMED) 1266
 systems evaluation, use of simulation 1225, 1226
 systems review, preoperative 276, 277, 331
 $T_{1/2}$ *see* half-life
 $T_{1/2}keo$ *see* equilibration half-time
 T_4/T_1 ratio 192, 193
 T&A (tonsillectomy and adenoidectomy) *see* adenotonsillectomy
 tachycardia
 malignant hyperthermia 1166
 postoperative 371
 sinus, ICU patients 953
 supraventricular (SVT) 954
 ventricular *see* ventricular tachycardia wide complex 954
 tachypnea
 malignant hyperthermia 1166
 thermal 1159
 tacrolimus 680, 681, 682
 inflammatory bowel disease 725
 nephrotoxicity 682, 717
 transplant recipients 680, 681, 682
 talc pleurodesis, cystic fibrosis 526
 talipes equinovarus, congenital 757–8, 758
 arthrogryposis 768
 Tarui disease 1044–5
 task assistance 1282
 task trainers 1226, 1226
 taurine 164
 Tax Relief and Health Care Act 2006 1240
 T-cells, gastrointestinal tract 157
 teachers, clinical 31–3, 32
 teaching, pediatric anesthesiology 31–4
 evaluating quality 34
 historical aspects 24–5
 methods 32–4
 simulation-based 33–4
 see also pediatric anesthesiology education
 teaching goals 31
 TeamSTEPPS® 1281, 1281–4
 communication 1283–4
 leadership 1281–2
 mutual support 1282–3
 situation monitoring 1282
 team training
 aviation 1220
 medical 1280, 1280–4
 use of simulation 1224–5, 1280–1
 teamwork 1279–86
 barriers to effective 1284
 defined 1279
 key skills 1223
 see also hand-offs
 teenagers *see* adolescents
 teeth
 primary (deciduous) 303, 303
 removal of loose 306
 secondary (permanent) 303, 303
 telencephalon 119, 119
 temperature
 core 406, 1156, 1163
 environmental
 during surgery 341, 488, 500–1
 insensible water loss and 207–8
 management 1156–64
 burn patients 906
 craniofacial surgery 836
 intracranial hypertension 976
 intraoperative 19, 341–2
 liver transplantation 687, 692–3
 MRI suite 927, 942
 neonatal resuscitation 515
 neonates 215, 500–1
 neurosurgical patients 548
 postoperative 371
 postresuscitation 264
 premature infants 488, 489, 489, 491
 spinal surgery 664–5
 trauma 916
 monitoring 342, 406, 1162–3
 during MRI 925
 neurosurgical patients 548
 PACU 371
 sites 406, 1163, 1163
 physiological control *see* thermoregulation
 skin 406, 1163
 see also heat loss; hyperthermia; hypothermia; warming
 temporal artery catheters 391
 temporomandibular joint (TMJ) reconstruction 830
 tentorium 127
 teratogenicity, anesthetic agents 462
 terbutaline 966, 967
 terminal care *see* end-of-life care
 testes
 development 741
 undescended (cryptorchidism) 746, 749
 testicular torsion 746–7
 tetanic stimulation 192
 tetracaine 420
 dosing 1296
 inguinal hernia repair 503, 503
 spinal blocks 430, 431
 tetralogy of Fallot 633–7
 anesthesia for surgically repaired 636–7
 anesthetic management of surgery for 635
 β -adrenergic receptor signaling 92–3
 developmental basis 77
 intracardiac shunting 591–2, 633, 633
 manipulation 593
 pathophysiology 633, 634
 with pulmonary atresia 637
 surgical options 633–5
 textbooks 24, 33
 thalamus
 temperature 1163
 thermoregulatory function 1156–7, 1157
 THAM 264, 1297
 thanatophoric dysplasia, genetics 814
 theophylline 112, 967
 therapeutic misconception 58
 thermal environment, neutral 207–8
 thermodilution method, cardiac output measurement 397, 949–50
 thermogenesis
 non-shivering 1158–9, 1161
 shivering *see* shivering
 thermoregulation 1156–9
 autonomic 1158
 behavioral mechanisms 1158
 effects of anesthetics 1156, 1160–2
 effects of regional anesthesia 1162
 neural mechanisms 1156–8, 1157
 premature infants 477
 thiopental 181–2
 anaphylactic reactions 1178
 burn patients 907
 central nervous system effects 542
 dosing 182, 1294
 extramural anesthesia/sedation 939
 fetal uptake 463
 induction 346
 rectal route 347
 local anesthetic-induced convulsions 440
 neurotoxicity 1194
 pharmacodynamics 182
 pharmacokinetics 181, 181–2
 postoperative behavior changes 1206, 1207
 renal transplantation 695
 thoracic neoplasms 583
 thoracic surgery 569–86
 analgesic requirements 573–5
 anesthetic requirements 571–3
 case study 586
 lung resection 576–7
 pathophysiology of one-lung ventilation 570
 robotic surgery 576
 specific lesions 577–85, 583
 thoracoscopy 575–6
 video-assisted *see* video-assisted thoracoscopic surgery
 thoracic trauma 912–13, 916
 thoracoabdominal syndrome 1092–3
 thoracoamniotic shunts 456
 thoracoscopy 575–6
 esophageal atresia repair 509, 509–10
 surgical procedures 576
 see also video-assisted thoracoscopic surgery
 thoracostomy tube drainage, empyema 584, 585
 thoracotomy 569
 analgesic requirements 573–5
 anesthetic techniques 573
 empyema 585
 pain after 573–4
 throat packs 786, 808, 840
 thrombin, generation 226, 227
 thrombin-activatable fibrinolysis inhibitor (TAFI) 227

thrombin time (TT) 232, 232
 neonates 212, 229
 point-of-care testing 234
 thrombocytopenia
 burn injuries 900
 during liver transplantation 691
 thrombocytopenia-absent radii (TAR) syndrome 774, 1118–19
 thromboelastography (TEG) 232, 234
 during liver transplantation 690
 reference ranges 1313
 thromboembolism, after Fontan procedure 632–3
 thrombomodulin 227
 thrombophilias 236–7
 acquired 236–7
 inherited 236
 thromboplastin 230–1
 thrombosis
 catheter-associated 237, 398
 diagnosis 237
 risk factors 236–7
 treatment 237
 thromboxane A1, pulmonary vasoconstriction 88
 thumb
 polydactyly 762, 763
 trigger 762
 thyroid dysfunction, Down syndrome 995–6
 thyroid hormone, myocardial effects 87–8
 thyroid-stimulating hormone (TSH) 1313
 thyroxine (T4), reference ranges 1313
 tibia vara
 adolescent 760
 infantile 760–1
 tidal volume 105, 105, 963
 ALI/ARDS 970, 971
 monitoring 405, 405
 Tight-to-Shaft tube (TTS™) 319
 time constant of lung (τ) 98
 timolol 801
 tissue expanders, MRI safety 924, 941–2
 tissue factor (TF) 225–6, 227
 tissue factor pathway inhibitor (TFPI) 226, 227
 tissue oxygenation index (TOI) 409
 tissue plasminogen activator (tPA) 227, 228
 tobacco smoke exposure, asthma and 106, 522
 tobacco use 522
 tocolysis 445, 471
 tongue, anatomy 303
 tongue-lip adhesion (TLA) 825
 tonsillar hypertrophy 781
 lingual 320, 782–3, 783
 tonsillectomy 781
 tonsillectomy and adenoidectomy (T&A) *see* adenotonsillectomy
 tonsillitis 781
 tonsils 303
 topical anesthesia 859
 fiber-optic laryngoscopy and bronchoscopy 791
 intravenous induction 346
 intubation of difficult airway 322
 nasotracheal intubation 313
 topiramate 871
 total anomalous pulmonary venous connection 78, 642
 total body irradiation (TBI) 931
 total body surface area (TBSA), burns
 assessment 897, 897
 total body water 168, 207, 207
 total cavopulmonary connection (TCPC) 628–33
see also Fontan procedure
 total intravenous anesthesia (TIVA) 351–2
 intubation of difficult airway 322
 jet ventilation without endotracheal tube 792
 laser microlaryngeal surgery 797
 outpatient surgery 884
 total lung capacity (TLC) 105, 963
 total respiratory compliance 963
 tourniquets, hand surgery 763

trabeculae carnae 69, 71
 trachea
 epithelial cells 100
 foreign bodies 793
 lengths 304, 304–5
 tracheal extubation
 adenotonsillectomy 784
 cleft palate reconstruction 840–1
 complications 356–7, 367–70
 craniofacial surgery 838–9
 difficult airway 327
 esophageal atresia and tracheo-esophageal fistula 510
 failure 965
 heart transplantation 702
 liver transplantation 687
 neonates and ex-premature infants 501–2
 PICU 965, 965
 pregnant women 461
 renal transplantation 696–7
 timing 355, 367
 tracheal intubation 311–16
 adenotonsillectomy 784
 anatomical aspects 304–5
 anterior mediastinal mass 336
 asthma 967–8
 awake 313, 320–1
 burn patients 900–2, 902
 cardiac arrest 269
 complications 316–17, 798
 craniofacial surgery 835–6, 836
 dental surgery 807
 difficult *see* difficult pediatric airway
 digital 326
 direct laryngoscopy 312, 312
 equipment 338
 esophageal atresia and tracheo-esophageal fistula 508
 failed, surgical airway for 327
 fiberoptic 322–3, 323
 under general anesthesia 321
 heart transplantation 700
 hemodynamic response 312
 history 19
 indications 311
 indirect methods 322–6
 intraocular pressure during 803
 laryngeal papillomatosis 797
 modified optical laryngoscopes 323–4
 muscle relaxants 196
 nasotracheal route 313–14, 314
 negative pressure pulmonary edema 357, 370
 optical stylets 325–6
 patient positioning 312
 premature infants 489
 rapid sequence *see* rapid-sequence induction
 sedated 321
 spinal surgery 661, 665
 trauma 909–10
 upper respiratory infections and 778
 video laryngoscopes 324–5
 without neuromuscular blockade 313
 tracheal occlusion, congenital diaphragmatic hernia
 fetoscopic 447, 447–8, 448, 448
 open methods 446–7
 tracheal stenosis 583, 798–9
see also subglottic stenosis
 tracheal surgery 798–800
 tracheal tubes *see* endotracheal tubes
 tracheitis 789, 790
 tracheobronchial tree, development 100
 tracheo-esophageal fistula (TEF) 506–10, 583
 classification and variants 506, 506, 507
 conduct of anesthesia 508–10, 509
 developmental aspects 96–7, 150, 151
 diagnosis 506–7
 postoperative care 510
 preoperative evaluation 507–8
 tracheomalacia 498
 tracheoscopy-assisted repair, tracheo-esophageal fistula 509
 tracheostomy 317–19
 craniofacial anomalies 824–5
 craniofacial surgery 836
 insertion 317–18
 pre-existing 318–19
 prone positioning for spinal surgery 661
 subglottic stenosis 799
 tracheostomy tubes 318–19
 MRI safety 924
 traditional healers, practices of 1141, 1145
 training *see* fellowship training; pediatric anesthesiology education
 train-of-four (TOF) stimulation 192–3
 tramadol 190
 metabolism 172, 172
 pharmacokinetics 189, 190
 tranexamic acid (TA; TXA) 253
 craniofacial surgery 838
 dosing 1297
 spinal surgery 669–70
 transcatheter device closure
 complications 618, 619–20
 congenital heart lesions 619–20
 transcranial Doppler ultrasound (TCD) 414–15, 976
 transcutaneous carbon dioxide monitoring (TCOM) 960, 961
 transepidermal water loss *see* insensible water loss
 transesophageal echocardiography (TEE)
 central venous catheter position 387, 387
 heart transplantation 700, 702
 transferrin 1313
 transferrin saturation 1313–14
 transfusion
 associated infectious diseases 246–8, 247
 errors 251
 exchange *see* exchange transfusion
 massive *see* massive transfusion
 transfusion-associated circulatory overload (TACO) 250
 transfusion-associated graft-versus-host disease (TA-GVHD) 249
 transfusion reactions 248–51
 allergic 249
 febrile non-hemolytic (FNHTR) 249
 hemolytic
 immune-mediated 248
 non-immune 250
 immune-mediated 248–50
 non-immune-mediated 250–1
 septic 250
 transfusion-related acute lung injury (TRALI) 249, 982
 transfusion-related immunomodulation (TRIM) 250
 transfusion therapy 239–51
 adverse effects 246, 246–51, 982
 ALI/ARDS 971
 blood products available 240–3
 burn patients 906
 children of Jehovah's Witnesses 5–6, 12–14
 craniofacial surgery 837
 dosing 1298
 extramural locations 938
 ICU patients 981, 981–2
 indications/triggers 244–6
 intraoperative 354
 liver transplantation 690–1
 logistics 243–4
 malaria 1147
 principles 239–40
 reducing need for 251–3
 spinal surgery 663–4, 667–71
 sickle cell disease 238, 530, 984
 trauma 915
 transient tachypnea of the newborn 102

- transitional circulation, neonatal 79, 79, 103–4
 congenital heart disease 594
 intracardiac shunting 594, 595
 transition to adult care 522–3
 transplantation, organ 678–719
 care of donors 679
 complications 716–18
 heart 697–704
 immunosuppression 679–82, 680, 680, 681
 intestinal, multivisceral and pancreatic 715–16
 kidney 693–7
 liver 682–93
 lung 526–7, 704–15
 post-transplant surgery 718
 quality of life 718
 renal 693–7
 transport
 to PACU 357–8, 363
 premature infants 488–9
 to/from ICU 357–8, 492, 989–90
 transporters
 drug uptake 169–70
 hepatic 143, 144
 intestinal 154–5
 renal tubules 162–3, 209
 transposition of great arteries 639–42
 anesthesia after repair 641–2
 arterial switch procedure 639–41
 atrial baffle procedures 639
 developmental basis 77
 pathophysiology 639, 640
 ventricular switch 641
 trans-sinusoidal maxillary distraction (TS-MD) 832, 832
 transverse sinus 128
 transversus abdominis plane (TAP) block 438
 trapezoidocephaly-synostosis syndrome 1006–7
 trauma 908–18
 abdominal 913–14, 916
 airway 910–11
 airway management 909–10, 916
 anesthetic priorities 916
 case study 917–18
 central nervous system *see under* central nervous system
 developing countries 1147
 extremity 914, 916
 eye, open globe 804–5
 initial evaluation 909, 910
 intraoperative management 915–16
 massive transfusion 246
 multiple 914–15, 916
 outcomes 916
 services, organization 908–9
 statistics 27–8, 908
 thoracic 912–13, 916
 vascular access 911
 traumatic brain injury (TBI) 911–12
 airway management 909, 910
 management 911–12, 913, 914
see also head injury
 trazodone-induced priapism 754–5
 Treacher Collins syndrome 819–20, 997, 1118–21
 airway management 320, 324, 825
 anesthetic implications 774
 facial clefts 822
 phenotype 819, 819–20, 820, 997, 998
 Treacle protein 997
Treponema pallidum, transmission via transfusion 247, 248
 tribal customs 1141
 tricuspid atresia 629, 639
 tricuspid valve
 defects in development 76
 development 69, 71
 tricyclic antidepressants, neuropathic pain 868
 trigemino-vagal reflex 801–2
 trigger thumb 762
 triglycerides 1314
 trigonocephaly 815, 816, 816
 intracranial hypertension 823, 823
 tri-iodothyronine (T3)
 dosing 1295
 myocardial effects 87–8
 reference ranges 1313
 tris-hydroxymethyl aminomethane (THAM) 264, 1297
 trisomy 13 1120–3
 trisomy 18 1122–5
 trisomy 21 *see* Down syndrome
 trisomy 22 1014–15
 tromethamine (THAM) 264, 1297
 tropisetron 377, 378, 888
 tropomyosin 87
 troponin 86–7, 87, 1314
 troposmia strategy 345
 truncus arteriosus 645–6
 developmental basis 76–7
 normal development 69–72, 73
 pathophysiology 645
 surgical repair 646
 Truview EVO2 laryngoscope 324
 trypsinase, serum 1179
 T-tubules 84–5, 86, 87
 tuberculosis (TB) 1146
 tuberous sclerosis 166, 1124–7
 tumor lysis syndrome 165
 Turner syndrome 774, 1126–9
 turricephaly 814, 818
 Tuskegee syphilis study 49
 22q11 deletion syndrome *see* velocardiofacial syndrome
 twin reversed arterial perfusion sequence (TRAP) 454, 454
 twin-twin transfusion syndrome (TTTS) 450–4
 complications 452
 fetoscopic cord coagulation 453
 microseptostomy 452
 pathophysiology 450–2, 451
 selective fetoscopic laser photocoagulation (SFLP) 452–3, 453
 serial amnioreduction 452
TWIST gene 813, 814
 two-challenge rule 1282
 tympanic membrane perforation 780
 tympanostomy tubes, insertion 779–80
 type I error 45
 type II error 45
 ulcerative colitis 724–6
 adolescents 533
 management 725–6
 ulnar artery catheters 392
 ulnar nerve 763
 ultrafiltration
 conventional (CUF) 611–12
 dilutional (DUF) 612
 modified (MUF) 611–12
 zero-balance (ZBUF) 612
 ultrasonic cardiac output monitor (USCOM) 950
 ultrasound
 antenatal 444–5
 cystic lung lesions 578
 urinary tract obstruction 456–7
 brain 544
 FAST protocol 914
 guided procedures 930
 brachial plexus block 431, 432, 432–4, 433
 caudal block 428–9
 central venous cannulation 394, 394–5
 epidural block 430
 femoral nerve block 434, 434–5
 fetal surgery 470
 ilio-inguinal iliohypogastric nerve block 437–8, 438
 paravertebral block 439
 penile nerve block 437
 regional anesthesia 427, 428, 441, 441
 sciatic nerve block 436, 436
 spinal block 431
 transversus abdominis plane block 438
 umbilical arteries
 catheters 383, 391
 fate 72
 umbilical block 438–9
 umbilical hernia, congenital 152
 umbilical veins 141
 catheters 382
 insertion 382, 383
 malposition 399
 neonatal resuscitation 515
 development 66, 66, 67, 68
 undue inducements, research participants 53
 unicoronal synostosis 815, 815, 816
 Unique disposable laryngeal mask 310
 United Network for Organ Sharing (UNOS) 679, 699
 univentricular heart/physiology *see* single-ventricle heart/physiology
 Univent tubes 572, 573
 University Hospital Consortium (UHC) database 1244
 University of Michigan Mott Children's Hospital (UMMCH) 1254
 upper respiratory tract infections (URTI; URI) 777–9
 anesthetic management 334
 criteria for canceling surgery 282, 334, 334, 880
 differential diagnosis 282
 laryngomalacia 788
 outpatient anesthesia 880–1
 pathophysiology 778
 preoperative assessment 282–3, 298, 331, 334
 risk factors for adverse events 777–8
 supraglottitis 789
 UpToDate 1277
 urachus 160, 741
 urea, plasma 279
 urea nitrogen, blood (BUN) 978, 1314
 uremic encephalopathy 694
 ureteric bud 159, 159–60, 160
 ureteropelvic junction (UPJ) obstruction 747–8
 ureters, development 159–60, 160, 740
 uric acid 1314
 uric acid nephropathy 165
 uridine diphosphate glucuronosyltransferase (UGT; UDPGT) 145, 173
 uridine glucuronyl transferase 1A (UGT1A) 143
 urinalysis, reference ranges 1314
 urinary retention, postoperative 378
 urinary tract 159–67
 developmental anomalies 161, 740–1
 developmental physiology 161–4
 duplication 161
 embryology and development 159, 159–61, 160, 740–1
 premature infants 487
 urinary tract infections (UTI), ICU patients 989
 urinary tract obstruction
 acute renal failure 979
 fetal 456–8
 fetal interventions 457–8
 oligohydramnios sequence 457, 458
 posterior urethral valves 744–5
 ureteropelvic junction obstruction 747–8
 urine
 color 406
 concentration 163, 209
 fetal production 160–1, 208
 specific gravity 491
 urine output
 acute renal failure 979
 during liver transplantation 689
 monitoring 215, 406
 neonates 213
 preterm infants 491
 urological procedures 740–56
 uterine blood flow (UBF), pregnancy 461
 uterine relaxation, fetal procedures 468, 469–70
 uvulectomy 1141

VACTERL (VATER) association 996, **1128–9**
 anesthetic implications 774
 case study 1002–3
 duodenal atresia 153
 esophageal atresia 506
 vagal nerve stimulators 281
 valdecoxib 851
 validity, clinical trials 43–4
 vancomycin 1296
 vaporizers
 developing countries 1143–5, 1144
 performance in MRI suite 940–1
 vascular access 381–401
 arterial 389–92
 burn patients 906
 complications 398–401
 CPR 262
 Down syndrome 996
 emergency 398
 ex-premature infants 500
 genetic syndromes 994
 heart transplantation 700
 hemodialysis 753, 754
 preoperative site evaluation 276
 renal transplantation 695
 trauma 911, 915
 ultrasound guidance 394, 394–5
 see also venous access
 vascular endothelial growth factor (VEGF) 483
 vascular injuries, regional blocks 439
 vascular malformations
 endovascular therapy 928, 928–9, 930
 see also arteriovenous malformations
 vascular rings, aortic arch anomalies 77, 78
 vascular tone
 neonatal transition 103
 regulation 88–91, 89
 vasculogenesis, pulmonary 98
 vas deferens, congenital absence 525
 vasoactive intestinal polypeptide (VIP) 123, 124
 vasoactive medications
 dosing 1295
 PICU 951–3
 vasoconstriction, peripheral
 effects of anesthetics 1160–1
 temperature control 1158
 vasoconstrictors
 dosing 1295
 topical 313, 786
 vasodilation, peripheral
 end-stage liver disease 684
 temperature control 1158
 vasodilators
 dosing 1295
 postarrest myocardial dysfunction 266
 vaso-occlusive crises, sickle cell 238, 335
 pain management 866
 PICU setting 983–4
 vasopressin (arginine vasopressin; AVP;
 anti-diuretic hormone; ADH)
 intravenous fluid therapy and 219
 newborn 209
 peripheral vasoconstriction 90, 209
 pharmacological use 952
 anaphylactic reactions 1180
 cardiac arrest 263
 diabetes insipidus 553
 dosing 1295
 liver transplantation 689
 renal actions 162, 163, 209
 sodium balance 218
 see also syndrome of inappropriate secretion of
 anti-diuretic hormone
 vasopressors
 cardiac arrest 263
 postarrest myocardial dysfunction 266
 vasospasm, cerebral 564
 VATER association *see* VACTERL association
 VATS *see* video-assisted thoracoscopic surgery
 vecuronium 194–6
 cerebral effects 544

dosing 196, 1294
 fetal procedures 468
 liver transplantation 687
 pharmacodynamics 195–6
 pharmacokinetics 193, 195
 trauma 910
 vein of Galen aneurysms 562, 562
 veins, systemic
 development 66, 66–9, 67, 68
 developmental anomalies 78
 velocardiofacial syndrome (VCFS) 999–1000,
1024–5
 facial features 999
 velopharyngeal insufficiency 833
 velopharyngeal incompetence 833
 venous access 381–9
 cardiopulmonary bypass 612–13
 congenital heart disease 604
 CPR 262
 ex-premature infants 500
 heart transplantation 700
 intravenous induction 346
 liver transplantation 686–7
 neonatal resuscitation 515
 renal transplantation 695
 spinal surgery 665
 trauma 911, 915
 see also central venous access; peripheral
 venous access
 venous sinuses, cerebral 128
 ventilation
 after Fontan procedure 630–1
 burn patients 906–7
 difficult airway management 321–2
 during CPR 260, 261–2
 during one-lung ventilation 570
 facemask *see* facemask ventilation
 failed, surgical airway for 327
 fiberoptic intubation 323
 intraoperative 340
 mechanical *see* mechanical ventilation
 monitoring adequacy 401–6
 neonatal resuscitation 514–15
 non-invasive *see* non-invasive ventilation
 one lung *see* one-lung ventilation
 pregnant women 460, 461
 premature infants 476
 pulmonary vascular resistance control 592–3,
 593
 respiratory distress syndrome 478
 volume and pressure monitoring 405,
 405–6
 see also specific modalities
 ventilation/perfusion (V/Q) matching, one-lung
 ventilation 570
 ventilator-associated pneumonia (VAP) 988
 ventilators
 anesthesia 340
 developing countries 1143
 modes 340, 963–4
 ventral roots (anterior roots) 656
 ventricles
 development 69, 71–2, 73
 septation 69, 72, 73
 septation defects 76
 ventricular assist devices (VADs) 973–4
 ventricular dysfunction
 after tetralogy of Fallot repair 635, 636, 636
 congenital heart disease 602
 ventricular fibrillation (VF) 954
 CPR 268, 269
 donor heart 701
 ventricular septal defects (VSD) 76, 643–4
 after tetralogy of Fallot repair 635
 anesthetic management 643
 pathophysiology 643, 644
 pulmonary atresia with 637, 638
 repaired 643–4
 transcatheter device closure 619–20
 transposition of great arteries 639, 640, 641
 tricuspid atresia with 639

ventricular shunts 550–1, 828
 postoperative management 976
 ventricular switch procedure (Rastelli) 641,
 642
 ventricular tachycardia (VT) 954
 after RV outflow reconstruction 636–7
 pulseless, CPR 268, 269
 verapamil 954, 1296
 vertebrae
 anatomy 656–7
 apical, scoliosis 657, 658
 vertebral arteries 656
 development 75
 vertebral venous plexus 128–9
 vertebrobasilar arteries 127
 vesicoamniotic shunts 457–8
 vesicoureteral reflux (VUR) 747
 Veterans Administration (VA) 1250
 video-assisted thoracoscopic surgery (VATS)
 569, 575–6
 anesthetic techniques 573
 case study 586
 congenital cystic lung lesions 579
 empyema 585
 scoliosis 659
 see also thoracoscopy
 video games 286
 villi, intestinal 149, 150, 153
 viral infections, transplant recipients 714, 716
 viral respiratory tract infections
 inciting/exacerbating asthma 106
 pathophysiology 778
 see also upper respiratory tract infections
 Virtual Anesthesiology Training Simulation
 System 1220–1
 Virtual Pediatric Intensive Care Unit (VPICU)
 1254
 viscoelastic clotting tests 232, 234
 visual analog scale (VAS), assessment of anxiety
 285, 285
 visual evoked potentials (VEP) 125, 137
 visual loss, postoperative (POVL) 666, 1175–6,
 1253
 vital capacity 963
 vitamin A deficiency, cystic fibrosis 524
 vitamin D deficiency, cystic fibrosis 524
 vitamin E
 deficiency, cystic fibrosis 524
 retinopathy of prematurity and 483
 vitamin K
 deficiency, cystic fibrosis 524
 deficiency bleeding (VKDB) 145
 dependent coagulation factors 212, 228
 premature infants 488
 vitelline arteries 72, 140–1
 vitelline veins 66, 66, 67, 68, 141
 vocal cords
 papillomas 796, 796
 paralysis 788
 volatile anesthetic agents *see* halogenated agents;
 inhaled anesthetic agents
 volume-controlled pressure-limited ventilators
 340
 volume-controlled ventilation 963
 asthma 968
 congenital heart surgery 608–9
 volume of distribution 168
 volvulus 153
 vomiting
 during radiation therapy 931
 opioid-induced 857–8, 858
 postoperative *see* postoperative nausea and
 vomiting
 von Gierke disease 1040–1
 von Hippel-Lindau (VHL) gene 728
 von Hippel-Lindau (VHL) syndrome
1128–31
 von Recklinghausen disease 1080–3
 von Willebrand disease (vWD) 234–5
 adenotonsillectomy 783
 screening tests 230

- von Willebrand factor (vWF) 224, 234
 antigen 230, 1314
 assays 230, 234–5
 deficiency/qualitative defects 234
 developmental changes 228, 228
 functional analysis 230
 von Willebrand ristocetin cofactor activity 230, 1314
 VPS, LLC 949
 VSD *see* ventricular septal defects
 V wave 396–7
 Wada testing 929
 Wake Up Safe initiative 1245–8
 wake-up test
 interventional radiology 929
 spinal surgery 556, 671–2
 wall suction 339–40
 MRI suites 934
 war, victims of 1141, 1147
 warmers
 forced air 341–2, 1164
 overhead radiant 208
 warming
 blood products 215, 243
 inspired gases 215, 1164
 intraoperative 1163–4
 intravenous fluids 215, 1163–4
 methods
 neonatal resuscitation 514
 neurosurgical patients 548
 operating room 341–2, 1163–4
 PACU 372
 surface 1164
 water
 excess, hyponatremia 218
 insensible loss *see* insensible water loss
 renal excretion 162, 163
 total body 168, 207, 207
see also fluid(s)
 Waters, Ralph 17, 20
 Waterston shunt 622
 Weaver syndrome 1130–1
 Weber-Cockayne syndrome *see* Cockayne syndrome
 weight *see* bodyweight
 Wenckebach phenomenon 955
 Werdnig–Hoffmann disease 1112–15
 West Nile virus, transmission via transfusion 247–8
 wheezing
 asthma vs 966
 bronchospasm vs 347
 outpatient anesthesia 881
 preoperative evaluation 335, 347
 whey proteins 157–8
 whistling face syndrome 773, 1132–5
 white blood cell count (WBC)
 normal neonates 480, 481
 reference ranges 1314
 septic preterm infants 480
 whole blood (WB) 241
 collection 240–1
 compatibility of recipients 240
 transfusion 243–4, 1298
 Williams syndrome (WS) 998–9, 1134–5
 balloon dilation of pulmonary arteries 619
 facial features 998, 999
 Wilms tumor 748–50
 abdominal mass 729, 748
 associated anomalies 749
 case study 416–17, 418
 embryological origin 161
 staging system 749
 surgical complications 750, 750
 wire-guided endobronchial blockers (WEBs) 572, 572
 Wisconsin laryngoscope blade 338
 Wiskott–Aldrich syndrome 1136–7
 withdrawing mechanical ventilation 9
 Wolffian duct *see* mesonephric duct
 Wolff–Parkinson–White (WPW) syndrome 954
 Wong–Baker pain scale 846, 848
 World Federation of Societies of Anaesthesiologists (WFSA) 1140, 1142
 World Health Organization (WHO) 50, 1150
 Surgical Safety Checklist 1286, 1287
 wound dressing changes, burns 904
 wound infections, diabetes 221
 wrong patient, electronic records 1276
 wrong side/site procedures 1245–8
 xenon (Xe) 174, 175
 neuroprotective effects 1216
 neurotoxicity 1194, 1196, 1198
 Yale Preoperative Anxiety Scale 284
 modified 284, 284
 Yankauer suction 339–40
 yawning 1159
 yolk sac 149, 151–2
 young adults 520–38
 alcohol and drug misuse 521
 chronic diseases 522–34
 cigarette smoking 522
 pregnancy 522
 transition to adult care 522–3
see also adolescents
 Yount procedure 768
 Zellweger syndrome 1138–9

