Subject Index

ACE inhibitors, see Angiotensin-converting enzyme inhibitors
Advanced glycation end products (AGEs)
diet effects on inflammation 78
hemodiafiltration removal 180
Alkaline phosphatase, chronic kidney disease-mineral and bone disorder biomarker 225
Analgesics, Dialysis Outcomes and Practice Patterns Study findings 53
Anemia
  hemoglobin
  cycling 242, 243
target in chronic kidney disease 241, 242
  pure red cell aplasia with erythropoiesis-stimulating agents 243, 244
red blood cell lifespan determination
  breath carbon monoxide 252, 253
  chromium-51 labeling 252
effects on erythropoietin-stimulating agent therapy 250–252
overview 248, 249
survival in renal failure 249
vitamin E studies in dialysis patients 93–95
Angiography, preoperative fistula evaluation 24, 25
Angiotensin-converting enzyme (ACE) inhibitors, Dialysis Outcomes and Practice Patterns Study findings 50
Antihypertensive agents, Dialysis Outcomes and Practice Patterns Study findings 50
Arterial blood pressure, biofeedback-driven dialysis 205, 206
Arteriovenous fistula (AVF)
  access dysfunction detection 13, 14
  advantages 12
  physical examination monitoring 14–16
  preoperative evaluation
    angiography 24, 25
    ultrasonography
      arterial assessment 25, 26
      venous assessment 27
  prevalence trends in vascular access 13
  stenosis, see Vascular access surveillance
  blood flow 18, 19
  intra-access static pressures 16, 17
  recirculation 17
Aspirin, Dialysis Outcomes and Practice Patterns Study findings 52
Atherosclerosis, oxidative stress in pathogenesis 134–136
Bicarbonate, dialysate composition 10
Biofeedback-driven dialysis
  arterial pressure biofeedback 205, 206
  biochemical monitoring and control 206, 207
  blood volume biofeedback 200–203
  body temperature biofeedback 203–205
  integrated adaptive control 207, 208
Bioimpedance, *see* Whole-body impedance spectroscopy

Biosimilar
- definition 261
- erythropoietin 244, 245, 264–267, 269
- generic drug comparison
  - immunogenicity 263, 264
  - manufacturing differences 263
  - product differences 262, 263
  - regulation of evaluation 267–269

Bisphosphonates, vascular calcification effects 230

Blood volume monitoring (BVM)
- advantages 124
- biofeedback-driven dialysis 200–203
- clinical outcomes 121–123
- overview 119, 120
- study design in diabetes 120, 121

Body composition, assessment in hemodialysis patients 109–113

Body mass index (BMI)
- correlation with hemodialysis outcomes 108–113
- urea distribution volume relationship 112, 113

Body temperature, biofeedback-driven dialysis 203–205

Body transfer resistance
- solute mass transfer 181
- treatment time effects 181, 182

Bone mineral density (BMD), monitoring in renal patients 226

B-type natriuretic peptide (BNP)
- actions 69, 70
- physiology 68, 69
- renal insufficiency effects 70–72
- therapeutic prospects 73, 74

Calcium
- absorption 211, 212
- chronic kidney disease-mineral and bone disorder biomarker 225
- dialysate composition 9, 10
- hemodialysis flux kinetics 213, 214
- intake 211
- mineral metabolism disorders and outcomes in renal patients
  - correction of causal factors and secondary event prevention 218–220
  - epidemiology 217, 218
  - pathophysiology 216, 217
  - time-related plausibility between causal factors and secondary events 218
- phosphate binders 235, 236

Cardiovascular disease
- non-traditional risk factors 223
- risks in chronic kidney disease 63–66

Central venous catheter (CVC)
- catheter type and site 41
- complications 40, 42
- continuous quality improvement care 45
- duration of use in hemodialysis patients 44
- indications in hemodialysis 40, 41
- insertion 41
- monitoring and maintenance 49, 59
- nursing and care staff 42, 43
- patient education 43
- prevalence in hemodialysis patients 39
- risk factors 44, 45

Chronic kidney disease (CKD)
- cardiovascular disease risks 63–66
- insulin resistance correlation 139
- mortality of dialysis patients 138

Chronic kidney disease-mineral and bone disorder (CKD-MBD)
- biomarkers
  - alkaline phosphatase 225
  - calcium 225
  - parathyroid hormone 224, 225
  - phosphorus 225
  - vitamin D (calcidiol) 225
- bone biopsy and histological parameters 224
- definition 224
- management
  - hyperphosphatemia control 227, 228
  - overview 227
  - secondary hyperparathyroidism control 229, 230
- soft tissue calcification imaging 225–227

Cinacalcet, secondary hyperparathyroidism control 214, 229, 238

Subject Index
Computed tomography (CT), vascular calcification 226
p-Cresol, hemodiafiltration removal 180
Cross-membrane flux, middle-molecule removal 179

Daily hemodialysis
HEMO Study of dose 146
historical perspective 147, 148
London Study of more frequent hemodialysis 148–150
prospects for more frequent dialysis 152 rationale 146, 147

Dialysate composition
acid buffering and bicarbonate 10
calcium 9, 10
potassium
arrhythmia relationship 9
calcium concentration 9
sodium
concentration 7, 8
conductivity kinetic modeling 8, 9

Dialysis membrane, see Membrane

Dialysis Outcomes and Practice Patterns Study (DOPPS)
medication use and outcome findings
analgesics 53
antihypertensive agents 50
aspirin 52
gastro-protective agents 52
multivitamins 53
overview 48, 49
statins 51, 52
study design 49
treatment time analysis 155–159, 176, 177

Distribution loop, contaminant control 2–4
DNA methylation, see Epigenetics

Dry weight, assessment 100–102, 115–118

Endothelial function, dialysis patients 84–87

Epigenetics
epigenotype manipulation 59, 60
overview 55, 56
techniques for study 56, 57
uremia and epigenotype 57–59

Erythropoietin (EPO)
biosimilars 244, 245, 264–267
erthropoiesis-stimulating agent prospects 256, 259
fusion polymers 257
gene expression regulation 259
gene therapy 258, 259
high-molecular-weight erythropoietins 256, 257
mimetic antibody fusion peptide 257
pure red cell aplasia induction 243, 244
red blood cell lifespan effects on erythropoietin-stimulating agent therapy 250–252
resistance and body composition 109
small-molecule erythropoiesis-stimulating agents 258

Folic acid
diet effects on inflammation 79
epigenetics and levels 58, 59

Gene therapy, erythropoietin 258, 259

Hemodiafiltration (HDF)
clearance performance 179–181
cross-membrane flux and middle-molecule removal 179
inflammation
chronic inflammation 186, 187
RISCAVID Study 187, 188
online hemodiafiltration
conventional mode 193, 194
disinfection and microbial monitoring 195, 196
double high-flux hemodialysis 194
hygiene rules 193
mid-dilution mode 195
paired hemofiltration 194
prescription 195
push/pull mode 194
technical prerequisites 192, 193
vascular access 193

Hemodialysis frequency, see Daily hemodialysis

Hemodialysis treatment time
body transfer resistance effects 180, 181
effects on patient outcome
Dialysis Outcomes and Practice Patterns Study 155–159, 176, 177
National Cooperative Dialysis Study 175
history of study 154, 155
nutrition effects 158
optimization 159, 160
phosphate balance 159
survival findings 155, 156
ultrafiltration rate 156–158
Hemoglobin
cycling 242, 243
target in chronic kidney disease 241, 242
HEMO Study
frequency of hemodialysis findings 146
National Cooperative Dialysis Study
dosing controversy 172, 173
observational study reconciliation 173–175
treatment time studies 158
uremic toxicity and outcomes 128, 129, 178, 179
Histamine receptor antagonists, Dialysis Outcomes and Practice Patterns Study findings 52
Hollow-fiber membrane, see Membrane
Homocysteine
epigenetics and levels 57, 58
hemodialfiltration removal 180
Hydration, see Overhydration
Hyperparathyroidism, see Secondary hyperparathyroidism
Hyperphosphatemia, control 227, 228
Inflammation
epigenetics and homocysteine levels 57, 58
hemodialfiltration
chronic inflammation 186, 187
RISCAP Study 187, 188
insulin resistance and chronic kidney disease 140
nutrition interactions
diet effects on inflammation 78–81
inflammation effect on nutritional state 77, 78
oxidative stress 84
pathogenesis 77
Insulin resistance
chronic kidney disease correlation 139
factors affecting in chronic kidney disease 140, 141
protein turnover 141–143
Kt/V
dialysis prescription 169
National Cooperative Dialysis Study
dosing controversy 169–172
Lanthanum carbonate
hyperphosphatemia control 228
secondary hyperparathyroidism control 236, 237
Leptin, hemodiafiltration removal 180
Mediterranean diet, effects on inflammation 80
Membrane
cross-membrane flux and middle-molecule removal 179
dialyzer classification by membrane composition
modified cellulosic dialyzers 165
synthetic dialyzers 165, 166
dialyzer classification by membrane composition (continued)
unmodified cellulosic dialyzers 164, 165
hollow-fiber membrane characteristics
dimensions 162, 163
non-membrane-related determinants of performance 164
pore properties 167, 168
surface area 163
vitamin E coating
clinical studies 92
mechanisms of action 92, 93
synthetic membrane biocompatibility 96
Monocyte, endothelial function in dialysis patients 84–87
Multivitamins, Dialysis Outcomes and Practice Patterns Study findings 53
Myeloperoxidase (MPO)
inflammation and oxidative stress role in
ermia 136
oxidative stress role 133, 134

NADPH oxidase, oxidative stress role 133

National Cooperative Dialysis Study (NCDS)
dosing controversy 169–172
treatment time effects on patient outcome 175

Obesity paradox, see Body mass index

Online hemodiafiltration, see
Hemodiafiltration

Online intradialytic monitoring, principles 200

Overhydration
consequences of sodium excess and overhydration 102–104
dry weight assessment 100–102, 115–118
epidemiology in dialysis patients 99, 100
modulation 104–106
whole-body impedance spectroscopy studies 115–118

Oxidative stress
atherosclerosis pathogenesis role 134–136
inflammation and endothelial function in dialysis 84
pathways 132–134
prevalence in kidney disease 135, 136
vitamin E therapy
anemia studies 93–95
dialysis membrane coating clinical studies 92
mechanisms of action 92, 93
synthetic membrane biocompatibility 96
dietary supplementation 90–92
low-density lipoprotein oxidation inhibition 90

Parathyroid hormone (PTH)
chronic kidney disease-mineral and bone
disease biomarker 224, 225

hyperparathyroidism, see Secondary hyperparathyroidism

Percutaneous balloon angioplasty, vascular access stenosis 31–33

Phosphate
absorption 211
calcium-based binders 235, 236
chronic kidney disease-mineral and bone disorder biomarker 225
hemodiafiltration removal 180
hemodialysis
flux kinetics 212, 213
treatment time and balance 159
hyperphosphatemia control 227, 228
intake 211
mineral metabolism disorders and outcomes in renal patients
correction of causal factors and secondary event prevention 218–220
epidemiology 217, 218
pathophysiology 216, 217
time-related plausibility between causal factors and secondary events 218

Physical examination, arteriovenous fistula 14–16

Potassium, dialysate
arrhythmia relationship 9
concentration 9

Procainamide, DNA methyltransferase inhibition 59

Protein turnover
insulin resistance studies 142, 143
insulin role 142

Proton pump inhibitors, Dialysis Outcomes and Practice Patterns Study findings 52

Pure red cell aplasia (PRCA), erythropoiesis-stimulating agent induction 243, 244

Reactive oxygen species, see Oxidative stress

Red blood cell (RBC), see also Anemia lifespan
determination
carbon monoxide breath testing 252, 253
Subject Index 277

chromium-51 labeling 252
effects on erythropoietin-stimulating agent therapy 250–252
overview 248, 249
pure red cell aplasia with erythropoiesis-stimulating agents 243, 244
survival in renal failure 249
Renal osteodystrophy, definition 224
RISCAVID Study 187, 188
Secondary hyperparathyroidism (SHPT) control 214, 229, 230, 235–238
pathophysiology 234, 235
Sevelamer
hyperphosphatemia control 227, 228
secondary hyperparathyroidism control 236
Sodium
consequences of sodium excess and overhydration 102–104
dialysate concentration 7, 8
conductivity kinetic modeling 8, 9
modulation of overhydration 104–106
Soy, diet effects on inflammation 80, 81
Statins, Dialysis Outcomes and Practice Patterns Study findings 51, 52
Thrombectomy, vascular access stenosis 33, 34
Treatment time, see Hemodialysis treatment time
Ultrafiltration (UF) rate, treatment time considerations 156–158
Ultrasonography
arteriovenous fistula blood flow surveillance 18, 19
preoperative fistula evaluation arterial assessment 25, 26
venous assessment 27
vascular calcification 226, 227
Urea distribution volume, body mass index relationship 112, 113
Uremia, definition 125
Uremic retention complexity 126, 127
solutes 125
Uremic syndrome, definition 125
Uremic toxicity
assessment in vitro 127, 128
definition 125
HEMO Study 128, 129
Vascular access, see also Arteriovenous fistula; Central venous catheter
online hemodiafiltration 193
percutaneous balloon angioplasty for stenosis 31–33
thrombectomy 33, 34
tunneled hemodialysis catheter procedures 34, 35
Vascular calcification, see Cardiovascular disease; Chronic kidney disease-mineral and bone disorder
Vitamin C, diet effects on inflammation 79
Vitamin D
analogs in secondary hyperparathyroidism control 229, 230, 237, 238
calcidiol as chronic kidney disease-mineral and bone disorder biomarker 225
deficiency in insulin resistance and chronic kidney disease 140, 141
Vitamin E
anemia studies 93–95
dialysis membrane coating clinical studies 92
mechanisms of action 92, 93
synthetic membrane biocompatibility 96
dietary supplementation 90–92
low-density lipoprotein oxidation inhibition 90
Water treatment
clinical benefits 4, 5
contaminant limits 2
distribution loop 2–4
prospects 5
technology 2, 5
Whole-body impedance spectroscopy (BCM)
dry weight assessment 117, 118
model description and validation 115–117