

# Index

- abbreviated injury scale (AIS), 57–8, 58*t*
- abducent nerve palsy, 37
- abusive trauma in  
 childhood, 18
- Acceptance and Commitment Therapy (ACT), 332
- acquired brain injury (ABI), 302
- acute encephalopathy, 41
- acute imaging, 43
- acute in-patient environment  
 cognitive assessment, 275–6
- Acute Lung Injury (ALI), 168
- Acute Respiratory Distress Syndrome (ARDS), 168–9
- acute subdural haematomas (ASDH), 27, 200, 210*f*, 211
- Addenbrooke's Cognitive Examination-III (ACE-III), 279
- Advanced Critical Care Practitioner (ACCP), 91
- Advanced Trauma Life Support (ATLS), 34, 78, 222, 308, 382
- aerobic glycolysis (Warburg Effect), 135
- age variation in traumatic brain injury, 5
- aged populations outcome and prognosis, 371
- agitation of patients, 78
- airway management and intubation, 78–9, 222–3
- airway obstruction management, 76, 77*f*
- airway protection, 148
- alcohol and traumatic brain injury, 7
- $\alpha$ -amino-3-hydroxy-5-methyl-4-isoxazole propionic acid (AMPA) receptors, 19
- Alzheimer's disease, 19, 20, 326, 371
- American College of Emergency Physicians/Centers for Disease Control and Prevention (ACEP/CDC), 44, 45*t*
- American European Consensus Conference, 168
- American Trauma Life Support guidelines, 259
- amyloid plaque, 19
- anaesthesia for emergency neurosurgery  
 cerebral perfusion pressure, 199
- extubation and postoperative care, 203
- haemodynamics, 198–9
- induction of, 200–1
- intra-operative management, 202–3
- intracranial pressure, 199
- introduction to, 197
- maintenance of, 202*t*
- monitoring of, 201
- pathophysiology, 197, 198*t*
- patient positioning, 201–2
- perioperative assessment and, 199–203
- preoperative assessment and, 199–200
- target directed strategies, 198–9
- timing of, 200
- analgesia options, 150–3
- anatomical scoring system, 57–8, 58*t*
- Andexanet alfa, 80
- animal (large) models, 25–6
- anosognosia, 358
- Antecedent Behaviour Consequence (ABC) Charts, 335, 337*f*
- anterior nasosethmoidal repair, 231
- anterior wall fractures, 233
- anteriograde amnesia, 277
- anti-epileptic drugs (AEDs), 251
- anti-platelet agents, 80
- anticonvulsants, 149, 266–7
- anxiety management training, 338
- Apolipoprotein E4 (APOE 4) allele, 371
- apparent diffusion coefficient (ADC), 48
- assaults and TBIs, 6
- assessment. *see also* capacity  
 assessment in clinical practice; clinical assessment; cognition assessment  
 behavioural assessment, 29–30  
 of cerebral blood flow, 138–40  
 of communication skills, 316
- craniofacial trauma, 223–5, 224*f*
- Glasgow Coma Scale, 34–6, 35*t*
- intensive care management, 97–8, 98*t*, 99, 266
- interview process in, 285, 286*f*
- mild traumatic brain injury, 341
- motor assessments, 30
- paediatric traumatic brain injury, 259*t*, 260
- perioperative assessment, 199–203
- preoperative assessment, 199–200
- processing speed assessment, 278
- Sports Concussion Assessment Tool, 77, 254
- St Andrews Sexual Behaviour Assessment, 335
- assistive technology for cognition (ATC)  
 attention functions, 354–5  
 effectiveness of, 354–8  
 emotional functions, 355–6  
 facilitating use of, 358–9  
 higher-level cognitive functions, 356–7

- (ATC) (cont.)  
 introduction to, 353, 354*t*  
 memory functions, 355  
 self and time functions, 357–8  
 summary of, 359  
 Association of Anaesthetists of Great Britain and Ireland (AAGBI), 200  
 ATC. *see* assistive technology for cognition  
 attention functions and ATC, 354–5  
 attention impairments, 277–8, 283, 329  
 awareness in rehabilitation, 328  
 axonal injury, 26–7, 28, 44. *see also* traumatic axonal injury
- barbiturate coma, 157–8  
 bedside testing, 279*f*, 279  
 behavioural assessment in traumatic brain injury (TBI) models, 29–30  
 behavioural management after TBI  
 introduction to, 333–4  
 neuropsychological rehabilitation, 333–9  
 overview of, 334–8, 335*f*, 336*f*, 337*f*  
 personality changes, 339–40  
 post-traumatic amnesia, 338–9  
 reduced insight and self-awareness, 339  
 bicoronal incision, 230  
 bifrontal decompressive craniectomy, 158  
 biomarker use in pre-hospital management, 81  
 biomechanical injury variables, 24–5  
 blast injuries, 29, 372  
 blast theory, 165  
 blood-oxygen-level-dependent (BOLD) signals, 49–50  
 Bolam test, 380–1  
*Bolitho v City and Hackney*, 381  
 bone resorption after cranioplasty, 244–5  
 BOOST-II trial, 140  
 Botulinum Toxin A (BTX-A), 312
- brain apnoea management, 76, 77*f*  
 brain chemistry, 150  
 brain contusions and lacerations, 13–14  
 brain dehydration, 155  
 brain-directed therapies, 102–3  
 brain injury induced coagulopathy, 80–1  
 brain swelling, 17–18  
 brain tissue biochemistry, 150  
 brain tissue oximetry, 140–1  
 Brain Trauma Foundation (BTF), 99, 102, 113, 127, 166, 199, 250–1  
 brainstem avulsion, 15  
 brainstem death (BSD)  
 anatomy and physiology, 186–7  
 brief history, 186  
 chronic lung disease, 190  
 common causes, 187  
 confirmatory tests, 190, 191*t*  
 devastating brain injury, 47–8, 187–8  
 diagnosis situations, 189*t*, 189–90  
 high spinal cord injury, 190  
 international variation in diagnosis, 190–1  
 long-acting sedative agents and, 190  
 organ and tissue donation, 191–5  
 paediatric situations, 189  
 pathophysiology of, 187  
 summary of, 195  
 UK code of practice for BSD testing, 188*t*, 188–9  
 breathing and pre-hospital management, 79  
 British Society of Rehabilitation Medicine (BSRM), 308  
 bulbar function, 199–200
- calpain activation, 16–17  
 capacity assessment in clinical practice  
 advance decisions, 281–2  
 clarification of, 284  
 clinical judgement, 287  
 cognitive assessment and, 286–7  
 conditions for, 285  
 facilitation of, 287
- fluctuating control, 281  
 gathering information, 284–5  
 interview process, 285, 286*f*  
 introduction to, 281  
 neuropsychological factors affecting decision-making, 282–4  
 overview of, 279–82  
 process of, 284–7  
 summary of, 287, 288*f*  
 unwise decisions, 281  
 urgent decisions, 282  
 carbon dioxide, 153  
 cardiac complications, 104  
 cardiorespiratory issues  
 Acute Respiratory Distress Syndrome, 168–9  
 cardiac dysfunction, 164–5  
 dobutamine for blood flow, 167  
 epinephrine for CPP control, 166  
 norepinephrine for CPP control, 166  
 pneumonia, 168  
 respiratory complications, 167  
 systemic complications, 164  
 tracheostomy, 170–1  
 vasoactive drugs and, 166  
 venous thromboembolism, 169–70  
 cardiorespiratory support management, 99–101  
 carotidocavernous fistula (CCF), 253  
 case conferences, 294  
 catecholamine surge, 167  
 catheter placement in microdialysis, 136, 137*f*  
 cavernous carotid fistula (CCF), 37  
 cell death, 20  
 cell type variables, 24–5  
 cellular models, 24–5  
 central craniofacial fractures, 226–7  
 central nervous system (CNS) infection, 249–50  
 centrolateral craniofacial fractures, 227  
 cerebral autoregulation, 121, 122*f*, 198

- cerebral blood flow (CBF)  
assessment of, 138–40  
ICP impact on, 110, 132  
maintenance of, 146  
monitoring of, 137–40  
overview of, 30  
sedative agents and, 150
- cerebral blood volume,  
153, 198
- cerebral metabolic rate for  
oxygen (CMRO<sub>2</sub>), 150–1
- cerebral metabolism, 135–6
- cerebral oxygenation  
monitoring, 137–8,  
140–2
- cerebral perfusion  
pressure (CPP)  
anaesthesia for emergency  
neurosurgery, 199
- brain tissue  
biochemistry, 150
- clinical outcomes in TBI,  
124, 125*f*, 126*f*
- epinephrine for CPP  
control, 166
- ICP and, 30
- intensive care management  
and, 97–8, 98*t*, 99, 266
- Lund protocol and, 146–7
- management of, 91, 102–3
- monitoring of, 132, 133,  
137–40
- norepinephrine for CPP  
control, 166
- positioning in cerebral  
perfusion, 309–10
- respiratory care  
rehabilitation and, 309
- therapy protocols for, 147–8
- vasoactive drugs and, 166
- vasopressor and, 99
- cerebrospinal compensatory  
reserve (RAP), 122, 124*f*
- cerebrospinal fluid (CSF), 86,  
110, 112, 113*t*, 215
- cerebrospinal fluid (CSF) leaks  
craniofacial trauma and, 235
- neurosurgical  
complications, 247
- pneumocephalus  
complications, 247–8
- cervical spine injuries, 381–2,  
383–4*t*
- cervical spine protection,  
78, 223
- cervicomedullary syndrome, 41
- Charlson Comorbidity Index  
(mCCI), 60
- children  
abusive trauma in  
childhood, 18  
impact of parental TBI, 298  
neuropsychological  
rehabilitation in, 343–5
- chronic lung disease, 190
- chronic subdural haematoma  
(CSDH), 41, 211, 212*f*,  
251–2
- chronic traumatic  
encephalopathy (CTE),  
254, 371, 372
- circulation and pre-hospital  
management, 79
- Citizen's Advice Bureau, 296
- Citizens' Advice Bureau, 386
- classification of head injuries  
craniofacial trauma, 225–8
- epidemiology of traumatic  
brain injury, 1, 2*t*
- Le Fort classification of  
fractures, 226, 227*t*
- mild traumatic brain injury,  
66, 341
- clinical assessment  
cranial nerves and, 37*f*,  
37–8
- examinations, 34
- external examination, 36–7
- false localizing signs, 38, 39*f*
- Glasgow Coma Scale (GCS)  
assessment, 34–6, 35*t*
- history-taking, 34
- intracranial herniation,  
39, 40*f*
- introduction to, 34
- non-accidental traumatic  
brain injury, 40–2, 41*f*
- peripheral nervous  
system, 38
- pupillary reflexes, 36
- raised intracranial  
pressure, 38
- clinical outcomes in TBI, 124,  
125*f*, 126*f*
- COACH system, 356
- coagulopathy in brain  
injury, 80–1
- cognition assessment  
in acute in-patient  
environment, 275–6
- attention impairment, 277–8
- bedside testing, 279*f*, 279
- capacity assessment and,  
286–7
- capacity assessment in  
clinical practice, 279–82
- cognitive functioning  
impairments, 276–7
- executive functioning, 278
- of impairments, 276–7
- introduction to, 275
- memory impairment, 277
- neuropsychological  
rehabilitation, 326–7
- perception processes, 278
- process of, 276
- processing speed, 278
- rehabilitation and, 318
- speech and language  
impairment, 278
- cognitive behavioural therapy  
(CBT), 331–2
- cognitive communication  
disorder, 316
- cognitive impairments, 326,  
327–8, 359
- cognitive tests, 30
- communication  
assessment of  
communication skills, 316
- complications with, 282
- introduction to, 315–16
- neuropsychological  
rehabilitation, 330
- occupational therapy  
for, 317
- during recovery, 291–2
- rehabilitation of disorders,  
315–17
- Community Brain Injury  
Rehabilitation Centre, 303
- community rehabilitation,  
320–1
- computed tomography (CT)  
scanning  
cervical spine injuries, 382
- craniofacial trauma, 229
- extradural haematomas,  
209*f*, 210
- interhospital transfer of  
brain-injured patients  
and, 87
- intracerebral  
haematomas, 213
- measurement data from, 365
- for mild TBI, 69
- NICE head injury guidelines,  
44*t*, 207

- (CT) scanning (cont.)  
 overview of, 43–5  
 traumatic intracranial haematomas, 208
- Computer Aided Design and Manufactured modelled implants (CAD/CAM), 228
- concussion, 77, 254–5
- continuous EEG (cEEG) monitoring, 142–3
- contracoup injury, 13–14
- controlled cortical impact (CCI) model, 26–7, 29
- Cormack-Lehane laryngoscopy, 201
- coroner reports, 379
- cortical spreading depolarisation (CSD), 143
- cost effectiveness in intensive care management, 105
- cranial nerves, 15, 37*f*, 37–8, 252, 253*t*
- craniofacial trauma  
 airway management and intubation, 222–3  
 assessment of, 223–5, 224*f*  
 cerebrospinal fluid leaks, 235  
 cervical spine immobilisation, 223  
 classification of fractures, 225–8  
 early management, 222–5  
 frontal sinus fractures, 232–4, 233*f*  
 imaging with, 225, 226*f*  
 introduction to, 222  
 operative considerations in management of, 229–34  
 orbital injuries with, 229  
 pan-facial injury sequencing, 229–32  
 reconstruction aims, 228–9  
 surgical intervention timing, 234
- cranioplasty after head trauma  
 bone resorption after, 244–5  
 complications of, 243–5  
 infections after, 244  
 introduction to, 238  
 material choices, 239–40  
 Neurological Susceptibility to a Skull Defect, 238–9  
 post-operative fluid collections, 244  
 sudden death after, 243–4
- summary of, 245  
 surgical intervention timing, 238  
 techniques for, 240–3, 242*f*  
 titanium for, 239–40
- cultural issues and family role in recovery, 293
- cytoskeletal proteins, 16–17
- Dabigatran, 80
- decompressive craniectomy (DC), 158, 216, 264–6, 265*f*
- Decompressive Craniectomy (DECRA) trial, 158, 216
- deep vein thrombosis (DVT), 169–70
- default mode network (DMN), 50
- delayed traumatic intracerebral haematoma (DTICH), 213
- dementia pugilistica, 19
- dementia risk, 370–1
- depressed skull fractures, 217, 248, 249*f*
- devastating brain injury (DBI), 47–8, 187–8
- diffuse axonal injury (DAI), 15, 44, 46
- diffuse brain injury models, 27–8
- diffuse vascular injury, 17
- Diffusion Tensor Imaging (DTI), 48–9, 69
- diffusion-weighted imaging (DWI), 48, 49*f*
- diplopia, 37
- disability and outcome measures and scoring, 368–70
- disability and pre-hospital management, 79
- Disability Rating Scale (DRS), 365–6, 367*t*
- discharge and family role in recovery, 297–8
- dobutamine for blood flow, 167
- donation following cardiac death (DCD), 194–5
- driving license authorities, 379
- drug induced coagulopathy, 80
- dura repair, 231
- dysphagia therapy, 315
- echocardiograms (ECGs), 164–5
- electrocardiograph (ECG), 200
- electroencephalogram (EEG), 251
- electrolyte dysfunction, 104
- electrophysiology monitoring, 142–3
- emergency anaesthesia. *see* anaesthesia for emergency neurosurgery
- emotional disorders and neuropsychological rehabilitation, 330–2
- emotional functions and ATC, 355–6
- emotional state and neuropsychological complications, 284
- encephalopathy, 41, 254–5
- endocrine dysfunction, 104, 268
- endotracheal tube (ETT), 201, 202
- epidemiology of traumatic brain injury  
 age variation, 5  
 alcohol and, 7  
 association with other structures, 5  
 burden of, 1–3  
 causes of, 6, 7*f*  
 definition and classification, 1, 2*t*  
 gender variation, 5  
 incidence of, 3–4*t*, 3–5  
 introduction to, 1  
 mortality rates, 6  
 prevention strategies, 9*t*, 10  
 severity, 5–6  
 sports injuries, 7–9
- epidural haematoma, 27
- epilepsy, 268
- epinephrine for CPP control, 166
- episodic memory, 277
- erythropoietin, 103
- European Committee for Standardisation (CEN), 88
- European Union (EU), 2–3
- EuroTARN initiative, 62
- excitotoxicity in head injuries, 19–20
- executive functioning capacity assessment, 278, 286

- neuropsychological complications, 283*f*, 283  
 neuropsychological rehabilitation, 329  
 expectation management during recovery, 292  
 experimental traumatic brain injury (TBI) models  
   acute subdural haematomas, 27  
   behavioural assessment, 29–30  
   blast injury models, 29  
   cellular models, 24–5  
   cerebral blood flow/oedema, 30  
   controlled cortical impact model, 26–7, 29  
   diffuse brain injury models, 27–8  
   extradural haemorrhage models, 27  
   focal axonal injury, 28  
   focal traumatic brain injury models, 26–7  
   impact acceleration model, 28  
   inertial acceleration model, 27–8  
   intracranial/cerebral perfusion pressure, 30  
   introduction to, 24  
   large animal models, 25–6  
   lateral fluid percussion model, 29  
   outcome measurements in, 29  
   rodent models, 26  
   summary of, 30–1  
   weight drop model, 26  
 explicit memory, 277  
 extension, defined, 35  
 external examination, 36–7  
 external ventricular drain (EVD), 158, 215–16, 250  
 extra-corporeal carbon dioxide removal, 169  
 Extracorporeal Membrane Oxygenation (ECMO), 82  
 extracorporeal membrane oxygenation (ECMO), 169  
 extradural haematoma (EDH), 209*f*, 210, 260, 261*f*  
 extradural haemorrhage, 14, 27  
 extubation in emergency anaesthesia, 203  
 Facial Fracture Severity Score (FFSS), 226  
 false localizing signs, 38, 39*f*  
 family role in recovery  
   abusive/aggressive visitors, 296–7  
   in acute stage, 290–1  
   communication during, 291–2  
   cultural issues, 293  
   discharge and, 297–8  
   dissatisfied relatives and, 296  
   family, defined, 290  
   information services, 293  
   introduction to, 290  
   management of  
     expectations, 292  
     patient care and, 292–3  
     practical management of difficulties, 296–7  
   in rehabilitation, 293–6, 295*f*  
   substance misuse problems, 296  
   summary of, 298  
 fat embolism, 18  
 Fiberoptic Endoscopic Evaluation of Swallowing (FEES), 314  
 FLAIR (fluid attenuated inversion recovery), 46  
 flexion, defined, 35  
 focal axonal injury, 28  
 focal traumatic brain injury models, 26–7  
 focal vascular injury, 15  
 frontal sinus fractures, 232–4, 233*f*  
 Functional Assessment Measure (FAM), 366  
 Functional Independence Measure (FIM), 366  
 functional MRI (fMRI), 49–50, 69, 341  
 functional recovery, 318  
 Galveston Orientation and Amnesia Test (GOAT), 338  
 gender variation in traumatic brain injury, 5  
 general intensive care management, 99, 100*t*  
 Generalised Anxiety Disorder (GAD), 331  
 genetic factors in outcome and prognosis, 371  
 genetic manipulation in models, 25  
 Glasgow Coma Scale (GCS)  
   anaesthesia for emergency neurosurgery, 197  
   assessment, 34–6, 35*t*  
   craniofacial trauma, 223  
   in current practice, 59  
   interhospital transfer of brain-injured patients, 90, 92–4  
   level of awareness, 364  
   paediatric traumatic brain injury, 258, 259*t*, 260  
   prediction methodology, 60  
   scores, 1  
   therapeutic hypothermia and, 156  
   traumatic intracranial haematomas, 207  
 Glasgow Outcome Scale (GOS), 365, 366*t*  
 Glial fibrillary acidic protein (GFAP), 69  
 global positioning system (GPS), 357  
 glucose energy, 134–5  
 glutamate levels, 136  
 glycaemic control, 101  
 Goal Management Training (GMT), 329  
 gradient recalled echo (GRE), 46  
 group rehabilitation, 333  
 growing skull fracture (GSF), 248, 262–4, 265*f*  
 Guidelines for the Management of Severe Traumatic Brain Injury, 127  
 gun violence, 6  
 gyrencephalic brains of large animal models, 25  
 Haddon, William, Jr., 9  
 haemodynamics, 148, 198–9  
*Head Injury:*  
   *A Multidisciplinary Approach* (Whitfield, Thomas, Summers, Whyte, Hutchinson), 378  
 Helicopter Emergency Medical Services (HEMS), 89  
 high frequency oscillatory ventilation (HFOV), 169  
 high spinal cord injury, 190

- higher-level cognitive functions, 356–7  
 history-taking in clinical assessment, 34  
 Human Tissue Act 2004 (HTA), 192  
 Hutchinson, Peter J., 378  
 hydrocephalus, 252  
 hyperosmolar therapy, 203  
 hypertonic saline, 155  
 hypoglycaemia, 101  
 hypopituitarism, 268  
 hypotension, 88  
 hypothermia as therapy, 155–7, 267  
 hypoxaemia, 88  
 hypoxic brain injury, 76, 77f
- imaging in trauma. *see* neuroimaging in trauma  
 Immediate Post-concussion Assessment and Cognitive Test (ImPACT), 70  
 impact acceleration model, 28  
 Impact Brain Apnoea, 77  
 implicit memory, 277  
*in vitro* cellular models, 24–5  
*in vivo* cellular models, 24, 25–6, 132–3  
 inertial acceleration model, 27–8  
 infections after cranioplasty, 244  
 informed consent, 381  
 injury severity score (ISS), 57–8, 58t, 60  
 input measures in trauma scoring systems, 57  
 insight and behavioural management after TBI, 339  
 insight and neuropsychological complications, 283–4  
 intensive care management  
   brain-directed therapies, 102–3  
   cardiac complications, 104  
   cardiorespiratory support, 99–101  
   care team, 105  
   electrolyte and endocrine dysfunction, 104  
   general intensive care management, 99, 100t  
   glycaemic control, 101  
   of intracranial and cerebral perfusion pressures, 102–3  
   introduction to, 97t, 97  
   length of stay and cost effectiveness, 105  
   management protocols, 105  
   monitoring and assessment, 97–8, 98t, 99, 266  
   neurocritical care benefits, 104–5  
   neurosurgical intervention, 103  
   paediatric traumatic brain injury, 266–7  
   pulmonary complications, 104  
   seizures, 101  
   summary of, 105–6  
   supportive measures, 101–2  
   systemic complications, 103–4  
   temperature management, 101  
   therapeutic nihilism, 105  
 Intensive Care Units, 215  
 interhospital transfer of brain-injured patients  
   checklists for, 92–4, 93f, 93t  
   conduct of, 87–9  
   indications for, 86–7  
   introduction to, 86  
   maintaining standards for, 90–2, 91t, 92t  
   non-surgical patient management, 90  
   primary transfer to tertiary referral centres, 89–90  
   summary of, 94  
   training for, 94  
 internal memory, 328  
 International Classification of Diseases (ICD), 1, 2t  
   codes, 59  
 International Classification of Functioning, Disability and Health (ICF), 301, 327, 353, 354t  
 International Multidisciplinary Consensus Conference on Multimodality Monitoring in Neurocritical Care, 132  
 interview process in assessment, 285, 286f
- intra-operative management of emergency anaesthesia, 202–3  
 intracerebral haematomas, 212–14, 213f  
 intracranial haemorrhage, 14–15  
 intracranial herniation, 39, 40f  
 intracranial hypertension (IcHTN), 148, 150, 151t, 152f, 198, 199, 223  
 intracranial perfusion pressures, 102–3  
 intracranial pressure (ICP)  
   anaesthesia for emergency neurosurgery, 199  
   analysis of waveforms, 114f, 116f, 118f, 119f, 120–1  
   background, 110  
   cerebral autoregulation assessment, 121, 122f  
   cerebral blood flow, 110, 132  
   cerebrospinal compensatory reserve, 122, 124f  
   clinical outcomes in TBI, 124, 125f, 126f  
   clinical use of, 127–8  
   common patterns after injury, 113–21, 114f, 116f, 118f, 119f, 120f  
   CPP and, 30  
   decompressive craniectomy, 216  
   definitions and pathophysiology, 110–12, 111f  
   Lund protocol and, 146–7  
   manual chest techniques, 310, 311  
   monitoring of, 215  
   multimodality monitoring, 132  
   overview of, 38, 88  
   post-operative increases, 208  
   pre-hospital management, 79–80  
   RESCUE-ICP trial, 103, 158  
   respiratory care rehabilitation and, 309  
   specific ICP care, 79–80  
   surgical management of, 158–9, 207  
   technology of, 112, 113t



- therapeutic hypothermia  
 and, 156  
 values and treatment  
 thresholds, 112–13
- intractable intracranial  
 hypertension, 215–16
- intraventricular haemorrhage  
 (IVH), 15, 262, 264*f*
- intubation, 78–9, 100
- jugular vein oximetry (SjvO<sub>2</sub>),  
 142, 151
- ketamine, 78, 152
- lacerations with craniofacial  
 trauma, 224–5
- lactate/pyruvate ratio  
 (LPR), 136
- language impairment  
 assessment, 278
- language rehabilitation,  
 314–15, 330
- large animal models, 25–6
- large skull defect, 238–9
- Laser Doppler flowmetry,  
 121, 139
- lateral craniofacial  
 fractures, 228
- lateral fluid percussion (LFP)  
 model, 29
- Le Fort classification of  
 fractures, 226, 227*t*
- length of stay in intensive care  
 management, 105
- Licor Brain Oxygen  
 Monitoring System, 140
- life expectancy, 378
- localisation to pain, 35
- long-acting sedative  
 agents, 190
- long-term memory, 277
- loss of consciousness  
 (LOC), 340
- Lund protocol, 146–7
- magnetic resonance imaging  
 (MRI), 46–8, 47*f*, 365,  
 382
- Major Trauma Centre (MTC),  
 89, 222, 321
- Major Trauma Networks  
 (MTN), 89
- management protocols in  
 intensive care, 105
- mannitol, 154–5
- manual chest techniques  
 (MCT), 310, 311
- manual hyper-inflation  
 (MHI), 310
- Manual In-Line Spinal  
 Immobilisation  
 (MILSI), 201
- marital breakdown post-  
 trauma, 297
- Maxillofacial Injury Severity  
 Score (MFISS), 225
- mean arterial pressure (MAP),  
 110, 147–8, 166, 199
- measures and scoring. *see also*  
 computed tomography  
 (CT) scanning; Glasgow  
 Coma Scale  
 coma/level of awareness, 364  
 compounding effects of  
 secondary insults, 370  
 Disability Rating Scale,  
 365–6, 367*t*  
 Glasgow Outcome Scale,  
 365, 366*t*  
 input measures, 57  
 intensive care management,  
 101–2  
 magnetic resonance imaging  
 (MRI) scan, 365  
 outcome of, 60, 364–6  
 Patient Reported Outcome  
 Measures, 63  
 post-traumatic amnesia, 364  
 prognostic models of, 368  
 threshold values, 366–8  
 in trauma scoring  
 systems, 57
- medical negligence, 379–81,  
 380*t*
- Medical Research Council  
 (MRC) CRASH trial, 368
- medico-legal aspects  
 cervical spine injuries,  
 381–2, 383–4*t*  
 driving license  
 authorities, 379  
 introduction to, 377  
 medical negligence, 379–81,  
 380*t*  
 personal injury, 377–9  
 police and coroner  
 reports, 379  
 summary of, 387  
 support services, 386  
 whiplash associated  
 disorders, 382–6, 385*t*
- memory  
 ATC and, 355  
 cognition assessment, 277  
 episodic memory, 277  
 explicit memory, 277  
 impairment assessment, 277  
 implicit memory, 277  
 internal memory, 328  
 long-term memory, 277  
 neuropsychological  
 complications, 282–3  
 neuropsychological  
 rehabilitation, 328–9  
 procedural memory, 277  
 short-term memory, 277  
 working memory, 277
- meningitis, 235, 248, 250
- methylphenidate for attention  
 impairments, 329
- microdialysis  
 brain tissue  
 biochemistry, 150  
 catheter placement, 136, 137*f*  
 future of, 137  
 introduction to, 132–3  
 markers of cerebral  
 metabolism and injury,  
 134–6, 135*f*  
 multimodality monitoring  
 and, 132–7  
 principles of, 133, 134*f*
- mild traumatic brain injury  
 (mTBI)  
 assessment of, 341  
 behavioural changes  
 after, 340  
 classification system, 66, 341  
 clinical evaluation and, 68  
 defined, 65–7  
 discharge advice and follow-  
 up, 70–1  
 epidemiology of, 67, 340  
 imaging, 69, 341  
 introduction to, 65  
 neurocognitive screening, 70  
 neuropsychological  
 rehabilitation, 340–3  
 non-specific symptoms and  
 diagnosis, 341  
 outcome after, 369–70  
 pathophysiology of, 67–8  
 post-concussion syndrome,  
 340, 342–3  
 recovery and outcome,  
 341–2  
 serum biomarkers, 69–70

- (mTBI) (cont.)  
 summary of, 71  
 treatment of, 343
- Mini Mental Status Examination (MMSE), 279
- Minimally Conscious State (MCS), 368–9
- missile head injury, 18–19
- monitoring in intensive care management, 97–8, 98*t*, 99
- Monro, Alexander, 38
- Monro-Kellie doctrine, 110, 216
- Montreal Cognitive Assessment (MoCA), 279
- mood disorders, 331
- morphine, 152
- mortality rates, 6
- motor assessments, 30
- motor control rehabilitation, 312–13
- motor vehicle accidents (MVA), 259
- multimodality monitoring  
 cerebral blood flow, 137–40  
 cerebral oxygenation monitoring, 137–8, 140–3  
 electrophysiology monitoring, 142–3  
 introduction to, 132  
 microdialysis and, 132–7  
 muscle relaxants, 150–3  
 musculoskeletal integrity in rehabilitation, 311–12
- N-methyl-D-aspartate (NMDA) receptors, 19
- National Electronic Injury Surveillance System – All Injury Program, 8
- National Institute for Health and Clinical Excellence (NICE), 44*t*, 44, 67, 68, 259, 308, 383–4*t*
- National Institute of Clinical Excellence (NICE), 90
- National Traffic Safety Bureau, 9
- Near InfraRed (NIR) tools, 81
- near-infrared spectroscopy (NIRS), 141–2
- Neuro Anaesthesia & Critical Care Society of Great Britain and Ireland, 90
- neuro-haemodynamic theory, 165
- neurobehavioural change (NBC), 334
- neurocritical care benefits, 104–5
- neurogenic pulmonary oedema (NPO), 165
- neuroimaging in trauma. *see also* computed tomography (CT) scanning  
 acute imaging, 43  
 computed tomography (CT) scanning, 43–5, 44*t*, 46*f*  
 craniofacial trauma, 225, 226*f*  
 diffuse axonal injury, 46  
 Diffusion Tensor Imaging, 48–9, 69  
 diffusion-weighted imaging, 48, 49*f*  
 functional MRI, 49–50, 69, 341  
 introduction to, 43  
 magnetic resonance imaging, 46–8, 47*f*, 365, 382  
 mild traumatic brain injury, 69, 341  
 positron emission tomography, 50–1, 51*f*  
 in pre-hospital management, 81  
 Single Photon Emission Computed Tomography, 51–3, 52*f*  
 subacute imaging, 46–53  
 susceptibility weighted imaging, 47, 69  
 turbo Proton Echo Planar Spectroscopic Imaging, 47  
 Xenon CT, 51–3, 52*f*
- Neurological Susceptibility to a Skull Defect (NSSD), 238–9
- neuromuscular status in rehabilitation, 311–12
- NeuroPage system, 329
- neuropathology of head injuries  
 abusive trauma in childhood, 18  
 brain contusions and lacerations, 13–14  
 brain swelling, 17–18  
 brainstem avulsion, 15  
 cranial nerve avulsion, 15  
 diffuse axonal injury, 15  
 diffuse vascular injury, 17  
 excitotoxicity and nitric oxide in, 19–20  
 extradural haemorrhage, 14  
 fat embolism, 18  
 focal injury, 13–15  
 focal vascular injury, 15  
 intracranial haemorrhage, 14–15  
 intraventricular haemorrhage, 15  
 introduction to, 12*t*, 12  
 missile head injury, 18–19  
 parenchymal haemorrhage, 15  
 pituitary infarction, 15  
 progressive degeneration and traumatic encephalopathy, 19  
 scalp injury, 13  
 skull fractures, 13  
 subarachnoid haemorrhage, 14–15  
 subdural haemorrhage, 14  
 traumatic axonal injury, 15–17, 16*f*, 16*t*, 17*f*
- neuroprotective agents, 82
- neuropsychological complications  
 affecting decision-making, 282–4  
 attention and, 283  
 communication and, 282  
 emotional state, 284  
 executive functioning, 283*f*, 283  
 insight and, 283–4  
 memory and, 282–3  
 paediatric traumatic brain injury, 267–8  
 neuropsychological rehabilitation  
 attention impairments, 329  
 behavioural management, 333–9  
 in children, 343–5  
 cognition assessment, 326–7  
 cognitive impairments, 326, 327–8  
 emotional disorders, 330–2  
 executive functioning, 329  
 group rehabilitation, 333  
 introduction to, 326



- language and  
   communication, 330  
 memory impairments, 328–9  
 mild traumatic brain injury,  
   340–3  
 personality change, 339–40  
 self-identity and, 332–3  
 summary, 345  
 summary of, 330  
 visuo-spatial functions, 330  
 neurosurgical complications  
   central nervous system  
     (CNS) infection, 249–50  
   cerebrospinal fluid leaks, 247  
   chronic subdural  
     haematoma, 251–2  
   concussion with  
     encephalopathy, 254–5  
   cranial nerve trauma, 252,  
     253*t*  
   growing skull fracture, 248  
   hydrocephalus, 252  
   meningitis prophylaxis,  
     248  
   pneumocephalus with,  
     247–8  
   seizures, 250, 251*t*  
   vascular complications,  
     252–4  
 neurosurgical intervention,  
   82, 103  
 Neurovent catheters, 140  
 New Injury Severity Score  
   (NISS), 59  
 NEXUS study, 381  
 NHS Blood and Transplant  
   (NHSBT), 193*t*  
 nitric oxide (NO) in head  
   injuries, 19–20  
 non-accidental traumatic brain  
   injury, 40–2, 41*f*  
 non-encephalopathic  
   presentation, subacute, 41  
 non-surgical patient  
   management, 90  
 norepinephrine for CPP  
   control, 166
- occupational therapy, 317,  
   319, 320  
 Oliver Zangwill centre, 333  
 on scene management, 77–8  
 Operating Department  
   Practitioner (ODP), 91  
 opioids in  
   neuroanaesthesia, 201
- optic nerve sheath diameter  
   (ONSD), 143  
 orbital injuries with  
   craniofacial trauma, 229  
 orbital rim bone fragments, 232  
 orbital roof repair, 231  
 orbital trauma, 224  
 organ and tissue donation  
   after BSD, 194–5  
   after cardiac death, 194–5  
   critical care and, 191–2  
   ethical/legal  
     considerations, 192  
   management of potential  
     donor, 193–4  
   relatives of potential donor,  
     193*t*  
 Organ Donation  
   Taskforce, 192  
 Organ Donor Register  
   (ODR), 191  
 orotracheal intubation with  
   craniofacial trauma, 225  
 osmotic therapy, 154–5, 266  
 outcome and prognosis  
   in aged populations, 371  
   blast injuries, 372  
   dementia risk, 370–1  
   disability and, 368–70  
   experimental traumatic  
     brain injury (TBI)  
     models, 29  
   genetic factors in, 371  
   introduction to, 364  
   long-term outcome, 370–1  
   measures of, 60, 364–6  
   mild traumatic brain injury,  
     369–70  
   paediatric traumatic brain  
     injury, 267–9  
   penetrating injuries and, 372  
   predictions of, 60, 61*t*  
   summary of, 372  
   trauma scoring systems,  
     60, 61*t*  
 Overt Behaviour Scale  
   (OBS), 335
- paediatric brainstem death, 189  
 paediatric traumatic brain  
   injury  
   anticonvulsants for, 266–7  
   assessment of, 259*t*, 260  
   decompressive craniectomy,  
     264–6, 265*f*  
   endocrine dysfunction, 268
- epidemiology of, 258–9  
 growing skull fracture,  
   262–4, 265*f*  
 hypothermia for, 267  
 intensive care management,  
   266–7  
 intraventricular  
   haemorrhage, 15, 262,  
   264*f*  
 introduction to, 258  
 neuropsychological  
   performance, 267–8  
 osmotic agents, 266  
 outcomes in, 267–9  
 post-traumatic epilepsy, 268  
 post-traumatic  
   hydrocephalus, 268  
 return to activity, 268–9  
 subdural haematoma, 261–2,  
   263*f*  
 summary of, 269  
 surgical considerations,  
   260–6  
 pan-facial injury sequencing,  
   229–32  
 parenchymal haemorrhage, 15  
 partial tissue oxygen tension  
   ( $P_{bt}O_2$ ), 140, 141  
 pathophysiology  
   anaesthesia for emergency  
     neurosurgery, 197, 198*t*  
   brainstem death, 187  
   intracranial pressure,  
     110–12, 111*f*  
   mild traumatic brain  
     injury, 67–8  
 Patient Reported Outcome  
   Measures (PROMs), 63  
 penetrating injuries, 372  
 perception processes, 278  
 percutaneous dilatation  
   technique (PDT), 170–1  
 percutaneous endoscopic  
   gastrostomy (PEG), 315  
 peripheral nervous system, 38  
 persistent vegetative state  
   (PVS), 368–9  
 personal digital assistants  
   (PDAs), 353  
 personal injury legality, 377–9  
 personality changes after TBI,  
   339–40  
 physiological scoring  
   systems, 59  
 physiotherapy intervention in  
   rehabilitation, 308–9

- pituitary infarction, 15  
 plasma osmolality, 154–5  
 pneumocephalus  
   complications, 247–8  
 pneumonia, 168  
 police reports, 379  
 positive behaviour supports  
   (PBS), 338  
 positive end expiratory  
   pressure (PEEP), 153–4,  
   165, 168, 169  
 positron emission tomography  
   (PET), 50–1, 51*f*, 198  
 post-concussion syndrome,  
   340, 342–3  
 post-operative care in  
   emergency  
   anaesthesia, 203  
 post-operative fluid  
   collections, 244  
 post-traumatic amnesia (PTA),  
   275, 277, 338–9, 364,  
   366–8, 378  
 post-traumatic epilepsy (PTE),  
   250, 251*t*, 268  
 post-traumatic  
   hydrocephalus, 268  
 post-traumatic seizures  
   (PTS), 203  
 post-traumatic stress disorder  
   (PTSD), 331  
 posterior wall fractures, 233–4  
 posture and seating  
   rehabilitation, 313–14  
 pre-hospital management  
   agitation of patients, 78  
   airway management and  
   intubation, 78–9  
   biomarker use, 81  
   brain apnoea and airway  
   obstruction, 76, 77*f*  
   breathing and, 79  
   cervical spine protection, 78  
   circulation and, 79  
   coagulopathy in brain  
   injury, 80–1  
   concussion, 77  
   disability and, 79  
   future developments, 81–2  
   imaging use, 81  
   introduction to, 76  
   neuroprotective agents, 82  
   neurosurgical procedures, 82  
   as prevention of TBI, 76  
   remote technologies, 81–2  
   on scene management, 77–8  
   specific ICP care, 79–80  
   summary of, 82  
   suspended animation, 82  
   triage and transfer, 81  
   pre-morbid functioning, 276  
   pressure reactivity index (PRx),  
   121, 122*f*, 124, 148  
   prevention strategies, 9*t*, 10  
   primary head injury lesions,  
   44–5, 46*f*  
   primary transfer to tertiary  
   referral centres, 89–90  
   probability of survival (Ps), 60  
   procedural memory, 277  
   processing speed  
     assessment, 278  
   progressive neurological  
   degeneration, 19  
   prolonged disorders of  
   consciousness (PDOC),  
   368–9  
   Prophylactic Pneumococcal  
   Conjugate Vaccine  
   (PCV), 235  
   Propofol, 151  
   prothrombin complex  
     concentrates (PCC), 80  
   protocol-driven therapy, 146  
   pulmonary complications, 104  
   pupillary abnormalities,  
   207–8  
   pupillary reflexes, 36  
  
 Quebec Task Force (QTF),  
   382–4, 385*t*  
  
 raised intracranial pressure, 38  
 randomised controlled trials  
   (RCTs), 332  
 Randomized Evaluation of  
   Surgery with Craniectomy  
   for Uncontrollable  
   Elevation of Intracranial  
   Pressure (RESCUE-ICP),  
   103, 158  
 range of movement (ROM)  
   rehabilitation, 313  
 reactive oxygen species (free  
   radicals), 19  
 reconstruction aims in  
   craniofacial trauma, 228–9  
 recruitment manoeuvres (RM),  
   153–4  
 rehabilitation by  
   multidisciplinary team  
   acute care, 317–19  
   communication disorders,  
     315–17  
   community rehabilitation,  
     320–1  
   family role in recovery,  
     293–6, 295*f*  
   introduction to, 308  
   manual chest techniques,  
     310, 311  
   manual hyper-inflation, 310  
   motor control, 312–13  
   musculoskeletal integrity  
     and neuromuscular status,  
     311–12  
   physiotherapy intervention,  
     308–9  
   positioning in cerebral  
     perfusion, 309–10  
   post-acute care, 319–20  
   posture and seating, 313–14  
   as prescription vs. plan, 321  
   respiratory care, 309  
   speech and language, 314–15  
   suction treatment, 310  
   rehabilitation principles  
     cost effectiveness and, 304–6  
     critical features of, 303  
     introduction to, 301  
     models of service, 301–3,  
       302*f*  
     process of, 304*f*  
   relative recovery in  
     microdialysis, 133  
   remote technologies, 81–2  
   respiratory care  
     rehabilitation, 309  
   retrograde amnesia, 277, 378  
   revised trauma score (RTS),  
     59, 60  
   Rivaroxaban, 80  
   road traffic accidents (RTAs),  
     5, 6  
   rodent models, 26  
  
 scalp injury, 13  
 secondary brain injury, 71,  
   146, 370  
 sedation options, 150–3, 334  
 seizures, 101, 250, 251*t*, 378  
 self-awareness and behavioural  
   management after  
   TBI, 339  
 self-efficacy, 358  
 self-functions and ATC, 357–8  
 self-identity and brain injury,  
   332–3

- semi-permeable ('dialysis') membrane, 133
- Sensory Modality Assessment and Rehabilitation Technique (SMART), 318
- serum biomarkers, 69–70
- A Severity Characterization Of Trauma (ASCOT), 59
- severity of traumatic brain injury, 5–6
- sexual problems post-trauma, 297–8
- short-term memory, 277
- Single Photon Emission Computed Tomography (SPECT), 51–3, 52f
- skull fractures. *see also*  
   depressed skull fractures  
   central craniofacial fractures, 226–7  
   centrolateral craniofacial fractures, 227  
   classification of, 225–8  
   with craniofacial trauma, 225–8  
   depressed skull fractures, 217, 248, 249f  
   features associated with, 37  
   frontal sinus fractures, 232–4, 233f  
   growing skull fracture, 248, 262–4, 265f  
   lateral craniofacial fractures, 228  
   Le Fort classification of, 226, 227t  
   neuropathology of, 13  
   overview of, 13  
   paediatric traumatic brain injury, 262–4, 265f
- smartphones, 353, 357–8
- social networks for recovery, 297
- Society of British Neurosurgeons (SBNS), 87
- spasticity concerns, 311–12
- Specialist Nurse Organ Donation (SNOD), 192, 193t
- specific ICP care, 79–80
- speech impairment  
   assessment, 278
- speech rehabilitation, 314–15
- Sports Concussion Assessment Tool (SCAT), 77, 254
- sports injuries, 7–9
- St Andrews Sexual Behaviour Assessment (SASBA), 335
- St Andrews Swansea Neurobehavioural Scale (SASNOS), 335
- staircase approach, 150, 151t, 152f
- STICH 1 and 2 trials, 158
- Streptococcus pneumoniae*, 235, 250
- subacute imaging, 46–53
- subacute non-encephalopathic presentation, 41
- subarachnoid haemorrhage (SAH), 14–15, 164, 214f, 214
- subdural haematoma, 41, 261–2, 263f
- subdural haemorrhage, 14
- substance misuse  
   problems, 296
- suction treatment, 310
- sudden death after  
   cranioplasty, 243–4
- Summers, Fiona, 378
- surgical intervention and management  
   craniofacial trauma, 234  
   cranioplasty after head trauma, 238  
   depressed skull fractures, 217  
   extradural haematoma, 260, 261f  
   intractable intracranial hypertension, 215–16  
   introduction to, 207  
   paediatric traumatic brain injury, 260–6  
   traumatic intracranial haematomas, 207, 209f, 210f, 212f, 213f, 214f  
   surgical site infections (SSIs), 249–50  
   susceptibility weighted imaging (SWI), 47, 69  
   suspended animation, 82  
   swallow disorders, 314–15  
   syndrome of the trephine, 238
- temperature management, 101
- the 'standardised W statistic' (Ws), 61–2
- therapeutic hypothermia (TH), 101
- therapeutic nihilism, 105
- therapeutic options  
   barbiturate coma, 157–8  
   brain chemistry and, 150  
   CPP therapy protocols, 147–8  
   general criteria and management goals, 148, 149t  
   hypothermia as, 155–7  
   intracranial hypertension and staircase approach, 150, 151t, 152f  
   introduction to, 146  
   Lund protocol, 146–7  
   osmotic therapy, 154–5  
   protocol-driven therapy, 146  
   sedation, analgesia and muscle relaxants, 150–3  
   surgical management of intracranial hypertension, 158–9  
   ventilation needs, 153–4  
   thermal diffusion flowmetry (TDF), 139
- Thomas, Elfyn O., 378
- thromboprophylaxis, 169–70
- time functions and ATC, 357–8
- titanium for cranioplasty, 239–40
- tonsillar herniation, 40
- total intravenous anaesthesia (TIVA), 202t
- tracheostomy, 170–1
- Track-TBI study, 49
- TracMan study, 171
- tranexamic acid (TXA), 81
- transcranial Doppler (TCD), 138–9
- transfer in pre-hospital management, 81
- transient traction force, 28
- Trauma Audit and Research Network (TARN), 60, 62–3, 200
- trauma scoring systems  
   anatomical scoring system, 57–8, 58t  
   applications of, 62–3  
   case study, 58, 59t  
   comparing systems of trauma care, 61–2  
   in current practice, 59  
   input measures, 57  
   introduction to, 57  
   outcome prediction, 60, 61t

400	Index
trauma scoring systems (cont.) physiological scoring systems, 59 prediction methodology, 60 summary of, 63 trauma unit (TU), 81 traumatic axonal injury (TAI), 15–17, 16 <i>f</i> , 16 <i>t</i> , 17 <i>f</i> Traumatic Coma Data Bank, 5 traumatic encephalopathy, 19 traumatic intracranial aneurysms, 253–4 traumatic intracranial haematomas acute subdural haematomas, 210 <i>f</i> , 211 age factors and, 208 anticoagulation concerns, 208–9 chronic subdural haematomas, 211, 212 <i>f</i> decompressive craniectomy, 216 external ventricular drain, 215–16 extradural haematomas, 209 <i>f</i> , 210 intracerebral haematomas, 212–14, 213 <i>f</i> neurological deterioration with time, 208 neurological status, 207–9 pre-existing medical conditions, 208	subarachnoid haemorrhage, 14–15, 164, 214 <i>f</i> , 214 surgical intervention and management, 207, 209 <i>f</i> , 210 <i>f</i> , 212 <i>f</i> , 213 <i>f</i> , 214 <i>f</i> traumatic intraventricular haemorrhage (tIVH), 252 traumatic subarachnoid haemorrhage, 28 traumatic vertebral artery injury (TVAI), 252–3 triage in pre-hospital management, 81 tricarboxylic acid (TCA) cycle, 135 <i>f</i> , 135–6 trigeminal nerve injury, 37 TRISS methodology, 60 trochlear nerve palsy, 37 tumour-associated cerebral oedema, 203 turbo Proton Echo Planar Spectroscopic Imaging (t-PEPSI), 47  ubiquitin C-terminal hydrolase L1 (UCH-L1), 69 UK code of practice for BSD testing, 188 <i>t</i> , 188–9 unwise decisions, 281 Utstein Template, 62  vasoactive drugs, 166 vasopressin, 167  vegetative state, 368–9 venous thromboembolism, 169–70 Ventilator Acquired Pneumonia (VAP), 311 ventilatory support, 148, 153–4 ventriculitis, 250 verbal fluency defects, 315 VICAID palm top system, 356 videofluoroscopy (VF), 314 violence and TBIs, 6 visual acuity with craniofacial trauma, 224 visuo-spatial functions, 330  Warfarin, 80 weight drop model (WDM), 26 Wernicke’s aphasia, 315 Westmead Scale, 338 whiplash associated disorders (WAD), 382–6, 385 <i>t</i> Whitfield, Peter C., 378 Whyte, Maggie, 378 working memory, 277 World Health Organization (WHO), 202, 301, 327, 340, 353  Xenon CT (Xe-CT), 51–3, 52 <i>f</i>  zygoma repair, 231–2