Index

Note: Page numbers in *italics* refer to Figures; those in **bold** to Tables

Abbreviated Injury Scale (AIS), 18
abusive head trauma (AHT), 58, 61
ACE see acute concussion evaluation (ACE)
ACEP see American College of Emergency Physicians (ACEP)
acute concussion evaluation (ACE), 64–5
acute stress disorder (ASD), 198–200
acute subdural hematomas
  age, outcome variable, 96
  craniotomy, 97
  indications, surgical evacuation, 94
  low-pressure venous bleeding, 96
  surgical evacuation, 97
  tomographic appearance, 93
adolescent respiratory distress syndrome (ARDS), 129, 139
agitation
  and aggression, acute phase, 79–80
  anger and aggression, 202–3
  critical illness neuropathy/myopathy (CIPNM), 153–4
  definition, 79
  delirium, 152
  directed and nondirected generalized responses, 151
  dysautonomias/paroxysmal sympathetic hyperactivity, 153
  fight/flight response, 150
  medications and adverse effects, 151
  treatment scheme, 80
AHT see abusive head trauma (AHT)
AIS see Abbreviated Injury Scale (AIS)
akinetic mutism, 80, 81
Alcohol Use Disorders Identification Test (AUDIT-C), 201
American College of Emergency Physicians (ACEP), 61, 62
antiepileptic drugs (AEDs), 147, 148
awakening and breathing coordination, delirium monitoring, and exercise/early mobility (ABCDE), 152
behavioral complications, mTBI
  first stage, 76
  PTA, 76–9
  second phase, 76–7
  third phase, 77
Benchmark Evidence from South American Trials: Treatment of Intracranial Pressure (BEST TRIP), 119–20
brain tissue oxygenation (P_{btO_2}), 122, 123
CAGE questionnaire, substance abuse, 201
catheter-related bloodstream infections (CBSIs), 142–3
cerebral biochemistry
  lactate–pyruvate ratio, 123
  microdialysis, 123–4
  cerebral oxygenation monitoring
    brain tissue oxygenation (P_{btO_2}), 122, 123
    Jugular bulb oxymetry, 121–2
    near-infrared spectroscopy (NIRS), 122–3
  cerebral perfusion pressure (CPP)
    augmentation, 128, 129
    calculation, 116
    CPP-/ICP-oriented therapy, 120
    management, 128–9
    vasopressor pumps movement, 125
  cerebral salt wasting (CSW), 148, 149, 149
  cervical artery dissection, 82
Christchurch Health and Development Study (CHDS), 186, 188
CIPNM see critical illness neuropathy/myopathy (CIPNM)
clinically important TBI (cTBI), 63, 63
cognitive behavioral therapy (CBT), 197
cognitive deficits
  attention and speed of processing, 166–7
  executive functions, 167–8
  long-term memory, 166
mild TBI patients, 215
rehabilitation see rehabilitation working memory, 166
computed tomography (CT)
  bones, cranium, 14, 16, 16–17
cranial scanning, 13
intracranial traumatic lesions, 13, 14
local/diffuse brain edema, 13
mnemonic, 16
systematic approach, 13, 15
contusions and intraparenchymal hematomas, 97–8
coping hypothesis, 167
critical illness neuropathy/myopathy (CIPNM), 153–4
Decompressive Craniectomy in Patients With Severe Traumatic rain Injury (DECRA) trial, 104, 106
depressed skull fractures
closed, 107
complications, 105
CT, 105
description, 105
epilepsy, 105
irreparable laceration, 107
open, 105
repair, 107, 108
scalp lacerations, 105
venous sinuses, 107
depression
apathy and fatigue, 196
class I pharmacotherapy study, 196
cognitive behavioral therapy (CBT), 197
increased risk assessment, 194–6
major depressive disorder (MDD), 194
methylphenidate and dextroamphetamine, 196
modafinil, 197
Neurobehavioral Functioning Inventory-Depression Scale (NFI-D), 196
Patient Health Questionnaire-9 (PHQ-9), 196
preinjury psychiatric illness, 194
selective serotonin reuptake inhibitors (SSRIs), 196
stimulants and dopamine agonists, 197
diabetes insipidus (DI), 149, 149–50
diffuse axonal injury (DAI), 14
diffusion tensor imaging (DTI)
  acute and chronic white matter, severe TBI, 29
diffusion tensor tractography, 27–8
  fractional anisotropy (FA), 26
mean diffusivity (MD), 25–6
voxel-based analysis, 26–7
diffusion tensor tractography, 27–8
diffusion weighted imaging (DWI), 24–5
DTI see diffusion tensor imaging (DTI)
DWI see diffusion weighted imaging (DWI)
dysautonomias, 137, 153
emergency department (ED)
  mTBI
    assessment, signs and symptoms, 59–61
categories, symptoms, 58, 59
CT vs. observation, 63, 64
Glasgow Coma Scale (GCS) score, 58–9
hospitalization vs. discharge, 64
immediate injury characteristics, 60
neuroimaging, 61–4
physical examination, 61
system of care, assessment, 64–5
physical and cognitive rest
  discharge instructions, 65, 66
  referral, concussion specialist/neuropsychologist, 66
rest and return to sport, 66–7
endophenotypes, TBI
  multiple vector-based analytical scheme, 9, 10
  multivariate statistical analysis, 9
epidemiology
  incidence, 184–5, 186
  prevalence, 185–7
  prevalence of disability, 187–9
epidural hematomas
craniotomy and clot evacuation, 95
craniotomy and evacuation, 95
description, 93
indications, surgical evacuation, 93, 94
infratentorial compartment, 95
surgical decompression, 94–5
excitatory–inhibitory ratio (EIR) model, 153
executive functions
definition, 167
global intellectual efficiency, 167–8
rehabilitation
  behavioral management techniques, 170
  environmental modifications, 169
  external cueing, 169
  problem-solving training (PST), 168–9
time pressure management, 169
extra-axial lesions
  acute subdural hematomas, 96–7
  contusions and intraparenchymal hematomas, 97–8
  epidural hematomas, 93–5
  posterior fossa mass lesions, 98–101
FA see fractional anisotropy (FA)
fcMRI see functional connectivity MRI (fcMRI)
fluid-attenuated inversion recovery (FLAIR)
cerebral edema, 23
white matter hyperintensities, 24
FOUR score see Full Outline of UnResponsiveness (FOUR score)
functional anisotropy (FA), 26
Full Outline of UnResponsiveness (FOUR score), 115, 117–18
functional connectivity MRI (fcMRI)
mild TBI (mTBI), 35
resting state, 32, 35
GAD see generalized anxiety disorder (GAD)
Galveston Orientation and Amnesia Test (GOAT), 77
generalized anxiety disorder (GAD), 199
Glasgow Coma Scale (GCS)
  ED patients, 59
  Full Outline of UnResponsiveness (FOUR score), 115, 117–18
  motor score, 115
mTBI diagnosis, 59, 60
Glasgow Coma Scale (GCS) (Cont’d)

3–8 score, 49–53, 120
9–12 score, 48–9
13–15 score, 47–8
severe TBI, 33
young children, 58

Glasgow Outcome Scale (GOSE), 104, 217
goal management training (GMT), 169
GOAT see Galveston Orientation and Amnesia Test (GOAT)
Guidelines for the Management of Severe Traumatic Brain Injury, 90
Guidelines for the Surgical Management of Traumatic Brain Injury, 90

helicopter emergency medical system (HEMS), 45
high-frequency jet ventilation (HFV), 139
holistic rehabilitation, 172–3, 174
hypomagnesemia, 150
hypotension, 50, 90, 134–5, 140, 154, 203
hypoxia, 90, 105, 123, 124, 134–5, 154

ICP see intracranial pressure (ICP)
incidence, TBI, 184–5
in-hospital observation
abnormal intracranial CT findings, 72
agitation and aggression, acute phase, 79–80
akinet mutism, 80, 81
anticoagulation, 75–6, 76
behavioral complications, acute phase, 76–7
criteria, admission, 72
delayed/expanding hematoma, 80–81
discharge, 83
meningitis, 81–2
mild and moderate TBI, 73–4
normal intracranial CT findings, 71
posttraumatic amnesia (PTA), 77–9
schedule and indications, 75
specialized neurosurgical centers, 72–3
traumatic cervical arterial dissection, 82, 82
ward to admit, 73–4

Injury Severity Score, 18, 142
intensive care unit (ICU) care see also systemic treatment, ICU
death, 89
discharge, 131
extra-axial lesions see extra-axial lesions
medical therapy, 89
neurological treatment, 125–31
neuromonitoring see neuromonitoring
pathophysiology, TBI, 91
preoperative evaluation and preparation, 92
tomographic appearance, traumatic intracranial mass lesions, 92, 93
Traumatic Coma Data Bank, 90
The International Neurotrauma Research Organisation in Vienna, Austria, 49
intracranial pressure (ICP)
cerebral perfusion pressure (CPP) calculation, 116
elevated, 116
intraparenchymal ICP monitoring device, 116, 118
monitoring, 118, 118–20

Jugular bulb oxymetry, 121–2
late-life dementia, 6, 188, 189
long-term memory, 166, 172
Lund concept, 130–131

magnetic resonance imaging (MRI)
acute TBI, 125
conventional, 23–5
diffusion tensor imaging (DTI), 25–8
functional connectivity MRI (fcMRI), 32–5
quantitative volumetric techniques, 28, 30–31, 31, 32
susceptibility-weighted imaging (SWI), 25
major depressive disorder (MDD), 194
mania, 195, 197, 202
Marshall classification see Trauma Coma Data Bank (TCDB) classification
meningitis, 19, 74, 81–2
mild TBI (mTBI)
cognitive and behavioral disabilities, 6
cognitive impairment, 215
computed tomography (CT) scan, 212
definition, 55, 56, 57
emergency department (ED) assessment, signs and symptoms, 59–61
CT vs. observation, 63, 64
Glasgow Coma Scale (GCS), 58–9
hospitalization vs. discharge, 64
neuroimaging, 61–4
physical examination, 61
system of care, assessment, 64–5
epidemiology
abusive head trauma (AHT), 58
motor vehicle collisions (MVC), 57
sports-related mTBI, 58
fcMRI, 35
follow-up, 212–13, 213
imaging, 213–14, 214
in-hospital observation see in-hospital observation
long-term outcome and community integration, 216, 217
magnetic resonance imaging (MRI), 212
neuropathophysiology, 57
physical and cognitive rest, 65–7
postconcussive symptoms (PCS), 211, 215
posttraumatic complications, 81
prediction, 218
prehospital management, 47–8
return to work, 215–16, 219
score, 5
social burden, 5
terminology, 57
treatment strategies
postconcussive complaints, 218–19
rehabilitation, 219
WHO Collaborating Center for Neurotrauma, 211
whole-brain functional networks, 34
moderate TBI
in-hospital observation schedule and indications, 75
observation, patients, 73–4
posttraumatic complications, 81
prehospital management, 48–9
score, 5
MRI see magnetic resonance imaging (MRI)
mTBI see mild TBI (mTBI)

National Acute Brain Injury Study: Hypothermia (NABIS:H), 138
National Ambulatory Medical Care Survey (NAMCS), 184
National Hospital Discharge Survey (NHDS), 184, 188
National Institute for Clinical Excellence (NICE) guidelines, 72, 73, 74
National Institutes of Neurological Disorders and Stroke (NINDS), 138
National Vital Statistics System, 184
near-infrared spectroscopy (NIRS), 122–3, 125
Neurobehavioral Functioning Inventory—Depression Scale (NFI-D), 196
neuroimaging
basal cisterns, 18–19
blood (lesion volume), 18
bone, 19–20
brain, 18
cranial computed tomography see computed tomography (CT)
functional connectivity assessment, 32–4
magnetic resonance imaging (MRI), 125
MRI see magnetic resonance imaging (MRI)
mTBI the Canadian CT Head Rule, 61 clinically important TBI (cTBI), 61 indications, head CT scan, 61, 62 the New Orleans Criteria, 61 noncontrast CT, 61 noncontrast CT, 124 PET imaging, 125 Rotterdam CT score, 21, 21 Trauma Coma Data Bank (TCDB) classification, 20–21 ventricles, 19
neurological treatment
level 3 and 4 interventions, 129–30
level 1 interventions, 126–9
level 2 interventions, 129
neurologic syndromes
seizure detection, 148
seizure prevention, 147
neuromonitoring
CBF monitors, 120, 121
cerebral biochemistry, 123–4
cerebral oxygenation monitoring, 120–123
clinical deterioration, 115
electrical function monitoring, 124
GCS vs. FOUR score, 115, 117–18
intracranial pressure (ICP) and cerebral perfusion pressure monitoring, 116, 118–20
multimodality monitoring, 124, 125
neuromuscular blockade, 136, 137–8
neuropathophysiology, mTBI, 57
neuropsychiatric and behavioral sequelae
acute stress disorder/posttraumatic stress disorder, 198
agitation, anger and aggression, 202–3
depression, 194–7
generalized anxiety disorder (GAD), 199
mania, 197
obsessive-compulsive disorder (OCD), 199–200
panic disorder, 199–200
psychiatric disorders assessment, 192–3
psychotic symptoms, 200–201
risk factors, 193–4
sleep disturbance, 203
substance abuse, 201–2
treatments, 196–7
NeuroQuant®, 31
neurosurgical centers, 72–3, 81
NIRS see near-infrared spectroscopy (NIRS)
noncontrast CT, 61, 124
nonfocal intraparenchymal lesions
critical care management, 102
decompressive craniectomy, 104, 105
DECRA trial, 104
diffuse axonal injury (DAI), 101
Selfotel trial, 104

obsessive–compulsive disorder (OCD), 199–200
Ohio State University TBI Identification Method (OSU TBI-ID), 187
out-of-hospital management see prehospital management
panic disorder, 199
paroxysmal sympathetic hyperactivity (PSH), 153
pathophysiology
phases, 91
primary injury, 91
secondary injury, 91
PCS see postconcussion syndrome (PCS)
penetrating brain injury
avoidance of infection, 109
management algorithms, 108
mortality rate, 108
multiple prognostic indicators, 108
stab and gunshot (GSW) wounds, 108
surgical management, 109
pharmacologic interventions, 7–8
pituitary dysfunction and electrolyte abnormalities
aldosterone secretion, 150
cerebral salt wasting (CSW), 149
diabetes insipidus (DI), 149–50
hypomagnesemia, 150
iatrogenic hypernatremia, 150
potassium regulation, 150
syndrome of inappropriate antidiuretic hormone (SIADH), 148, 149, 149
positive end-expiratory pressure (PEEP), 138–9
postconcussion syndrome (PCS), 66
postconcussive symptoms, 211, 215
posterior fossa mass lesions
epidural hematomas, 99
intracerebral hematomas, 101, 103
mass effect, 101
preoperative planning, 101
scalp lacerations and open fractures, 99
standard ICP monitoring techniques, 99
surgical management, 101, 102
ventriculostomy, 101
posttraumatic amnesia (PTA), 166
anterograde memory impairment, 78
characteristics, 166
definition, 77
disorientation and anterograde amnesia, 77
Nijmegen PTA scale, 77, 78
posttraumatic epidural hematoma, 101, 103
mass effect, 101
preoperative planning, 101
scalp lacerations and open fractures, 99
standard ICP monitoring techniques, 99
surgical management, 101, 102
ventriculostomy, 101
posttraumatic stress disorder (PTSD), 198–200
prehospital management
mild TBI
anticoagulants, 48
hypoxemia and hyperventilation, 47–8
immobilization, spine, 48
patient-related factors, 48
moderate TBI, 48–9
patient categorization, GCS, 46
severe TBI see severe TBI
problem-solving training (PST), 168–9
propofol infusion syndrome, 126–7
PSH see paroxysmal sympathetic
early activity (PSH)
PST see problem-solving training (PST)
psychiatric disorders
deficits/cognitive impairment, awareness, 193
depression see depression
depression see depression
equity and behavioral functioning, 193
injury-related factors, 193
post-TBI psychiatric evaluation, 192
relevant premorbid factors, 193
psychotic symptoms, 200–201
PTA see posttraumatic amnesia (PTA)
regional oxygen saturation (rSO2), 123
rehabilitation
attention, 170–171
evidence-based cognitive rehabilitation, 173, 173
executive functions, 168–70
holistic rehabilitation, 172–3
long-term memory, 172
reviews and meta-analyses, 173–4
working memory, 171
respiratory issues, ICU
traceostomy, 142
ventilator-associated pneumonia (VAP), 139–42
ventilator management, 138–9
Richmond Agitation–Sedation Score (RASS), 151–2
Rotterdam CT score, 21, 21
second-impact syndrome (SIS), 66
sedation
comatose patients, 126
dexmedetomidine, 136–7
dosing, 136
propofol, 135–6
short-acting sedatives, 135
seizure
detection, 148
intracranial pressure (ICP), 128
nonconvulsive, 124
prevention, 147
selective serotonin reuptake inhibitors (SSRIs), 196
severe TBI
airway management, 49
algorithm, 52, 53
antishock garments, 51
autotransfusion, 51
chin lift and jaw trust, 49
gastric tube, 50
hypoventilation, 50
intravenous access, 51
intubated and nonintubated groups, 49
MIST protocol, 51, 52
oxygen supply and ventilation control, 50
prehospital management, 49–53
score, 5
shaken baby syndrome, 58
Short Michigan Alcohol Screening Test (SMAST), 201
SIS see second-impact syndrome (SIS)
skull base fracture, 81
sleep disturbance, 77, 193, 198, 203
social burden, TBI
European estimates, 5
US estimates, 4
substance abuse, 6, 34, 188, 193, 194, 196, 201–2
susceptibility-weighted imaging (SWI), 22, 23, 25
syndrome of inappropriate antidiuretic hormone
(SIADH), 148, 149
systemic treatment, ICU
agitation, 150–154
airway, breathing, and circulation (ABCs)
reassessment, 134
analgesia, 136, 137
catheter-related infections, 142–3
fluids, 144–5
glucose, 146
hypoxia and hypotension, 134–5
neurologic syndromes see neurologic syndromes
neuromuscular blockade, 136, 137–8
nutrition, 145–6
pituitary dysfunction and electrolyte
abnormalities, 148–50
respiratory issues, 138–42
sedation, 135–7
temperature management, 138
transfusions, 144
venous thromboembolism prophylaxis and
treatment, 143–4
TBI see traumatic brain injury (TBI)
TCDB classification see Trauma Coma Data Bank
(TCDB) classification
tensor-based morphometry (TBM), 30
tissue oxygenation index (TOI), 123
tracheostomy, 142, 142, 150
transcranial Doppler, 120, 125
Transfusion Requirements in the Critical Care (TRICC) trial, 144
transfusions, 76, 101, 144
Trauma Coma Data Bank (TCDB) classification
description, 20
limitations, 21
shift cutoff value, 18
TBI patients categories, 20, 20
traumatic brain injury (TBI)
as chronic, lifelong condition, 6–7
classification, 8–9
cognitive impairments see cognitive deficits
divisions, 115
endophenotypes, 9, 10
fever, 138
mechanically ventilated patient, 139–40
mild see mild TBI (mTBI)
paucity, therapies, 7–8
secondary brain insults, 115, 116
social burden, 4–5
traumatic cervical arterial dissection, 82
ventilator-associated pneumonia (VAP)
antibiotic regimens, 140, 141
fiber-optic bronchoscopy, 140
incidence rates, 140
preventive strategies, 141
tracheostomy, 141
voxel-based morphometry (VBM), 30
Wechsler Adult Intelligence Scale, 167
WHO Collaborating Center for Neurotrauma, 211
working memory, 166, 171
X-skull radiography, 19
zero positive end-expiratory pressure (ZEEP), 139