# Index

abbreviated injury scale (AIS) 47, 48 abducent nerve palsy 30-1 abscess, brain 204 acute lung injury (ALI) 132-3 acute respiratory distress syndrome (ARDS) 130, 132-3 Addenbrooke's Cognitive Examination (Revised) (ACE-R) 269 age variation 5 airway management 65 craniofacial injuries 180-1, 191 - 2intubation 63, 65 see also respiratory care alcohol 56-7 Alzheimer's disease (AD) risk 283 American football 7 amnesia 246, 267-8 anterograde 267-8 retrograde 267-8 see also memory anaesthesia 160 perioperative anaesthetic management 162-4 induction of anaesthesia 162 - 3maintenance 164 monitoring 163 patient position 163 postoperative care 164 preoperative assessment and optimization 162 surgical timing and 190-1 target-directed strategy 161 - 2cerebral perfusion pressure 161-2 hemodynamics 161 intracranial pressure 162 analgesia 117, 118 anatomical scoring system 47 aneurysms, traumatic intracranial 206

animal models see experimental models anosmia 30, 209 anticonvulsants 67, 208 children 222 antidepressants 271 anxiety disorders 270 aphasia 255–6 therapy see speech and language therapy apolipoprotein E (apoE) 8, 284 apoptosis 18 arteriovenous fistulae 15, 206 assessment 28 behavioural 249 capacity 241, 269-70 cognitive functioning 241-2, 245 - 6communication skills 257 craniofacial 181-2 examination 28-33 cranial nerves 30-1 external examination 30 Glasgow Coma Scale (GCS) 28-30, 35 peripheral nervous system 31 pupillary reflexes 30 false localizing signs 31-2 history 28 in experimental models 25-6 behavioural assessment 25 cerebral blood flow and oedema 25-6 intracranial pressure 26 in rehabilitation 231-2 intracranial herniation 32-3 mild head injuries 55-6 mood disorders 245-6, 271 neuropsychological 266-7, bedside testing 269 non-accidental head injury in children 33-4 preoperative 162 raised intracranial pressure 32 see also imaging; scoring systems

attention 268 impairment 247-8 axon retraction balls 15 barbiturates 118-19 children 222 behavioural assessment 249 in experimental models 25 behavioural changes 271-2 behavioural management 241, 271 - 2challenging behaviour 249 - 50post-traumatic amnesia and 272 Bi-Spectral Index (BIS) 118 bicoronal flap 186 bone allograft 195 bone autograft 194-5 bone flap storage 195 graft consolidation 195 bone xenograft 195 botulinum toxin A (BTX-A) 254 boxing injuries 7, 210–11 progressive neurological degeneration 17-18, 283 - 4brain abscesses 204 brain contusions 13 brain lacerations 13 brain swelling 16-17 see also cerebral oedema brain tissue oximetry 107, 108-9 brainstem avulsion 14 brainstem death (BSD) 151-5, anatomy/physiology 151 causes 152 history 151 international variation in diagnosis 155 organ donation and 157 ethical and legal issues 156 pathophysiology 152 special situations 153-4 chronic lung disease 153 high spinal cord injury 153

# Index

brainstem death (BSD) (cont.) long-acting sedative presence 153-4 paediatric considerations 153 testing 152-3, 154 confirmatory tests 154-5, burden of disease 3 capacity assessment 241, 269-70 cardiovascular complications 129 - 30carers see family caroticocavernous fistula (CCF) 15, 206 case management 258-60, casting 254 catheter placement external ventricular drains (EVD) 174 prevention of infection 174 microdialvsis 105 cerebral blood flow (CBF) assessment 43 in experimental models 25-6 cerebral autoregulation 160 CO2 pressure and 119 intracranial pressure relationship 87-8 monitoring 110 laser Doppler flowmetry 111, 112 thermal diffusion 111-12 thermodilution 111 transcranial Doppler (TCD) 110-11 cerebral metabolism autoregulation 160 markers 104-5 cerebral oedema assessment in experimental models 26 see also brain swelling cerebral oxygenation monitoring 106 brain tissue oxygenation 107, 108-9 jugular venous oximetry 106 - 8near infrared spectroscopy (NIRS) 109-10

cerebral perfusion pressure (CPP) 114-16, 161-2 assessment in experimental models 26 children 220 CPP based therapy 114-16 during anaesthesia 161-2 intracranial pressure relationship 87-8 management in intensive care 80-1 target CPP 116 see also vasoactive drugs monitoring 79 outcome prediction 98, 99 patient positioning and 236 cerebral salt wasting syndrome (CSW) 141 diagnosis 141 treatment 142 cerebrospinal fluid (CSF) acidosis 120 drainage 220 cerebrospinal fluid leak 191 CSF fistula repair techniques 202 diagnosis 201 infection and 201, 203-4 prophylactic antibiotics 201 skull base fracture 201-2, source identification 202 cerebrovascular pulse transmission (CVPT) 98 cervical spine injuries 292-6 craniofacial injuries and 180 imaging 67, 292-4 NICE recommendations 293 - 4whiplash associated disorders (WAD) 294-6, persistence of 296 challenging behaviour 249-50 children 213 brainstem death 153 cervical spine injury 293-4 Glasgow Coma Scale 215 modification 50, 215 growing skull fracture 205 impact of parent's brain injury 273

inflicted (non-accidental) head injury 17 assessment 33-4 mild head injuries 60, 213-14 concussion 214, imaging 60 post-concussional syndrome 214 screening 214-16 second impact syndrome 214 rehabilitation with acquired brain injury 250-1 severe head injury 216-17 decompressive craniectomy 223 extra-axial haematomas 217 - 18hypothermia induction 222 - 3intracranial pressure management 220-2 intracranial pressure monitoring 218-20 trauma systems 217 without extra-axial clots 218 chronic subdural haematoma (CSDH) 14, 173, 207 circulation management 64, 65 - 6classification 2-3, clinical neuropsychology see neuropsychology clotting abnormalities 175 cognitive assessment 245-6 acute phase 241-2 animal models 25 rehabilitation planning and 246 cognitive behavioural therapy (CBT) 271 cognitive communication disorder 256 cognitive impairments 245, 267 epilepsy and 269 rehabilitation approaches 246-9 attention 247-8 executive function 248 language and communication 248-9

### Index

memory 247 visuospatial functions 248 see also cognitive assessment coma 279 see also Glasgow Coma Scale (GCS) communication disorders 255-7 assessment of communication skills 257 rehabilitation 257-8 community rehabilitation 252-3 complications cerebrospinal fluid leak 201-2, chronic subdural haematoma 207 cranial nerve trauma 209 cranioplasty 197-9 epilepsy 207-8 growing skull fracture 205 hydrocephalus 208-9 infection 201, 203-4, pneumocephalus 204-5 see also systemic complications; vascular complications computed tomography (CT) see CT scanning concussion 59 children 214, postconcussive syndrome (PCS) 59-60, 214, 274 - 5sport 210, 214 conivaptan 143 consent 292 contracoup injuries 13 controlled cortical impact model 23 controlled non-heart beating donation (CNHBD) 158. contusions 13, 171-2 coroner reports 289-90 cost effectiveness, in rehabilitation 232-3 cranial nerves avulsion 15 brainstem death tests 154 examination 30-1 trauma 209

craniofacial injury 180 airway considerations 191-2 cerebrospinal fluid leak 191 craniofacial assessment 181 - 2early management 180-1 facial fractures 183-4 fracture classification 183 central craniofacial fractures 183 lateral craniofacial fractures 183 frontal sinus fracture management 188-90 imaging 182-3 orbital injuries 184-5 sequencing 185-8 timing of surgical intervention 190-1 cranioplasty 194 complications 197-9 contraindications 196-7 future developments 199 indications 196 materials 194, 199 bone allograft 195 bone autograft 194-5 bone substitutes 195-6 bone xenograft 195 critical care see intensive care CT scanning 36-7, 43 Canadian CT Head Rule 37 cervical spine 67, 292-4 image transfer between hospitals 72 mild head injuries 56 children 60, 215-16, moderate and severe head injuries 66-7 children 216-17 NICE Guidelines 37 outcome prediction 279 scan classification system 169, SPECT 42-3, Xenon-CT 43

death 151 see also brainstem death decompressive craniectomy 174–5 children 223 surgical techniques 175 deep vein thrombosis (DVT) 133 delayed traumatic intracerebral haematoma (DTICH) 170 dementia pugilistica 283-4 depressed skull fractures 172-3 infection risk 203-4 surgical techniques 173 depression 270 antidepressants 271 assessment 271 diabetes insipidus (DI) 138 diffuse injury 15-17 brain swelling 16-17 diffuse axonal injury (DAI) 15, 23-4, imaging 38-9 diffuse vascular injury 16 experimental models 23-5 impact acceleration model 24 inertial acceleration model 23 - 4mixed focal and diffuse injury models 24-5 optic nerve stretch injury model 24 fat embolism 17 traumatic axonal injury (TAI) 15, Diffusion Tensor Imaging (DTI) 41 diffusion-weighted imaging (DWI) 40-1 Disability Rating Scale (DRS) 280, 281 discourse disorders 256, dobutamine 131 donors see organ donation dopamine 131, Doppler imaging laser Doppler flowmetry 111 transcranial Doppler (TCD) 110 - 11Driving Vehicle Licensing Authority (DVLA) 290 dural repair 187 dysarthria 256-7 dysphagia 237-8 evaluation 238 therapy 238

### Index

elderly patients 284 emergency department care 64-6 airway management 65 breathing 65 circulation 65-6 disability 66 empyema, subdural 204 endotracheal tube (ETT) 163, 164 enteral nutrition 135-6 see also nutritional issues epidemiology 1 age variation 5 causes of TBI 3, 6-7 sporting injuries 7 gender variation 5 incidence 3-5, mild head injury 54-5 mortality 5-6, 62 systemic complications 129 epilepsy 207-8 cognitive functioning and 269 prophylactic anticonvulsants 67, 208 risk factors 207-8 epinephrine 130, 131 episodic memory 267 evaluation see assessment examination see assessment excitotoxicity 18 executive functions 248, 268 rehabilitation approaches 248 experimental models 22-6 diffuse injury models 23-5 impact acceleration model 24 inertial acceleration model 23 - 4optic nerve stretch injury model 24 focal injury models 22-3, 24 - 5acute subdural haematoma 23 controlled cortical impact model 23 extradural haemorrhage 23 focal axonal injury 24 weight drop model 22

outcome measurements 25 - 6behavioural assessment 25 cerebral blood flow 25-6 cerebral oedema 26 intracranial pressure 26 external ventricular drains (EVD) 174 prevention of catheter infection 174 surgical techniques 174 extradural haematoma 171 children 217-18 extradural haemorrhage 13 experimental model 23 surgical management 171 see also intracranial haematoma extubation 164 facial injury see craniofacial injury facial nerve assessment 31 trauma 209 facial swelling 190 false localizing signs 31-2 family 273-4 communication of prognostic information 284-5 guidelines 285 setting the scene 285 intervention with 273-4 process of family adjustment 273 support 296-7 during acute phase 242 organ donation and 156 - 7fat embolism 17 fentanyl 118, 163 FLAIR (fluid-attenuated inversion recovery) 38 fluid balance 137-8 intravenous fluid effects on the brain 137-8 focal injury 12-15 brain contusions 13 brain lacerations 13 brainstem avulsion 14 cranial nerve avulsion 15

experimental models 22-3, 24 - 5acute subdural haematoma 23 controlled cortical impact model 23 extradural haemorrhage 23 focal axonal injury 24 mixed focal and diffuse injury models 24-5 weight drop model 22 pituitary infarction 14 scalp injury 12 skull fractures 12-13 vascular injury 15 see also intracranial hemorrhage fractures see skull fractures frontal craniotomy 186 frontal sinus fractures 188 management 188-90 gender variation 5 Glasgow Coma Scale (GCS) 2, 28-30, 35, 49, 51, 66 children 215 modification for 50, 215 outcome prediction 279 haematoma 167-8 Glasgow Outcome Scale (GOS) 280, glutamate 18, 161 glycerol 105 pathological threshold 105 - 6Goal Management Training 248, goal-setting in rehabilitation 231, 232 growing skull fracture 205 head injury 1, classification 2-3, 62 definitions 54 prevention 1, 8-9 sporting injuries 7 susceptibility to 8 see also mild head injuries (MHI); moderate head injuries; severe head injuries; specific types of injury;

traumatic brain

injury (TBI)

acute imaging 36–7,

# Index

haematoma see intracranial haematoma haemodynamics 161 see also hypotension haemorrhage craniofacial injuries 180 see also intracranial haemorrhage high-frequency centroid (HFC) 97 history 28 Human Tissue Act 2004 (HTA) 156 hydrocephalus 208-9 hydroxyapatite 196 hyperbaric oxygen (HBO) 120 hypernatraemia 138-9 diagnosis 139 treatment 139 hypertension, intracranial see intracranial pressure (ICP) hypertonic saline 121-2, 142, 221 children 221 complications 143 hyperventilation 65, 119-20, 220 - 1hypocapnoea 220-1 hyponatraemia 140-3 diagnosis 141 hypertonic 140 hypotonic 140 cerebral salt wasting syndrome (CSW) 141 syndrome of inappropriate antidiuretic hormone secretion (SIADH) 140 - 1treatment 142 complications of 143 new therapies 143 hypotension 64, 65-6, 161 avoidance 80 children 222-3 neurogenic 129 hypothermia 122-3 hypoxia 161 monitoring 106 I:E ratio 98 imaging 36

CT scanning 36-7, 43 cerebrospinal fluid leak source identification 202 cervical spine 67, 292-4 craniofacial injuries 182-3 mild head injuries 55, 56-7 children 60 moderate and severe head injuries 66-7 subacute imaging 38-43 Diffusion Tensor Imaging (DTI) 41 diffusion-weighted imaging (DWI) 40-1 MRI 38-40, 43 positron emission tomography (PET) 41 - 2research techniques 40 SPECT/Xenon-CT 42-3, immune-enhancing nutrition 137 impact acceleration model 24 incidence of head injury 3-5, inertial acceleration model 23 - 4infection brain abscesses 204 catheter infection prevention 174 cerebrospinal fluid leak and 201, 203-4 cranioplasty and 197 depressed skull factures and 203 - 4meningitis 201, 204 subdural empyema 204 injury severity score (ISS) 47, 48, input measures 47-9, anatomical scoring system 47 case study 48, 49 current practice 49 physiological scoring systems 49 intensive care 7-8, 79, 81, 84 monitoring 79, 80 organ and tissue donation 155 - 6pre-ICU management 67 systemic complications 82-4

protocol-driven treatment benefits 82, 114 specialized neurointensive versus general intensive care 82-3 variations in practice and 83-4 treatment 79-81 intracranial pressure management 80-1, neurosurgical intervention 80 - 1interdisciplinary teams 231 International Classification of Functioning, Disability and Health (ICF) 229 intracerebral haematoma 171–2 intracranial haematoma 167-72 children 217-18 conservative treatment 170 - 1extradural 171, 217-18 factors influencing outcome 167 - 70age 167 haematoma/CT scan related factors 169-70 neurological status 167-9 pre-existing medical conditions 167 intracerebral 171-2 subdural 14, 171, 218 acute 14, 23 chronic 14, 173, 207 surgical techniques 171, 173 surgical treatment 171-2 intracranial haemorrhage 13-14 contusions 13, 171-2 extradural haemorrhage 13 experimental model 23 intraventricular haemorrhage 14 parenchymal haemorrhage 14 subarachnoid haemorrhage 14, 207 subdural haemorrhage 14 acute subdural haematoma 14, 23 chronic subdural haematoma 14, 173, 207

## Index

intracranial haemorrhage (cont.) experimental model 23 surgical techniques 171, 173 traumatic axonal injury and 15, see also intracranial haematoma intracranial hypertension see intracranial pressure (ICP) intracranial pressure (ICP) 62,87 assessment 32, 89, 220 in experimental models 26 importance of 87-8 in intensive care 79, 80 systemic complications and 83-4 normal values 90 outcome prediction 98-9 haematoma 169 patient positioning and 236 patterns of in head injury 90 physiotherapeutic interventions 235 timing of surgical intervention and 190 intraventricular haemorrhage 14 intubation 63, 65 rapid sequence intubation (RSI) 63, 65 jugular venous oximetry 106-8 lacerations brain 13 facial 181 scalp 181 lactate 104 pathological thresholds 105 - 6language 269 language therapy see speech and language therapy

laser Doppler flowmetry 111, 112 lateral fluid percussion model 25 Le Fort fractures 183–4 legal issues *see* medico-legal issues long-term memory 267 low molecular weight heparin (LMWH) 133 Lund therapy 116–17 measurement process 89-90 measurement technology 88-9 children 218-19 during anaesthesia 162 emergency care and 65, ICP waveform analysis 90 - 8cerebrovascular pulse transmission (CVPT) 98 compliance 95 derivations 94 frequency analysis 90-1 high-frequency centroid 97 I:E ratio 98 PRx index 95-6 pulse wave 91-2 RAP index 94-5 respiratory waves 92-4 slow waves 92-4 management anaesthesia and 160 barbiturates 118-19 children 220-2 decompressive craniectomy 174-5 external ventricular drains (EVD) 174, 220 hypertonic saline 121-2, 221 hyperventilation 220-1 in intensive care 80-1, 84 Lund therapy 116-17 mannitol 121, 221 monitoring 66-7, 87 children 218-20 clinical usefulness of 100

magnetic resonance imaging see MRI mandibular reconstruction 188 mannitol 67, 121, 163, 221 children 221 manual chest techniques (MCT) 237 manual hyper-inflation (MHI) 236 maxillary disimpaction 186-7 mean arterial pressure (MAP) 65-6 management 116 see also vasoactive drugs mechanical ventilation 80, 119-20 medico-legal issues 288 cervical spine injuries 292-6 NICE recommendations 293 - 4whiplash associated disorders (WAD) 294-6, consent 292 definitions 291 medical negligence 290-2 personal injury 288-90 driving licence authorities 290 personal injury reports 288-9 police and coroner reports 289-90 support services 296-7 memory 267-8 episodic memory 267 impairments 246, 267-8 rehabilitation approaches 247 long term memory 267 working memory 267 meningitis 204 craniospinal fluid leak and 201 methylmethacrylate 196 microdialysis 103 catheter placement 105 future role of 106 markers of cerebral metabolism and injury 104-5 pathological thresholds 105 - 6principles of 103-4 midazolam 117-18 mild head injuries (MHI) 54 children 60, 213-14 screening 214-16

Index

clinical features 55 concussion 59, 214, post-concussive syndrome (PCS) 59-60, 214 definition 54 discharge 59 epidemiology 54-5 evaluation 55-6 imaging studies 56-7 follow up 59 initial care and observation 57 outcome 282-3 pathophysiology 55 risk stratification 57 second impact syndrome 59, 214 Mini Mental Status Examination (MMSE) 269 Minimally Conscious State (MCS) 282 minor head injury 54 see also mild head injuries (MHI) missile injuries 12, 17 model systems see experimental models moderate head injuries 62 emergency department care 64-6 airway management 65 breathing 65 circulation 65-6 imaging 66–7 injury priorities 67-8 outcome 282 patient transfer 68 pre-hospital care 63-4 pre-ICU management 67 monitoring 103, 112 cerebral blood flow (CBF) 110 laser Doppler flowmetry 111, 112 thermal diffusion 111-12 thermodilution 111 transcranial Doppler (TCD) 110-11 cerebral oxygenation 106 brain tissue oxygenation 107, 108-9 jugular venous oximetry 106 - 8

near infrared spectroscopy (NIRS) 109-10 cerebral perfusion pressure (CPP) 79 during anaesthesia 163 in intensive care 79 microdialysis 103-4, catheter placement 105 future role of 106 markers of cerebral metabolism and injury 104-5 pathological thresholds 105 - 6see also intracranial pressure (ICP) mood disorders 270-1 assessment 245-6, 271 treatment 271 morphine 118 mortality 5-6, 62 motor control 254-5 assessment, animal models 25 MRI 38-40, 43 mild head injuries 56 moderate and severe head injuries 66 outcome prediction 279 spinal cord injury 67 muscle relaxants 117, 119, 163 musculoskeletal care 253-4 N-methyl D-aspartate (NMDA)

receptors 161 near infrared spectroscopy (NIRS) 109–10 negligence 290-2 neurogenic hypotension 129 neurogenic pulmonary oedema (NPO) 129-30 neuroimaging see imaging neurointensive care teams 82-3 neurological degeneration 17 - 18neuromuscular blockade 63 NeuroPage system 247, 248 neuropathology 12 diffuse injury 15-17 excitotoxicity 18 focal injury 12-15 inflicted (non-accidental) head injury in childhood 17

missile head injury 17 progressive neurological degeneration 17-18 neuropsychology 266 acute phase intervention 240 assessment 266-7, bedside testing 269 attention 268 behavioural changes 271-2 executive functioning 248, 268 language 269 mood disorders 270-1 perception 268-9 post-concussion symptoms 274-5 processing speed 268 see also cognitive impairments; memory neurosurgery 7-8 nitric oxide 18 nitrogen losses 137 non-accidental head injury, children 17 assessment 33-4 non-heart beating donation 158, non-missile injuries 12 norepinephrine 130, 131 nutritional issues 135-7 early feeding 136-7 enteral versus parenteral nutrition 135-6 immune-enhancing nutrition 137 nitrogen losses 137 stress ulceration prophylaxis 136 total parenteral nutrition (TPN) 136

occlusive injuries 205–6 occupational therapy 251 acute phase 238–40 community rehabilitation 252–3 post-acute phase 252 oculomotor nerve palsy 30 oedema *see* cerebral oedema; facial swelling; neurogenic pulmonary oedema (NPO)

# Index

older patients 284 opioids 118, 163, optic nerve stretch injury model 24 orbital injuries 184-5 see also craniofacial injury organ donation 155-6 brainstem death and 157 ethical and legal issues 156 donor management 156, 157 Human Tissue Act 2004 (HTA) 156 non-heart beating donation 158.relative support 156-7 outcome after mild head injury 282-3 after moderate head injury 282 after severe head injury 282 vegetative and minimally conscious states 282 compounding effects of secondary insults 283 genetic factors 284 long-term outcome 283-4 Alzheimer's disease risk 283 progressive neurological disease 283-4 measures 279-80 **Disability Rating Scale** (DRS) 280, 281 Glasgow Outcome Scale (GOS) 280, older patients 284 penetrating injuries 284 prediction see outcome prediction outcome prediction 47, 49-52, applications of 52 care system comparisons 51 coma/level of awareness 279 communication to families 284 - 5guidelines 285 setting the scene 285 CT scan 279 haematoma 167-70 age 167 haematoma/CT scan related factors 169-70

neurological status 167-9 pre-existing medical conditions 167 ICP-derived predictors 98-9 MRI scan 279 post-traumatic amnesia 279 threshold values 280-1 see also outcome paediatric head injury see children parenchymal haemorrhage 14 patient transfer 68, 71, 74, 76 checklists 75, 76 conduct of 72-3 indications for 71-2 maintaining standards 74-5 non-surgical patient management in district hospitals 74 primary transfer to tertiary referral centres 73 problems during 72-3 training 75 penetrating injuries 17, 172-3, outcome 284 perception 268-9 percussion 237 percutaneous dilatational tracheostomy (PDT) 134 - 5peripheral nervous system examination 31 persistent vegetative state (PVS) 282 personal injury reports 288-9 phenytoin 208 physiological scoring systems 49 physiotherapy 253-5 acute phase 235 motor control 254-5 musculoskeletal care 253-4 posture and seating 255 see also respiratory care pituitary infarction 14 pneumocephalus 204-5 pneumonia 131-2 police reports 289-90 positron emission tomography (PET) 41-2 post-concussive syndrome (PCS) 59-60, 214, 274-5

post-traumatic amnesia (PTA) 267 - 8behavioural changes 272 outcome and 279 threshold values 280-1 posture 255 pre-hospital care 63-4 Pressure Reactivity Index (PRx) 95-6 outcome prediction 99 prevention 1, 8-9 primary brain injury (PBI) 62, 160 probability of survival (Ps) 50 problem-solving training 248, processing speed 268 prognosis see outcome prediction programmed cell death 18 progressive neurological degeneration 17-18 propofol 117-18, 163, 164, prospective memory 267-8 protocol-driven treatment 114 intensive care 82, 114 pulmonary embolism (PE) 133 punch drunk syndrome 283 - 4pupil size/reactivity 66 outcome prediction, haematoma 168-9 pupillary reflexes 30 pyrexia 123 pyruvate 104 pathological thresholds 105 - 6RAP index 94-5 outcome prediction 99 rapid sequence intubation (RSI) 63 reactive oxygen species 18 rehabilitation 229, 233 acute phase 235-42 capacity assessment 241 manual chest techniques 237 manual hyper-inflation 236 positioning 236 prognosticating 242 respiratory care 235-6 suction 237

#### Index

trauma systems 217

behavioural management 241 challenging behaviour 249 - 50case management 258-60, children with acquired brain injury 250-1 cognitive assessment 241–2 cognitive impairments 246-9 attention 247-8 executive functioning 248 language and communication 248-9 memory 247 visuospatial functions 248 communication disorders 257 - 8cost-effectiveness 232-3 critical features of service 231 family education and support 242 manual hyper-inflation 236 models of service 229-31 neuropsychological intervention 240 occupational therapy 238-40, 251 community rehabilitation 252 - 3post-acute phase 252 patients in a reduced state of consciousness 240-1 physiotherapy 235, 253-5 motor control 254-5 musculoskeletal care 253 - 4posture and seating 255 rehabilitation planning 246 rehabilitation process 231-2 return to work 258-60, speech and language therapy 237-8, 255-8 communication disorders 255 - 7relatives see family remifentanil 118, 163, 164 respiratory care 235-6 manual chest techniques 237 manual hyper-inflation 236 positioning 236 suction 237 see also airway management

respiratory complications 131 - 3acute lung injury (ALI) 132 - 3pneumonia 131-2 retained secretions see sputum clearance return to work 258-60, revised trauma score (RTS) 49 road traffic accidents (RTAs) 6-7 prevention 8-9, scalp injury 12, 181 scoring systems input measures 47-9 anatomical scoring system 47 case study 48, 49 current practice 49 physiological scoring systems 49 outcome prediction 49-52, applications of 52 care system comparisons 51 in traumatic brain injury 50 - 1seating 255 second impact syndrome 59, 214 secondary brain injury 62, 114, 117, 160-1 prevention 80 CPP based therapy 114–16 Lund therapy 116-17 protocol-driven therapy 114therapy choice 114, 117 sedation 117-18, brainstem death testing and 153 - 4seizures, post-traumatic 207-8 prevention 67, 208 risk factors 207-8 Sensory Modality Assessment and Rehabilitation Technique (SMART) 239 severe head injuries 62 children 216-17 extra-axial haematomas 217 - 18

without extra-axial clots 218 emergency department care 64-6 airway management 65 breathing 65 circulation 65-6 imaging 66-7 injury priorities 67-8 outcome 282 vegetative and minimally conscious states 282 patient transfer 68 pre-hospital care 63-4 pre-ICU management 67 severity of head injury 2 measures 279 coma/level of awareness 279 CT scan 279 injury severity score (ISS) 47, 48, MRI scan 279 Post-traumatic amnesia 279 shaken baby syndrome 17 assessment 33-4 short-term memory 267 Single Photon Emission Computed Tomography (SPECT) 42-3, skull fractures 12-13 classification 172 craniofacial injuries 181-2, 183 central craniofacial fractures 183 facial fractures 183-4 frontal sinus fracture management 188-90 lateral craniofacial fractures 183 timing of surgical intervention 190-1 depressed 172-3 infection risk 203-4 surgical techniques 173 growing skull fracture 205 smell, impaired sense of 30, 209 spasticity 253-4 spatial perception problems 248

# Index

speech and language therapy 255 - 8acute phase 237-8 assessment of communication skills 257 communication disorders 255-7 rehabilitation 257-8 speech disorders 256-7 spinal cord injury 67 brainstem death testing and 153 spinal immobilization 64 split calvarial graft 194 sporting head injuries 7 concussion 210, 214 post-traumatic encephalopathy after repeated injury 210-11 Sports Concussion Assessment Tool (SCAT) 210 sputum clearance 236 manual chest techniques 237 manual hyper-inflation 236 standardized W statistic (Ws) 51 standardized Z statistic (Zs) 51 steroids 67 children 222 stress ulceration prophylaxis 136 subarachnoid haemorrhage 14, 207 subdural empyema 204 subdural haematoma acute 14 experimental model 23 children 214 chronic 14, 173, 207 subdural haemorrhage 14 surgical techniques 171, 173 see also intracranial haematoma suction 237 support services 296-7 surgical issues chronic subdural haematoma (CSDH) 173 clotting abnormalities 175 decompressive craniectomy 174-5

depressed skull fractures 172 - 3external ventricular drains (EVD) 174 surgical indications 161 traumatic intracranial haematomas 167-72 susceptibility weighted imaging (SWI) 39-40 swallowing difficulties 237-8 evaluation 238 therapy 238 swelling *see* brain swelling syndrome of inappropriate antidiuretic hormone secretion (SIADH) 140 - 1diagnosis 141 treatment 142 systemic complications 82-4, 129 cardiovascular complications 129 - 30fluid balance 137-8 hypernatraemia 138-9 hvponatraemia 140-3 nutritional issues 135-7 protocol-driven treatment benefits 82 respiratory complications 131-3 specialized neurointensive vs. general intensive care 82-3 variations in practice and 83 - 4venous thromboembolism 133 T2<sup>\*</sup> gradient recalled echo (GRE) 38

Target Controlled Infusion (TCI) 164 temperature control 122–3 THAM (tromethamine) 120 thermal diffusion 111–12 thermodilution 111 thiopental 163 threshold values 280–1 thromboprophylaxis 133 tissue donation 155–6, 158 Human Tissue Act 2004 (HTA) 156 *see also* organ donation tissue engineering 199 tonsillar herniation 33 total intravenous anaesthesia (TIVA) 164, total parenteral nutrition (TPN) 135-6, see also nutritional issues tracheostomy 134-5 transcranial Doppler (TCD) 110-11 transfer of patients see patient transfer Trauma Audit & Research Network (TARN) 49-50, 52 trauma care system comparisons 51 trauma centres 64 children 217 traumatic axonal injury (TAI) 15. traumatic brain injury (TBI) age variation 5 burden of 3 causes of 3, 6-7 sporting head injuries 7 classification 2-3, definition 1-2, 54 experimental models 22 diffuse TBI models 23-5 focal TBI models 22-3, 24 - 5outcome measurements 25 - 6gender variation 5 incidence 3-5, mortality 5-6, 62 outcome prediction 50-1 presentation 3 prevention 8-9 primary brain injury 62, 160 secondary brain injury 62, 114, 117, 160-1 prevention 80 severity 2 see also head injury; specific types of injury; systemic complications traumatic intracranial haematoma see intracranial haematoma

## Index

trigeminal nerve assessment 31 TRISS methodology 49 trochlear nerve palsy 30–1 turbo Proton Echo Planar Spectroscopic Imaging (t-PEPSI) 38–9

uncal herniation 32-3

vascular complications 205–7 arteriovenous fistulae 206 occlusive injuries 205–6 traumatic intracranial aneurysms 206 traumatic subarachnoid haemorrhage 207 *see also* intracranial haemorrhage vascular injury diffuse 16 focal 15 vasoactive drugs 130-1 deleterious effects of 131 dobutamine 131 dopamine 131 epinephrine 130 norepinephrine 130 vasopressin 131 vasopressin 131 vegetative state 282 persistent (PVS) 282 venous thromboembolism 133 ventilation 80, 119-20 hyperventilation 65, 119-20,

visual impairment 209 visual perception problems 248

warfarin 175 weight drop model 22 whiplash associated disorders (WAD) 294–6, persistence of 296 work, return to 258–60, working memory 267 Ws (standardized W statistic) 51

Xenon-CT 43

Zs (standardized Z statistic) 51 zygomatic disimpaction 187 zygomatic plating 187