

INDEX

A

Absorption, 216
 Accreditation Commission for Health Care, standards, 17
 Accrediting Agencies for Healthcare Organizations, standards, 9
 Accuracy, 366–367
 ACS, 396–397
 Adsorption, 216
 Adverse drug events, 1–6
 clinical, 3–4
 immediate use compounding and, 37
 Air monitoring, 276
 Air particulate counters, 123
 Air sampling, 433
 action levels, documentation, data evaluation for, 434
 devices for, 433
 nonviable, 429–430
 viable, 430
 Airflow
 loading, compounding areas, 398
 unidirectional, 133–134
 Aldesleukin, 216
 Allergen extracts, 338
 personnel cleansing, garbing for, 156
 Allergen immunotherapy, 44, 46
 Alternate site care settings, 220
 Aluminum, 61
 contamination, FDA mandate and, 97, 100
 content of infant vaccines and, 92–94
 load calculation for, 101
 toxicity of, 90–91
 Ambient light protection, 100–101
 Ambulatory care pharmacies, 10
 Ambulatory infusion center, 17
 Ambulatory infusion devices, reservoirs, multiday, 222
 American Academy of Allergy, Asthma, and Immunology, 46
 American Academy of Otolaryngic Allergy, 46
 American Academy of Pediatrics
 decision support and, 105
 excipients and, 87
 American Nurses Association, medication errors, 44
 American Osteopathic Association, 480
 Healthcare Facilities Accreditation Program, 9
 American Pharmacists Association
 nuclear pharmacy and, 209
 on ophthalmic formulas, 63–64
 on parenteral formulas, 62
 sterile compounding and, 36
 American Society for Parenteral and Enteral Nutrition (ASPEN)
 guidelines of, 27
 on parenteral nutrition additives, 95
 on parenteral nutrition compounding, 72–74
 on parenteral nutrition order review, 71–72
 on parenteral nutrition prescribing, 70–71
 on parenteral nutrition quality assurance, 75–76
 on parenteral nutrition safe practices, toolkit, 69–70
 survey by, 68–69
 American Society for Testing and Materials (ASTM), 27
 glove permeability standards of, 184–185
 Amino acids, 96
 Amphotericin, 56

Ampules
 aseptic technique for, 167–168
 automated compounding systems and, 382
 Ante area/room, 116, 340, 351–353
 cleaning, disinfecting program for, 420–421, 469–472
 cleanliness zone and, 428–429
 disinfectants for, 417, 418–419
 janitorial procedures for, 419
 Antimicrobial cleansing products, 156–157
 Antimicrobial effectiveness test, 268
 Antimicrobial preservatives, 56–57, 268
 Antineoplastics, 174–175
 Antioxidants, 57
 Appearance, finished preparation, 261
 Aqueous isotonic vehicles, 55
 Architectural schematic plan, 355–356
 Arsenic trioxide, 194
 Aseptic manipulation competency evaluation, 448
 Aseptic processing, biological issues, 272
 Aseptic technique, 2, 3, 161–170
 for ampules, 167–168
 biological issues in, 267
 for CSPs, 168–169
 equipment, environment and, 162–163
 hand hygiene and, 164
 for hazardous drugs, 192
 for needles, 165–166
 personnel cleansing, gowning and, 163–164
 for radiopharmaceuticals, 207–210
 requirements for, 162
 for syringes, 164–165
 for vials, 166–167
 ASHP
 Accreditation of Pharmacy Residency Programs, 27
 Accreditation of Pharmacy Technician Training Programs, 27
 continuing education resources of, 320
 CSP guidelines by, 489–516
 guidelines by, 27
 hazardous drugs and, 172
 hazardous drugs guidelines by, 517–543
 hospital pharmacy practice surveys by, 67–69
 National Surveys of Pharmacy Practice, 2
 ophthalmic formulas and, 63–64
 outsourcing pharmacy and, 481–482
 Pharmacy Informatics and Technology, 386–387
 on pharmacy technician accreditation, 325–326
 practice standards of, 26
 resources on sterile compounding, 27
 safety initiative of, 106
 sterile compounding guidelines of, 545–546
 on syringes and CSP storage, 478
 Technical Assistance Bulletin on *Handling Cytotoxic and Hazardous Drugs*, 176, 177, 178
 Technical Assistance Bulletin on *Quality Assurance for Pharmacy-Prepared Sterile Products*, 2–3
 Association for Professionals in Infection Control and Epidemiology, 40
 Automated compounding systems/devices (ACS), 364, 370–371, 374–375
 cleaning, disinfecting, maintenance of, 399
 container closure and, 382
 documentation for, 246
 downtime and, 400–401, 402
 environmental monitoring of, 397–398
 errors with, 69
 hardware failure and, 401
 hardware-software performance of, 398
 infrastructure failure and, 401–402
 large, 376–381
 mixing profiles for, 382
 monitoring performance of, 396–397
 parenteral nutrition compounding workflow process for, 74–75
 pediatric compounding and, 103
 serial dilution and, 382
 small, 376
 software, network failure and, 401
 sterility assurance validation of, 395–396
 surface sampling, assessment of, 398
 throughput validation of, 395
 workflow software for, 381–383
 Automated dispensing cabinets (ADCs), 41
 Automation
 business case for, 389
 capital expenditure value considerations for, 390
 data collection for, 394–396
 evolution of, 364–365
 go-live, ramp up schedule for, 392–393
 implementation of, 391
 interface design, parallel testing of, 391
 project planning for, 387–388
 project stakeholder engagement for, 388–389
 reasons for, 365–372
 solutions assessment of, 386–387
 stakeholder communication and, 392
 support, issue resolution for, 392
 system build, administration of, 393–395
 system installation, commissioning, 391–392
 training, practice for, 392

B

Backup power, 125
 Bacterial endotoxin testing, 262–263
 Bacteriostatic sodium chloride injection, 55
 Bacteriostatic water, 55
 Barcode(s), 240
 for ingredient, 260
 Barcoded medication administration (BCMA), 240
Basics of Aseptic Compounding Technique Video Training Program, The, 162, 328
 Batch compounding, 303–312
 component quality checks for, 307–308
 control record for, 311–312
 directions for, 308–309
 documentation of, 310
 equipment, supplies specifications for, 309
 final preparation testing, quarantine of, 309–310
 in-process testing for, 309
 labeling for, 231–232
 master formula for, 307
 master formula sheet for, 304–307
 master worksheets for, 52
 procedure checks for, 308
 record retention for, 310
 sample label for, 309
 schedules for, 406, 407
 BCG (bacillus Calmette-Guérin), 114–115
 Becton-Dickinson syringes, CSP storage and, 476–478
 Benches, 122–123
 Benjamin, Bona, 478
 Benzyl alcohol, 41, 56, 87–89
 Beyond use date(ing), 213–226
 commercial IV solutions after protective overwrap removal and, 299
 determination of, 223–224
 for immediate-use products, 36
 point-of-care activated devices and, 299
 policies and procedures for, 461
 Bing, Caryn Dellamorte, 213–226, 295–301

- Bioburden, 269, 270
 prefiltration control of, 272
- Biohazard
 symbol for, 178
 waste bag for, 118
- Biological agents
 cleaning, decontamination and, 117–118
 compounding of, 113–120
 disposal of, 118
 preparation of, 118
 receiving, 116–117
 safe handling of, 116–118
 spills and, 118–119
 storage of, 117
 transportation of, 118–119
 types of, 113–115
- Biological indicators, 269, 270
- Biological issues, 267–281
 air monitoring for, 276
 antimicrobial effectiveness test for, 268
 antimicrobial preservatives and, 268
 aseptic processing and, 272
 aseptic technique and, 267
 bioburden of, 269
 cleaning, disinfection and, 278–280
 culture media and, 268, 273–274
 depyrogenation and, 274–275
 environmental, personnel sampling, testing for, 275–276
 filter integrity testing for, 272
 hand hygiene and, 276–278
 media fill test and, 273
 microbial risk considerations in, 267–268
 microbiology test stability and, 268–269
 prefiltration bioburden control of, 272
 pyrogens and, 274–275
 sterility and, 269–270
 sterility testing for, 272–273
 sterilization and, 269–270
 sterilization filtration and, 270–271
 sterilization filtration validation and, 271–272
 sterilization of containers and, 274
 sterilization validation and, 270
 surface monitoring for, 275–276
 training, competency and, 280
- Biological safety cabinets (BSCs), 118, 138–146
 air barrier for, 139
 air movement within, 140
 biological safety levels and, 115–118
 Class I, 139
 Class II, 115, 139–140, 191
 Class II, Type A1, 139, 140, 141, 142
 Class II, Type A2, 139, 141, 143
 Class II, Type B1, 139, 141–142, 144
 Class II, Type B2, 139, 141, 142–143, 145
 Class III, 115, 139, 144
 equipment and, 115
 hazardous drug compounding and, 144–146
 training and, 115
- Biological therapy, 113
- Biosafety in Microbiological and Biomedical Laboratories, 116
- Boyce, Craig A., 363–407
- BSL-1 facility, 116, 117
- BSL-2 agents, 118
- BSL-2 facility, 116, 117
- Bubble diagram, 358
- Bubble point tester, 126
- Buchanan, E. Clyde, 7–33, 333–362, 473–485
- Buffer area/room, 116, 340, 351–353
 cleaning, disinfecting of, 420–421, 469–472
 cleanliness zone and, 429
 disinfectants for, 417, 418–419
 handling products in, 287–288
 ISO Class 7 environment and, 342, 343
 janitorial procedures for, 419
 Buffering agents, 57
 for ophthalmic formulations, 62
- C**
- Calcitriol, 216
- Calcium salts, 61
- Calcium solubility factors, 95–96
- Canada, Todd W., 67–79
- Capps, Richard C., 133–151
- Caregiver training, 462
- Carmustine, 185
- Carts, 122, 287
- Casework, 122
- Center for Biologics Evaluation and Research (CBER), 113
- Center for Drug Evaluation and Research (CDER), 113
- Center for Improvement in Healthcare Quality (CIHQ), 9, 480
 standards of, 12
- Centers for Disease Control and Prevention (CDC), 26
 biosafety in facility design and, 116
 hazardous drugs and, 172
 “one and only campaign” of, 42
 pediatric skin cleaning and, 90
- Centers for Medicare & Medicaid Services (CMS)
 accreditation and, 479–480
 Conditions of Participation, 9
 immediate-use medication and, 35–36
 medication compounding and, 35
 multiuse vials and, 41–42
 standards and, 9–10
- Certificate of analysis, 245, 259
- Certification records, 247
- Chairs, 122–123
- Chelating agents, 57
- Chemical degradation, 217–218
- Chemical incompatibility, 214
- Chemotherapy
 gloves for, 184–186, 190
 waste and, 292
- Chlorhexidine gluconate, 90–91, 157
- Chloroxylenol, 157
- Chromium, 195
- Cleaning, 409–423
 of ACS, 399
 assessment form for, 411
 biological agents and, 117–118
 biological issues of, 278–280
 of buffer area, ante area, 469–472
 competency evaluation of, 448–449
 compounding areas and frequency of, 413
 of facility, 359–360
 program setup for, 420–421
 supplies for, 126
- Cleanliness zone
 ante-area and, 428–429
 buffer area and, 429
 containment segregated compounding area and, 429
 general pharmacy area and, 429
 segregated compounding area and, 429
- Cleanroom
 facilities for, 339
 furniture for, 122–123
 garb for, 127–128
 standards for, 30
- Closed isolators, 147
- Closed system drug-transfer device (CSTD), 116, 128, 182–183, 191
- Closures, 59
- Cold, 220
- Commissioning for occupancy, 359
- Compatibility, filter, 251
- Competence Assessment Tools for Health-System Pharmacies, 329
- Competency, biological issues, 280
- Component(s), 55–59
 quality checks, batch compounding and, 307–308
 standards for, 258–259
- Compounding
 defined, 8
 of hazardous drugs, 337–338
 personnel responsibility for, 19
 robots for, 364
 specific types and facility features for, 344
- Compounding accuracy checks, 259–261
 for batch compounding, 309–310
- Compounding aseptic containment isolator (CACI), 115, 146–147, 149, 182, 191–192
 enclosure integrity of, 149
 glove practices in, 186
- Compounding aseptic isolator (CAI), 116, 147–149, 334, 335
 airflow of, 147
 decontamination/disinfection of, 148
 ergonomics of, 148–149
 material transfer and, 147–148
 recovery time for, 148
- Compounding isolators (CIs), 146–149
 garbing for, 156
- Compounding pharmacy relationships, 483–484
- Compounding Quality Act, 52
- Compounding record
 for batch compounding, 310
 documentation and, 460–461
- Compounding Sterile Preparations*, 328
- Comprehensive Accreditation Manual for Hospitals, 36
- Computerized provider order entry (CPOE), pediatric compounding and, 105
- Construction, 358–359
 contract for, 356–357
- Container/closure
 integrity of, 261
 sterilization of, 274
- Containers, 58
- Containment primary engineering control (C-PEC), 133, 138, 337–338
 venting of, 149–150
- Containment secondary engineering control (C-SEC), 181–182, 190–191, 337–338, 342
- Containment segregated compounding area (C-SCA), 181, 182, 342–343
 cleanliness zone of, 429
- Contamination, 4
 of doses, 2
- Continuing education
 analysis of, 319–320
 application of, 319, 320
 comprehension of, 319, 320
 CSP topics and, 319
 evaluation of, 320
 knowledge and, 319, 320
 resources for, 320
 synthesis of, 320
- Control number, 231
- Controlled air environment, 433
- Controlled areas, transport into, 287
- Controlled Environment Magazine Buyer's Guide, 121
- Controlled Environment Testing Association, 28
- Controlled environmental quality program elements, 430
- Controlled room temperature, 220, 284–285
- Controlled substances, handling, 293

Controlled Substances Act, 293
 Corrective action levels, 464
 Counter disinfecting, 419
 Coveralls, 159
 Coyne, Joseph W., 171–202
 Critical access hospitals pharmacies, 10
 Culture media, 273

- biological issues with, 268
- fill of, 273
- method suitability and, 273
- preparations, 221

 Current good manufacturing practices (cGMP), 162
 Custom reconstitution diluents/process, ACS and, 383
 Cyclophosphamide, 174, 194
 Cysteine (L-cysteine), 96–97
 Cytokines, 114

D

Dactinomycin, 216
 Data analysis, quality assurance, 464, 467
 Data collection, quality assurance, 464
 Deactivation agents, 126–127, 412
 Decontamination, 412, 413

- agents for, 126–127
- EPA-approved agents for, 117

 Degradation type cleaning solutions, 194
 DEHP toxicity, 101
 Delivery

- methods of, 295–296
- pneumatic tube systems and, 296

 Department of Transportation (DOT) hazardous waste transport, 196
 Depyrogenation, 254–255, 274–275
 Det Norske Veritas (DNV-GL Healthcare), 9, 12, 480
 Dextrose injection 5%, 55
 Diazepam, 216
 Diethylhexyl phthalate (DEHP), 90, 101
 Difficult to compound, 51
 Direct compounding area, 134–135, 163
 Discontinued orders, 406, 407
 Disinfectants, 126, 414

- activity levels of, 416
- adverse effects of, 418
- for buffer, ante areas, 417, 418
- choice of, 415–416
- pollution prevention and, 417, 418
- primary engineering controls and, 416–417
- regulation of, 414–415
- resistance to germicidal chemicals and, 415
- safe storage, mixing of, 419–420

 Disinfection, 409–423

- ACS and, 399
- assessment form for, 411
- biological issues in, 278–280
- buffer area, ante area, 469–472
- competency evaluation for, 448–449
- of facility, 359–360
- frequency, compounding areas, 413
- hazardous drugs and, 412, 413
- program setup for, 420–421
- rotation and, 419
- supplies for, 126

 Dispensing, documentation, 246
 D-listed drugs, 194–195, 292
 Dobutamine, 239
 Documentation, 243–248

- of air sampling, 434
- batch compounding record and, 310
- of compounded sterile preparation, 245–246
- compounding record and, 460–461
- of environmental monitoring, 246–247
- of finished preparation, 258

legal situations and, 244
 master formulation records and, 457
 medication-related records and, 244
 other records and, 461
 outside organizations and, 243
 personnel and, 247
 of quality assurance, 247
 of quality improvement, 244
 retention of, 248
 for special drug categories, 244–245
 workload justification and, 244
 Dopamine, 239
 Dose reconciliation to determine waste, 407
 Downtime

- of ACS, 400–401
- plan, recovery for, 402

 Doxorubicin, 184
 Drug delivery, stability related to, 218–219
 Drug Enforcement Administration (DEA), 293, 481

- documentation and, 243

 Drug incompatibilities, 42, 44
 Drug Quality and Security Act, 5, 7–8, 51–52, 475

- compounding and, 16
- standards of, 14–16

 Drug waste, nonhazardous, 292–293
 Dry-heat sterilization, 254–255

E

Efficiency, 370–371
 Electronic medication order, 258
 Elimination type cleaning solutions, 194
 Emergency management plan, 348
 Emergency power, 125
 Employee

- safety for, 369–370
- satisfaction of, 370
- training, orientation of, 318–319

 Emulsified oils, 56
 Emulsifiers, 57–58
 Endotoxin testing, 262–263
 Enoxaparin, 81–82
 Environmental monitoring, 123–124, 246–247

- automated compounding system and, 397–398
- frequency of, 433–434
- hazardous drug contamination and, 434–435
- program for, 426

 Environmental Protection Agency, 28, 194–195

- approved disinfectants and, 117
- hazardous waste transport and, 196
- labeling and, 414

 Environmental quality and control, 425–436
 Environmental sampling program, 275, 341–342, 360, 430
 Environmental temperatures, clinical setting and, 219–220
 Epinephrine, 194–195, 237
 Equipment

- ancillary, 121–131
- placement of, 341

 Erickson, Bruce A., 363–407
 Ethyl alcohol, 55

- cleansing products, 156–157

 Ethylene oxide gas sterilization, 255
 Etoposide, 195
 Exactamix (Baxter Healthcare Corporation) ACD, 76
 Excipients, 87, 88
 Existing facility, 348–349
 Expiration date, 213
 Expired sterile commercial products, 293
Extended Stability for Parenteral Drugs, 223

F

Face masks, 127
 Facility maintenance

- cleaning and disinfection of, 359–360
- environmental sampling, testing of, 360
- recertification and, 360

 Facility planning, 346

- architectural schematic plan for, 355–356
- commissioning for occupancy, 359
- construction of, 358–359
- construction contract and, 356–358
- design of, 116
- existing facility and, 348–349
- functional program for, 351–355
- ISO Class 5 cleanrooms and, 350–351
- need identification and, 347
- need justification and, 347–348
- robots and, 349–350
- specific compounding types and, 344
- strategic master plan for, 346–348

 Fatigue mats, 126
 Filgrastim, 216
 Filter(s)

- cautions for, 252
- integrity of, 251–252
- integrity testing for, 272
- selection of, 250–251
- sterilizing-grade, 271

 Filtrate volume, 251
 Filtration, sterilization by, 250–251
 Final preparations, batch compounding testing, quarantine, 309–310
 Fingertip testing kits/media, 129
 Finished preparation

- bacterial endotoxin testing and, 262–263
- components in, 258–259
- compounding accuracy checks for, 259–260
- documentation practices for, 258
- medication order for, 257–258
- pH testing and, 263
- physical inspection of, 261
- potency, stability testing and, 263
- release checks, tests for, 257–265
- sterility testing and, 261–262

 First air, 134
 503B pharmacies. *See* Outsourcing facilities
 Fixed oils, 56
 Floor disinfecting, 418–419
 Fluid thioglycollate medium, 262
 Food and Drug Administration (FDA)

- on aluminum contamination, 97, 100
- biological agents regulation of, 113
- on difficult to compound designation, 51
- on documentation, 243

 Food and Drug Administration Modernization Act (1997), 14
 Food, Drug, and Cosmetic Act (FDCA), 4, 16, 18, 161–162, 475

- documentation and, 243
- drug products exempt from compounding, 51

 Forced air sterilizer, 254
 Form 483 issues and, 477

- NECC investigation by, 3–4
- on outsourcing facility, 5, 8, 52, 475–478
- pharmacist oversight and, 2
- on registered outsourcing facility, 16
- Safe Use Initiative, 106
- standalone compounding pharmacies and, 14
- standards enforcement by, 16

 Formulation issues, 51–66
 Forrey, Ryan A., 121–131, 243–248, 283–294, 409–423
 Freezer(s), 124–125, 220

G

Gap analysis, 464
 Garbing
 allergen extracts and, 156
 ante-area, 155
 competency evaluation, 447
 compounding isolators and, 156
 high-risk weighing, measuring and, 156
 Garment(s), 159
 fit, integrity of, 159–160
 Gas producers, ACS and, 382–383
 Gene therapy, 114
 General duty clause, 25
 General pharmacy area, cleanliness zone, 429
 Gentamicin master formula sheet, 305–307
Getting Started in Aseptic Compounding, 162, 328
 Glass containers, 58
 Glass-aluminum contamination, 90–91
 Glassware sterilization, 274
 Gloved fingertip sampling evaluation, 447–448
 Gloves, 128, 157–159
 competency evaluation for, 447
 for hazardous drugs, 184–186
 latex vs nonlatex, 158–159
 powdered vs nonpowdered, 158
 protective, 159
 Glycerin, 56
 Goggles, 127
 Good manufacturing practices, 4, 14, 16
 Gowns, 127–128, 159
 for hazardous drugs, 186–188
 Gracimetric checks, 260
 Gravity compounding, parenteral nutrition,
 73, 75
 Growth media, 128, 432
 Gura, Kathleen M., 81–111

H

Hair coverings, hazardous drugs, 188
 Hamberg, Margaret, 478
 Hand hygiene, 276–278
 in ante-area, 155–156
 aseptic technique for, 164
 immediate-use compounding and, 40–41
Handbook on Injectable Drugs, 223
 Handling procedures, 283–294
 Hardware failure, ACS, 401
 Hardware-software performance, ACS, 398
 Hazardous Drug Working Group, 172
 Hazardous drugs, 171–202
 aseptic technique for, 192
 biohazard symbol and, 178
 BSC Class II and, 191
 CACI and, 191–192
 cleaning and, 412, 413, 194
 compounding area designs and, 354
 containment of, 181–182, 194–196
 C-PEC working, 190–191
 deactivating, 193–194
 decontaminating, 193–194
 defining, 175–176, 177
 disposal of, 194–196
 donning PPE, 188–189
 early interventions for, 172
 environment and, 181
 environmental monitoring for, 434–435
 exposure and adverse events, 171–172,
 173–175
 gloves and, 184–186
 gowns and, 186–188
 hair coverings and, 188
 handling competency evaluation, 449–450
 labeling, 178–179
 personal protective equipment and, 183–185,

188–189
 PPE disposal and, 189
 practice standards, best practices for, 177–178
 receiving, 179, 337
 reconstituting in vials, 192
 secondary engineering controls and, 337–338
 shoe coverings and, 188
 standards for, 23–26
 state OSHA programs and, 175
 storage of, 180, 285, 337
 supplemental engineering controls for,
 182–183
 surface contamination/sampling, 129,
 173–174
 training, competence and, 193
 transferring to IV bag, 192
 transport of, 180–181
 USP Chapter 800 and, 175
 withdrawing from ampule, 192–193
 work practices for, 189–192
 Hazardous waste
 disposal of, 292
 handling of, 291–292
 Health and Human Services, U.S. Department
 of, 3
 Advisory Committee on Compounding, 16
 standalone compounding pharmacies and, 16
 Health Insurance Portability and Accountability
 Act (HIPAA), 481
 Health status, 153–154
 Healthcare Facilities Accreditation Program
 (HFAP), 9
 Pharmacy Services/Medication Use—Acute
 Care Manual (2016), 13–14
 standards, 10, 12
 Heating, ventilation, and air conditioning
 (HVAC) systems, 340
 Heavy metals, 61
 HEPA filter(s), 163
 air supply and, 116
 primary engineering controls and, 135
 Hetey, Stephen K., 437–443
 Hexachlorophene, 90
 Hexylresorcinol 0.5%, 56
 Higher concentration delivery systems, 218
 High-risk compounding, 51
 Hinkle, George H., 203–211
 Home care setting
 CSP delivery in, 296–297
 pharmacies for, 10
 recycling methods for, 300
 storage in, 298
 waste disposal methods for, 300–301
 Hospital Accreditation Manual (2016), 10
 Hospital campus, 295–296
 pharmacy in, 10
 recycling methods in, 300
Hospital Pharmacies Status as Drug Manufacturer,
 52
 Hospital-acquired infections, 409
 Human Drug Compounding Outsourcing
 Facilities, 4
 Human particle generation, 153, 154
 Humidity controls, 124
 in compounding area, 397
 SEC and, 345–346
 Hydrolysis, 217–218

I

Immediate use
 defined, 35–36
 provision, 339
 Immediate-use compounding, 21–23, 35–49, 204
 hand hygiene and, 40–41
 injection, infusion preparation for, 39

labeling of, 231
 materials assembly for, 39–40
 preparation surface cleaning for, 40
 product selection, preparation of, 41
 risks associated with, 37–39
 safe preparation of, 39
 Immune globulins, 222
 Immunomodulators, 114–115
 Immunotherapy, 113
 Incompatible medications, 42, 44
 Incubation period, 433–434
 Incubators, 124
 Individual dose lots, 2
 Infection control, pediatric compounding, 90
 Information system, 483
 Infrastructure failure, ACS, 401–402
 Infusion(s)
 immediate-use compounding and, 39
 preparation for administration of, 44
 Infusion Nurses Society, 40–41
 Infusion pharmacy, 17
 Injection(s)
 drug solution into IV container, 168
 immediate-use compounding, 39
 pediatric pain minimization of, 87
 safety and, 41–43
 In-process testing, 309
 Instability, 214
 Institute for Environmental Sciences and
 Technology, 28
 Institute for Safe Medication Practices (ISMP),
 28
 best practice and, 29
 cartridge prefilled syringes survey of, 38
 dilution practices survey of, 38
 *Safe Practice Guidelines for Adult IV Push
 Medications*, 38
 safety initiative of, 106
 Institutional setting
 storage in, 298
 waste disposal methods in, 300
 Insulin, 216
*International Journal of Pharmaceutical
 Compounding*, 62
 International Organization for Standardization
 (ISO), 28–29
 ISO Class 5 environment, 36, 42, 69, 116,
 133, 276, 350–351
 ISO Class 7 environment, 36, 116, 276,
 342, 343
 ISO Class 8 environment, 116
 particulate matter in room classification
 and, 334
 standards for cleanrooms, associated
 environments, 30
 Intradermal injections, pediatric, 86
 Intramuscular injections, pediatric, 83, 84–85
 Intraosseous injections, pediatric, 86
 Intrathecal injections, pediatric, 86–87
 Intravenous admixture, 36
 Intravenous delivery, pediatric, 82–83
 Inventory control, sterile commercial drugs, 286
 Iodophors, 157
 Iso-osmotic, 60
 Isopropyl alcohol (70%), 42
 Isopropyl alcohol cleansing products, 156–157
 Isotonic, 60
 IV admixtures
 compounding of, 1–2
 nurses preparation of, 1–2

J

Job descriptions, 454
 Joint Commission, The (TJC), 9, 480–481
 accredited healthcare sites and, 10

documentation and, 243
 hospital sterile preparation facilities and, 339
 Medication Compounding Certification Program, 17–18, 36
 medication errors and, 38–39
 medication labeling of, 44
 Medication Management Standard, 35
 standards of, 10
 sterile compounding locations accredited by, 10
 urgent situations and, 36
 USP Chapter 797 and, 11–12
 vials and infection prevention and, 42
 Joint Council of Allergy, Asthma, and Immunology, 46
 Joint Task Force, allergen immunotherapy, 46

K

Kienle, Patricia C., 425–436, 453–472
 Klang, Mark G., 51–66
 Kuban, Patricia J., 227–242

L

Labeling, 227–242, 461
 of active ingredients, 229
 auxiliary, 232, 236, 239
 barcodes and, 240
 of batch, 231–232
 of beyond use date, 229
 color, graphics and, 239
 of finished preparation, 261
 general guidelines for, 228–232
 for home care settings, 237–238
 immediate-use, 231
 for institutional settings, 232–235
 optional, 236, 239
 other considerations for, 235
 of parenteral nutrition, 72
 patient-specific, in-house, 233–234
 for perioperative, procedural area settings, 236–237
 routes of administration and, 229–230, 232
 safe use information and, 230
 shipping outside facility and, 234–235
 single-dose or bulk package designation and, 230
 specialty, 240
 storage conditions and, 230, 232
 tall man letters and, 239–240
 total amount/volume of preparation and, 229, 232
 USP requirements for, 228–230
 Lactated Ringer's injection, 55
 Laminar airflow hood(s), 42, 162–163
 Laminar airflow system, 116
 Laminar airflow workbench(es), 116, 136–138
 blower above work surface and, 136–137
 blower below work surface and, 137
 vertical air flow and, 137, 138
 Latex allergies, 437–443
 allergens source and, 438
 best practices and, 441
 contact avoidance and, 439–440
 diagnosis of, 439
 future developments, therapies for, 442
 management of, 441
 types of reactions in, 438–439
 Leaching, 251
 Lean Six Sigma downtime, 371–372
 Learning goals, 320
 Lighting level, uniformity, 343, 345
 Lipid emulsions
 microbial contamination and, 222
 repackaging of, 102–103
 Liquid polyethylene glycol, 55

Lockers, 125–126
 Long-term care pharmacy, 17
 recycling methods for, 300
 Look-alike/sound-alike medications, 41
 Lorazepam, 216
 Lot number, 231
 Luer-lock syringes, 118

M

Maintenance, ACS, 399–400
 Mansur, Jeannell M., 35–49, 480–481
 Manual compounding process, 383, 384–385
 Manufacturer information, 223
 Manufacturing, defined, 8
 Masks, 159
 Master formula, 307
 Master formula sheet, 304, 307, 310
 equipment supplies and, 308
 example of, 305–307
 sample label for, 309
 Materials, 483
 McElhiney, Linda F., 161–170, 445–451
 Mechanical convection sterilizer, 254
 Media fill
 challenge testing, 447
 testing, 273–274
 testing kits/media, 129
 Medicaid, standards, 9
 Medicare
 compounded preparations oversight by, 3
 standards of, 9
 Medication
 labeling, 44
 order transcription for, 257–258
 reconstitution of, 38, 41
 selection of, 41
 Medication errors, immediate-use compounding, 37–39
 MEDMARX, 365–366
 MedWatch Safety Alert, syringes and, 476–478
 Methyl paraben, 41
 Microbial contamination
 immediate-use compounding and, 37
 risk considerations for, 267–268
 risk levels for, 19–21, 334, 335
 risk levels exemptions for, 19, 22–23
 Microbiological surface testing kits/media, 129
 Millwork, 122
 Minibags, 2
Mirror to Hospital Pharmacy, 1
Model Curriculum for Pharmacy Technician Training, 324, 326
 Model State Pharmacy Practice Act, 8
 Modular cleanroom, 353, 355
 Monoclonal antibodies (MABs), 114
 Mops, mop systems, 127
 Multichamber bags, parenteral nutrition, 72–73
 Multiple ingredients, ACS and, 383
 Multiple-dose containers, 58–59
 Multiuse vials, 41–42
 contamination control in, 222–223
 Multivitamins
 pediatric compounding and, 96
 pediatric, adult parenteral products of, 98–99

N

National Association of Boards of Pharmacy (NABP)
 compounding regulations of, 8–9
 outsourcing facilities and, 478–479
 record retention and, 310
 standalone compounding pharmacies and, 16
 National Institute for Occupational Safety and Health (NIOSH), 25
 hazardous drug alert by, 26, 27, 172

hazardous drug list of, 115, 176, 177, 278, 291
 incubators and, 124
 sterile compounding and, 37
 National Institute of Standards and Technology (NIST), incubators, 124
 National Patient Safety Goal(s), 11–12
 medication labeling and, 44, 45
 National Sanitation Foundation, 29
 Needles
 aseptic technique for, 165–166
 parts of, 166
 Network failure, ACS, 401
 New drug application, 52
 New England Compounding Center, 3–5, 162, 475
 New orders, 406, 407
New York Times, 340
 Nitroglycerin, 216
 Noise level, 345
 Nonaqueous vehicles, 56
 Nonhazardous drug waste, 292–293
 NRL, 437–438
 allergens identification of, 439
 closures and, 440–441
 risk factors for sensitivity development and, 440
 sensitizing antigens in, 440
 NSF International, 29–30
 Nuclear pharmacy, 204
 layout of, 205

O

Occupational Safety and Health Act (1970), 25
 Occupational Safety and Health Administration
 antineoplastics and, 175
 Hazard Communication Standard of, 176, 178
 hazardous drugs and, 172
 standards of, 25–26
Technical Manual, 175
 Office of Inspector General, 9
 Off-premises, CSP delivery, 296–297
 Ommaya reservoirs, pediatric, 86
 Oncology Nursing Society, 172
 Open isolators, 147
 Ophthalmic formulations, 62, 63
 buffers, pH and, 62
 sterility of, 63
 tonicity of, 62
 viscosity of, 62–63
 Osteen, Richard B., 153–160, 303–312
 Outsourcing, 473–485
 national trends and, 473–474
 organizational pharmacy responsibilities in, 482–483
 of parenteral nutrition, 77
 questions for, 483–484
 of radiopharmaceuticals compounding, 209
 Outsourcing facility(ies)/pharmacy, 52, 339
 accrediting organizations and, 479–481
 ASHP and, 481–482
 DEA and, 481
 FDA Form 483 issues and, 477
 HIPAA and, 481
 hospital preparations and, 474
 laws, regulations, standards for, 475–477
 state boards of pharmacy and, 478–479
 Overwrap removal, 219
 Oxidation, 217–218

P

Paclitaxel, 195
 Parabens, 56
 Parenteral admixtures, preparation of, 2

- Parenteral formulas, 62
 modalities of, 58
- Parenteral medication
 aluminum in, 95
 benzyl alcohol and, 87–89
 pediatric safety for, 103–104
 propylene glycol and, 88
- Parenteral nutrition
 customized, 73
 errors reported for, 69
 in hospital pharmacy practice, 67–68
 labeling of, 72
 multichamber bags for, 72–73
 order review of, 71–72
 outsourcing, 77
 pediatric, 95–101
 prescribing, 70
 quality assurance and, 75–76
 safety aspects of, 69–70
 solubility issues in, 215–216
- Parenteral nutrition compounding, 67–79
 accuracy of, 76–77
 ambient light protection and, 100–101
- Parenteral preparations
 impurities and, 61
 large volume, 218
 particulates and, 60–61
 pH and, 60
 physiologic norms for, 59
 pyrogenicity and, 60
 stability of, 61
 tonicity of, 60
- Partially-used packages, 286
- Particle management, 134
- Particulate(s), 261
 load, 251
- Patient
 monitoring, complaint system for, 462
 safety and, 365–366
 -specific labeling, 233–234
 training, 462
- PCMX, 157
- Pediatric compounding,
 ADC safety considerations in, 103
 aluminum toxicity and, 90–95
 ambient light protection and, 100–101
 benzyl alcohol and, 88–89
 concentration considerations in, 81–82
 considerations in, 81–111
 delivery routes for, 82–87
 drug delivery challenges of, 81–82
 excipients impact on, 87, 88
 injection pain minimization and, 87
 parenteral nutrition and, 95–101
 propylene glycol and, 88, 89
 repackaging emulsions, syringes for, 102
 rule of 6 for, 104–105
 safety and information support for, 105
 safety initiatives, considerations and, 105–106
 skin cleaning solutions and, 89–90
 smart pumps and, 105
 standardization issues for, 104
 storage containers for, 90–91, 101
 storage/dispensing considerations for, 104
 volume limits, intramuscular injections by age, 84
- Pediatric patient, parenteral medication safety, 103–104
- Pediatric Pharmacy Advocacy Group, safety initiative, 106
- Personal protective equipment (PPE), 115, 116
 for hazardous drugs, 183–189
- Personnel
 cleansing, garbing and, 153–160, 163–164
 microbial testing for, 275
 monitoring, 276
 preparation of, 153–156
 records for, 247
- Personnel training, 445–446
 aseptic manipulation competency evaluation and, 448
 cleaning, disinfecting competency evaluation and, 448–449
 competency evaluation and, 445–451
 garbing, gloving competency evaluation and, 447
 gloved fingertip sampling evaluation and, 447–448
 hazardous drug handling competency evaluation and, 449–450
 media fill challenge testing and, 447
 policies and procedures for, 455–456
 written knowledge assessment and, 446–447
- Pew Charitable Trusts survey (2015), 8
- pH
 buffers for, 57
 ophthalmic formulations and, 62
 parenteral preparations and, 60
 solubility and, 215
 testing for, 263
- Pharmaceutical services, 9
- Pharmacist education, 315–321
- Pharmacy
 adverse events and, 1
 school education for, 316–318
- Pharmacy Compounding Accreditation Board, standards, 17
- Pharmacy Compounding Advisory Committee, exemptions, 51
- Pharmacy Purchasing & Products Suppliers Guide, 121
- Pharmacy school education
 current instruction on CSPs in, 317
 curriculum changes in, 317–318
 practitioner perceptions of, 317
 professional perceptions of, 316
 student perceptions of, 316–317
- Pharmacy technician, 323–331
 advances in education, training of, 323–324
 certification for, 326, 327
 competency, evaluation of, 326–327, 329
 educational program accreditation of, 325–326
 educational programs for, 325
 educators and, 324–325
 hazardous drug training for, 328–329
 measuring performance of, 329
 orientation for, 327–328
 regulation of, 329–330
 sterile preparations and, 324, 325, 327
- Phenol, 56
- Phenylmercuric benzoate 0.1%, 56
- Phosphate salts, 61
- Phosphorus solubility factors, 95–96
- Photochemical decomposition, 218
- Physical incompatibilities, 214–217
- Physostigmine salicylate, 194
- Pinnacle (B. Braun Medical, Inc.) ACD, 76
- Plastic containers, 59
- Plastic toxicity, 90
- P-listed drugs, 194–195, 291
- Point-of-care activation systems/devices, 42, 219
- Point of preparation testing, 261
- Policies and procedures
 for beyond-use dating, 461
 compounding personnel responsibility and, 454–455
 documentation and, 457–461
 job descriptions and, 454
 other sources of, 457
 patient/caregiver training in, 462
 patient monitoring, complaint system and, 462
 personnel training/evaluation and, 455–456
 quality assurance and, 461
 standard operating procedures and, 456–457, 458–459, 460
 storage and, 461
 topics covered by, 455
 writing, 453–454
- Polyvinyl chloride toxicity, 90, 91
- Pore size, 251
- Positron emission tomography (PET) drugs, 204
- Potassium chloride, 2
- Potency testing, finished preparation, 263
- Power, Luci A., 171–202
- Power interruptions, 348
- Precision, ACS, 396–397
- Preparation
 name, 231–232
 -specific experimental studies, 223–224
- Pressure
 in compounding area, 397–398
 differential monitoring of, 124, 431–432
- Preventative maintenance, 399–400
- “Prevention of Medication Errors in the Pediatric Inpatient Setting,” 105
- Primary engineering controls (PECs), 133–151
 air cleanliness and, 135–136
 air sampling and, 429–430
 biological safety cabinets and, 138–146
 certification of, 150
 compounding isolators and, 146–149
 direct compounding area and, 134–135
 disinfectants and, 416–417
 HEPA filters and, 135–136
 laminar airflow workbenches and, 136–138
 performance verification of, 430–431
 placement of, 429
 purchasing and, 150–151
 unidirectional airflow and, 133–134
- Principles of Sterile Product Preparation*, 3
- Probability
 pathway modeling and, 370–371
 of nonsterile unit, 270
- Probability pathway modeling, 370–371
- Product integrity, 286
- Propofol, 56
- Proprietary bag, viral systems, 339
- Propyl paraben, 41
- Propylene glycol, 55
- PTAC accreditation, 326
- PTCB certification, 326
- PTEC organization, 324–325
- Purified water, 55
- Purity, maintaining, 295–301
- Pyrogen tests, 129–130
- Pyrogenicity, 60

Q

- Quality assurance, 462–464
 for compounded preparations, 461
 indicators for, 465–467
 for parenteral nutrition, 75–76
 records for, 247
- Quality control, 462
- Quality improvement, documentation, 244
- Quaternary ammonium compounds, 157

R

- Radionuclide generators, 210
- Radiopharmaceuticals, 203–211, 338
 airborne contamination control and, 206–208
 aseptic technique for, 207–208
 aseptic technique evaluation and, 208–210
 expiration of, 210

microbial risk levels for, 203–205
 nuclear pharmacy layout and, 205
 nuclear pharmacy personnel training and,
 208–209
 storage, use of radionuclide generator systems
 and, 210
 surface contamination and, 205–206
 Ready-to-use products, 219
 Recalls, 483
 Receiving
 documentation for, 245
 of hazardous drugs and, 179
 of sterile commercial products, 283–284
 Recertification
 facility and, 360
 records for, 247
 Record retention, 248
 for batch compounding, 310
 Recycling methods, 300
 Reduction, 217–218
 Reece, Kelley, 113–120
 Refrigerators, 124–125
 wireless monitoring of, 126
Remington: The Science and Practice of Pharmacy,
 223
 Remodeling facility, 355
 Repackaging, pediatric compounding and,
 102–103
 Repeatability monitoring, ACS, 396–397
 Repetitive motion injuries, 369
 Request for information, 356
 Request for proposal, 356–357
 Resource Conservation and Recovery Act,
 194–195, 291
 Respirators, 127
 Returns
 of CSPs, 288–289
 documentation for, 246
 methods for, 299–300
 Reverse distributor, 293
 Ringer's injection, 55
 Risk management, 483
 Robotics, 379–380
 holding vial body, 379
 holding vial neck, 379
 space for, 349–350
 Room separation, 349
 Roux, Ryan, 113–120
 Rule of 6, 104–105

S

Safe Handling of Hazardous Drugs, 172
 Safe harbor, 14, 15
 Safe Injection Practices Coalition, “one and
 only campaign,” 42
 Safety data sheet, 176, 178
 Sampling plan, 432
 Scalp vein catheters, 82
 Schneider, Philip J., 1–6, 315–321
 Secondary engineering controls (SEC), 333–362
 air cleanliness and, 334
 allergen extracts and, 338
 buffer, ante areas and, 340–341
 cleaning, disinfecting and, 342–343
 CSP classification and, 336
 environmental sampling, testing and,
 341–342
 equipment, supplies placement and, 341
 functional requirements of, 333–334
 hazardous drugs and, 337–338
 humidity and, 345–346
 HVAC systems and, 340
 immediate-use provision and, 339
 lighting level, uniformity and, 343, 345
 low-risk level CSPs and, 334–335, 337

microbial contamination risk levels and,
 334, 335
 noise level and, 345
 performance verification and, 430–431
 proprietary bag, vial systems and, 339
 radiopharmaceuticals and, 338
 segregated compounding area and, 334–335,
 337
 surface characteristics and, 340–341
 Security, refrigerator/freezer, 125
 Segregated compounding area, 334–335, 337
 cleanliness zone for, 429
 Selenium, 195
 Self-regulation, 2
 Shelving, 125–126
 disinfecting, 419
 Shoes
 covers for, 159
 hazardous drugs covers for, 188
 Single dose containers, 58–59
 Single-use vial, 41, 42
 Smart pumps, pediatric compounding and, 105
 Social Security Act, 9
 Sodium chloride (normal saline), 55
 Software failure, ACS, 401
 Solubility, 214–215
 calcium-phosphate issues in, 215–216
 larger organic ions and, 215
 parenteral nutrition and, 215–216
 pH and, 215
 Solubilizers, 57, 58
 Solutes, 56
 Solution characteristics, 251–252
 Sorption, 216, 251
 Soybean-casein digest medium, 262
 Specialized drug delivery systems, 298–299
 Specialty pharmacy, 17
 Spill kits, 118–119
 Spivey, Susan, 113–120
 St. John, Keith H., 267–281
 Stability
 criteria for, 214
 drug delivery and, 218–219
 factors affecting, 217
 maintaining for CSPs, 295–301
 microbiology tests and, 268–269
 parenteral preparations and, 61
 published information on, 223
 testing of finished preparation, 263
 Standalone compounding pharmacies, 14. See
 also Outsourcing facilities
 Standardize 4 Safety, 106
 Standardized medication administration times,
 406, 407
 Standards of practice, 3, 7–33, 456–457,
 458–459, 460
 State boards of pharmacy, 3
 compounding regulations of, 7–8
 outsourcing pharmacies and, 478–479
 policy inconsistencies and, 8–9
 standalone compounding pharmacies and, 16
 USP Chapter <797> and, 7
 Static-air sterilizer, 254
 Steam sterilization, 252–254
 Sterile commercial drugs/products
 inventory control of, 286–287
 receiving, 283–284
 Sterile compounding, 36
 area floor plan for, 432
 workflow systems, 364–365, 370, 395
 Sterile preparation formulation, 51–66
 Sterile water, 55
 Sterility, 367–369
 assurance of, 249–256, 270
 biological issues in, 269
 CSPs from nonsterile ingredients and,

249–250
 CSPs from sterile ingredients and, 249
 finished preparation testing for, 261–262
 limitations of, 220–221
 maintaining, 295–301
 ophthalmic formulations and, 63
 testing for, 129–130, 272–273
 Sterilization, 53
 biological issues in, 269
 of glassware, container closures, 274
 validation of, 270
 Sterilization methods
 dry heat, 254–255
 filtration, 250–252, 270–272
 gas, 255
 steam, 252–254
 Sterilizing-grade filter, 271
 Storage, 213–226
 conditions, 284–285
 of CSPs, 288–289
 documentation for, 245
 of hazardous drugs, 180, 285
 in home care setting, 298
 in institutional setting, 298
 monitoring conditions in, 285–286
 policies and procedures for, 461
 specialized drug delivery systems and,
 298–299
 Street clothes, accessories, 155
 Stuhan, Mary Ann, 323–331
 Subcutaneous injections, pediatric, 83–84, 85
 Sufentanil, 216
 Supplies, 126–130, 287
 ancillary, 121–131
 placement of, 341
 Supply carts, 122
 Surface(s)
 automated compounding system sampling
 and, 398
 immediate-use compounding and, 40
 monitoring of, 275–276
 secondary engineering controls and, 340–341
 Surface contamination
 by hazardous drugs, 173–174
 by radiopharmaceuticals, 205–2061
 Suspensions, automated compounding systems
 and, 382
 Sutton, Scott, 478
 Syringes(s), 59
 aseptic technique for, 164–165
 ISMP alert about, 476
 marking, 165
 parts of, 164, 165
 photographic documentation for, 260
 pull-back accuracy check for, 259–260
 racks for, 378
 repackaging, 102–103
 visual checks of, 260

T

Tacky mats, 130
 Tallman lettering, 41, 239–240
 Technology, 363–407
 automated compounding systems and,
 374–383
 evolution of, 364–365
 implementation of, 391–395
 manual processes assessment and, 383–386
 project planning for, 387–390
 reasons for, 365–372
 solutions assessment for, 386–387
 sterile compounding workflow systems and,
 372–374, 375
 workflow software and, 381–383
 Temperature control, 124, 286

- in compounding area, 397
- monitoring, 220
- packaging systems and, 297
- Terminal sterilization, 53, 270
- Thiopeta, 185
- Tirumalai, Radhakrishna, 267–281
- Toxicity
 - agents, 57
 - of ophthalmic formulations, 62
 - of parenteral preparations, 60
- Total nutrient admixture (TNA), 67
 - emulsion integrity and, 216
 - microbial contamination and, 222
 - pediatric, 95–96
- Total parenteral nutrition (TPN), 56
 - contamination and, 221–222
- Total particle counts, 431
- Trace elements, 97
- Training
 - biological issues in, 280
 - records for, 247
- Transfer carts, 122
- Transport
 - containers for, 297–298
 - into controlled areas, 287
 - of hazardous drugs, 180–181

U

- U-listed drugs, 194–195, 292
- Umbilical catheters, 83
- Unidirectional airflow, 134
- United States Pharmacopoeia (USP)*, 3
 - general chapters standards of, 24–25
 - Sterile Compounding Committee of, 18
- USP Chapter <788>, particulates and, 61
- USP Chapter <795>, 18
 - bulk ingredients and, 52
- USP Chapter <797>, 3, 5
 - action levels for microbial contamination and, 464

- allergen immunotherapy and, 46, 47
 - as best practice resource, 35–36
- BSL-1, BSL-2 facilities and, 116
- bulk compounded medications and, 52
- carts and, 122
- cleaning, disinfecting and, 410, 412
- compounding personnel responsibility and, 19
- disinfectants and, 414
- garbing standards and, 154
- hazardous drugs and, 172–173
- high-risk compounding and, 51
- Joint Commission standards and, 11–12
- microbial contamination and, 19–23
- nonsterile active ingredients and, 53
- parenteral nutrition and, 76–77
- shelving and, 125
- standard operating procedures and, 458–459
- state boards of pharmacy and, 7–8
- USP Chapter <800>, 175, 176
 - BSL-2 facilities and, 116
 - cleaning, disinfecting and, 412
 - C-PEC requirements and, 138
 - deactivation agents and, 126
 - standard operating procedures and, 459
 - standards and, 23–24
- USP-National Formulary, 10, 52, 53
 - standards, 18
- Utility interruptions, 348

V

- Vaccines, 113–114
- Valrubicin, 195
- Vehicles, 55
- Vial(s)
 - aseptic technique for, 166–167
 - piercing with needle, 167
 - racks for, 377
- Visual incompatibilities, 214
- Visual inspection

- of automated compounding systems, 383
- of batch compounding final preparations, 309
- Vitamin A, 216
- Volumes, very small/large, 383
- Volumetric air samplers, 123
- Voriconazole, 229

W

- Warfarin, 195–196
- Waste
 - compounding materials and, 289–291
 - disposal methods for, 300
 - documentation and, 246
 - handling hazardous, 291
 - management of, 289–291
 - reduction of, 370–72
- Water-miscible solvents, 55–56
- Websites, 547–568
- Wipers, 127
- Workflow management, 364–365
- Workload
 - assessment of, 384, 386
 - data collection examples for, 406
 - data collection questions for, 405
- Written procedures, 54–55

Y

- Yaniv, Angela W., 249–256, 257–265
- Yardley, William, 340
- Y-site administration, 218–219