Abrahamson, Stephen 16
Academy of Medical Educators 95
Accreditation Council for Graduate Medical Education (USA) 268
administrative support 187
Advanced Cardiac Life Support (ACLS) algorithm 160
Advanced Trauma Life Support (ATLS) 209
adverse events 112, 113, 132, 147, 254
Air Medic 1 system 15
airway management 240–1
American Board of Medical Specialties 268
anaesthetic machines
Gainesville Anesthesia Simulator (GAS) 16
simulated 204–5, 205
Anaesthetists Non-Technical Skills (ANTS) taxonomy xii, 64, 133, 134, 153, 161, 274
analysis of variance (ANOVA) 72
Anesthesia Simulator Recorder 16
animal training models 115
as-if as learning tool 53–4
assessment 3, 59–86
case studies 79–81, 80, 81, 81
challenges and future directions 76
domains of 63–4
formative 62
goals of 61
high-stakes 35–6
of learning 77
for learning 77
live vs. video rating 69
Miller's Pyramid 61
multiple metrics 67
organization and running 71
piloting of 70–1
principles of 61–2, 62
quality assurance 71–6
acceptability 75
educational impact 74–5
feasibility and cost-effectiveness 75
reliability 71–3
standard setting 75–6
validity 73–4
scoring metrics 64–7
checklist scores 65–6
global rating scales 65–7, 66, 68, 69, 70
technical measures 64–5
simulation-based 78
summative 62
Assessment and Management of Clinical Deterioration (ABCDE) 68, 248
assessors 67, 69
standardized patients as 101
Association of Simulated Practice in Healthcare (ASPiH) 20
Association of Standardized Patient Educators (ASPE) 97
attitudes 148, 158
cavalier xii, 76
two challenge rule xiii, 155, 156, 158
audio recording 181–2
consent for 182
audiovisual equipment 224–5
audiovisual interface 203–4
CAVE 18
avatars 8, 159, 265
Barrows, Howard 97
behavioural marker systems 5, 66, 132, 133–4
behaviourism 45, 46
best practices 36–7
blueprinting xii, 63, 81
BodySim program xii, 15
borderline groups method 75–6
box trainers (endotrainers) 113–14, 114
breast teaching associates (BTAs) 101
briefing, scenario-based training 220–1
CanMEDS 147, 209, 267, 268, 268, 273
cardiology 236–7, 237
care pathway modelling 209–10, 210
case studies 7
assessment 79–81, 80, 81, 81
see also practical applications
CAST see context augmented surgical training
cavalier attitudes xii, 76
CAVE (CAVE Audio Visual Environment) 18
checklist scores 65–6
checklists xii, 77
circles of focus 199, 201
clinical challenges, simulation of 205, 207–8
clinical educators 187
clinical skills assessment 244–5, 245
cockpit resource management (CRM) 5, 16, 132
key points 133
training 132
cognition 157–8
cognitive learning theory 45, 46
cognitive load theory 46
Cohen’s kappa statistic 72
collaborative learning 48
competency-based education 267–9, 268, 268
Comprehensive Anesthesia Simulation Environment (CASE) 16
computed tomography (CT) 260–1
corporate 222–3
dependent sample 222–3
dependent sample t test 222–3
development 269–70
distributed simulation 200–5, 201
deliberate practice 30–1, 31
design 74
constructivist theory 47
consultants, simulation training 265
context augmented surgical training (CAST) 206–7
debriefing 29, 55, 61, 180–1, 225–30
29, 55, 61, 180–1, 225–30
facilitation of 229–30
GAS model 182
physical space 227, 227
structure of 228–30
video-assisted 226
see also assessment; feedback
Debriefing with Good Judgment 226–7
decision-making 5, 17, 44, 65, 74, 81, 90, 111, 148, 153, 188, 209, 242–3, 253, 270
definitions
simulation 12
standardized patients 96–7
team training 149
deliberate practice 30–1, 31
Denson, Judson 16
design
distributed simulation 200–5, 201
instructional 28
simulation activities 169
team training 160, 161
developing countries 242–3
distributed simulation 6, 63, 196–212
access to 199–200
audiovisual interface 203–4
CAST 206–7
clinical challenges 207–8
conceptual/theoretical foundations 197–200
design and anatomy 200–5, 201
environment 201–3, 202, 203
future developments 209–10, 210
optimal fidelity 198–9, 199
public engagement 208–9
simulators 204–5, 204, 205
validity 205–6, 205
Dutch Society for Simulation in Health Care 32
eyearly simulators 12–13
economic factors 75, 265–6
available resources 275–6
funding 170, 173–4, 173
resource-poor settings 242–3
education 88–90, 89, 90
competency-based 267–9, 268
quality assurance 74–5
resources available 275–6
scholarship in 271
see also learning; training
Education Commission for Foreign Medical Graduates (ECFMG) 98
educational leadership 96
educators 87–110, 187–8
clinical 187
educational leadership 96
roles and skills 90–2, 91, 92–3
standardized patients as 100–1
endotainers see box trainers
environment
distributed simulation 201–3, 202, 203
for learning 142
orientation to 217–20
physical space 218–19
simulated 12, 16–17
for teaching 158–60, 159
equipment 185–6, 186
ethical values 88
event-based approach to training (EBAT) 7, 221, 223
evidence 2–3, 26–42
experiential learning 47–8
facilitator-learner interaction 54–5
facilitators, standardized patients as 105
faculty 88, 275
development programme 94, 180
support for training activities 180
training 92–4
see also education
feedback 29–30, 29, 54–5, 135, 226
behavioural marker systems 5, 66, 132, 133–4
from standardized patients 105
haptic 120–1, 263–4, 264
see also debriefing
fiction contract 219
fidelity of simulation 52–3, 52, 53, 141–2, 220
high-fidelity simulators 118–20, 119, 120
optimized level of 198–9, 199
‘fire drills’ 274
fixed percentage method xii, 75
fluid teams 148
formative assessment 62
full body simulators 12, 91, 172, 185, 186
Fundamentals of Laparoscopic Surgery (FLS) 114
funding for simulation activities 170, 173–4, 173
future developments 7–9, 8, 258–81
assessment 76
clinic to theatre 260–1
distributed simulation 209–10, 210
impact of technological change 259–65
paradigm shifts in medical education 267–72
technical skills 126, 261–2
theatre to ward 262–3, 263
training 273–82, 277, 278
Gainesville Anesthesia Simulator (GAS) 16
GasMan 15
general practice
incognito standardized patients 252
remote/rural 250–1, 251
generalizability theory 72, 73, 79, 150
Global Rating Scales xii, 65–7, 66, 68, 69, 70, 263
Good Medical Practice 268
Gordon, Michael 13, 236
gradient of perceived realism 199, 199
ground rules 217
guidelines 19–21, 20
gynaecology teaching associates (GTAs) 14, 100
haptic feedback 120–1, 263–4, 264
Harvey simulator 7, 13, 236–7, 237
hierarchies 148, 149, 150, 216, 227, 239, 243, 271, 277
Kirkpatrick’s levels 9, 33, 149, 271
high-fidelity simulators 118–20, 119, 120
high-stakes assessment 35–6
historical aspects
early simulators 12–13
simulator training 2
standardized patients 97–9
Hofstee method xii, 75
holographic simulation 261
human factors 132
hybrid simulation xii, 12, 62–3, 100, 100, 207–8
hypervigilance xii, 76
icebreaker activities 216
ICEPS xii, 64
ICSAD 67
Imperial College Evaluation of Procedure-Specific Skill see ICEPS
Imperial College Surgical Assessment Device see ICSAD
in situ simulation 62
inflatable igloos 201, 202
informal discussion 216
innovations 62–3
input–process–output (I-P-O) framework 150
instructional design 28
instructional strategies 45
internal metrics xii, 3, 64, 77
interprofessional learning 240–1
interventional specialties 121–3
intraclass correlation coefficient (ICC) 239
ISBAR xii, 152, 155, 156
Jones, Alan 19
Kinematick Simulation, Monitoring and off-line Programming Environment for Telerobotics see KISMET
Kirkpatrick’s four-level model 9, 33, 149, 271
KISMET xii, 17
Kneebone, Roger 62
Laerdal, Asmund S. 13
Laerdal ‘SimMan3G’ medical simulator 80
laparoscopic cholecystectomy 124
LapSim 118–20, 119, 120
leadership educational 96
skills assessment 238–9, 240
learners
facilitator interaction 54–5
issues with 49–50
learning 3, 43–58
acquisition 28
effective 28–9
experiential 47–8
facilitation of 28
instructional strategies 45
interprofessional 240–1
lifelong 4, 8, 94, 270
mastery 269, 269
observational 48
person-task-context model 44
safe learning environment 142
skills learning 44–5
see also education; training
learning objectives for non-technical skills 137–8, 141
learning opportunities
context-related issues 51–4
creation of 48–9
learner issues 49–50
recognition of 49
task-related issues 50–1
use of 49
learning theory 45, 46–8
Lewin, Kurt 51
life space 51
lifelong learning 4, 8, 94, 270
Lind, Bjorn 13
live assessments 69
McGill Inanimate System for Training and Evaluation of Laparoscopic Skills see MISTELS
magnetic resonance imaging (MRI) 260–1
Maintenance of Certification (MOC) 269–70
male urogenital teaching associates (MUTAs) 100–1
malignant hyperthermia 158
managerial staff 186
mastery learning 269, 269
memory 198–9
Miller's Pyramid 51, 60, 61, 270
Minimal Access Therapy Training Unit (MATTUS) 21
minimally invasive surgery trainer-virtual reality see MIST-VR
MIST-VR 115–16, 117, 261
translation into operating room 117–18, 118
MISTELS xiii, 64, 114
Mobile Skills Unit 250–1, 251
models, synthetic 204, 204
modified Angoff process xiii, 75
motor skills learning 47
moulage xiii, 222
Mouret, Philip 112
multiple metrics 67

neonatal resuscitation 32
non-technical integration 139–40, 140
non-technical skills 4–5, 29, 131–45
acquisition and context 134–6, 135, 136
behavioural marker systems 132, 133–4
CRM 5, 16, 132, 133
in healthcare 132–3
human factors 132
learning objectives 137–8, 141
non-technical integration 139–40, 140
and practical procedures 135–6
scenario-based training 136, 140–2
technical aspects of performance 138, 138, 139
see also specific programs
Non-Technical Skills for Surgeons (NOTSS) xiii, 64, 133
NOTECHS 132, 161

Objective Structured Assessment of Technical Skills (OSATS) xiii, 64, 121, 206
Objective Structured Clinical Examinations (OSCEs) xiii, 36, 98, 273–4
observation-feedback cycle 135
observational learning 48
Observational Teamwork Assessment for Surgery (OTAS) 34, 263
observers 223
open surgery, model for 204
operating department practitioners 187, 188
operating lamps 203, 203
optimized level of fidelity 198–9
organizational structure 148
Ottawa Consensus Statement (2010) 62, 63
outcome measures 28, 33–6
level 1 33–4
level 2 34, 34
levels 3 and 4 35

PACER xiii, 155
paediatrics 244–5, 245
part task trainers 12, 13–14, 13
patient instructors (PIs) 100
patient journey 259, 260
pedagogy see learning
person-task-context model of learning 44
physical space 218–19
physician support 246–9, 248, 249
planning 177–80, 178, 179
pop-up banners 202
portable assessment environments 202, 203
Postgraduate Ward Simulation Exercise (PgWSE) xiii, 246–9, 248, 249
potential uses of simulation 259–60, 260
practical applications 235–57
cardiology 236–7, 237
incognito standardized patients in general practice 252
interprofessional learning 240–1
leadership skills 238–9, 240
paediatrics 244–5, 245
physician support 246–9, 248, 249
remote/rural practice 250–1, 251
resource-poor settings 242–3
trauma team training 33, 209, 214, 215, 253
see also case studies
pre-briefing 215–16
Probe, Alert, Challenge, Emergency, Response see PACER
Procedicus Vascular Interventional System Trainer (VIST) 123
procedural skills 30–1, 31
professional patients 14
see also standardized patients
professional and personal development
continuing professional development 269–70
lifelong learning 4, 8, 94, 270
standardized patients 106–7
professional recognition 94–6, 95
professional values 88
psychological safety 217
pull-up backdrops 202, 203
quality assurance 71–6, 94–6, 95
acceptability 75
educational impact 74–5
feasibility and cost-effectiveness 75
reliability 71–3
simulation activities 175–6, 176
standard setting 75–6
validity 73–4
RAPIDS xiii, 64, 65
rationale for simulation-based training 27
real people as simulators 12, 14–15
see also standardized patients
realism 219, 220
see also fidelity
reflective practice 30
regulation 19–21, 20
reliability of assessments 71–3
reliability coefficients 72
remote/rural practice 250–1, 251
repetitive practice 30, 31
Rescuing A Patient In Deteriorating Situations see RAPIDS
research 37
resource-poor settings 242–3
Resusci Anne 13, 13
Rochester Communication Rating Scale (RCRS) xiii, 64
Index / 287

Safar, Peter 13
safety
learning environment 142
psychological 217
scenario-based training 221–3, 221, 222, 223
briefing 220–1
development 179
learning objectives 137–8
life savers 49
non-technical skills 136–42
storyboarding 137–40, 139, 140
see also training
science traceability structure 277, 277, 278
scoring metrics 64–7
checklist scores 65
global rating scales 65–7, 66, 68, 69, 70
technical measures 64–5
see also individual metrics
screen-based simulators 12, 15–16
Scrub Practitioners’ List of Intra-operative Non-Technical Skills see SPLINTS
Second Life 8, 262
selection centre, development of 79–81, 80, 81, 81
selective abstraction xiii, 201, 210, 220
Simbionix LAP Mentor 121
SimMan3G medical simulator 80
simulated environments 12, 16–17
simulated patients see standardized patients
simulation activities 168–95, 213–34
applications 89
audiovisual equipment 224–5
briefing 220–1
course ending 230–1
course/setting introduction 216–17, 216
 debriefing see debriefing
design of 169
equipment 185–6, 186
faculty development and support 180
faculty-learner interactions 90
funding 170, 173–4, 173
incorporation into training 172–3
participant considerations 180–2, 181, 182
planning continuum 177–80, 178, 179
pre-briefing 215–16
quality assurance 175–6, 176
rationale for 170–1, 171
scenario see scenario-based training
space and resources 184–5, 185
staffing 186–8
administrative support 187
educators 187–8
management 186
technical support 187
stakeholder engagement 176–7
stakeholders 174–5, 175
sustainability 183
training needs analysis 171, 171
see also specific activities
’simulation champion’ 180
simulation education centres 6, 18–19, 19, 20
simulation event checklist 223
simulation fellows 188
simulation fidelity see fidelity of simulation
simulation setting 214, 215
simulation-based assessment 78
simulation-based educators see educators
simulation-based team training see team training
simulation-based training see training
simulators
classification 12
distributed simulation 204–5, 204, 205
see also individual simulators
situation awareness 31, 79, 81, 133,
136, 240, 253
skills 4–5, 5
non-technical see non-technical
skills
technical see technical skills
skills learning 44–5
SNAPPI xiii, 155–6, 157
social learning theory 45
Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) 21
SPLINTS xiii, 64, 133
Spotlight model xiii, 198
staffing 186–8
administrative support 187
confederates 222–3
educators 187–8
management 186
observers 223
standardized patients see standardized patients
technical support 187
standard error of measurement (SEM) 72
standard setting 75–6
standardized patients 3–4, 4, 96, 188, 219
assessment 106
as assessors 101
characteristics and attributes 102
clinical practice and healthcare systems 101–2
definition 96–7
educational context 99
effects of being 103
history 97–9
incognito, in general practice 252
professional and personal development 106–7
recruitment and selection 102–3
sources 98
as teachers 100–1
trainers of 105
training 103–4
feedback and facilitation 105
history and consultation 104
portrayal of physical signs 104–5
standards 94–6, 95
see also quality assurance
storyboarding 137–40, 139, 140
summative assessment 62
supporting others 132
supportive interventions 246–9, 248, 249
surgeons
simulation training 263–5, 264
technical skills see technical skills
suturing, model for 204
take home messages 142
task management 136
task-related issues 50–1
specific vs. general tasks 51
taxonomy 12, 12
teachers see educators
teaching 3, 4
environment 158–60, 159
see also education; training
Team Behavioural Rater 161
Team Response to Airway Crises (TRAC) course 240–1
team training 4–5, 5, 45, 136, 146–67
barriers to 147–9
attitudes, traditions and hierarchies 148
cultural differences 148
educational system 148–9
fluid teams 148
organizational structure 148
definitions 149
design and implementation 160, 161
drivers for 147
evidence on 149–51, 150, 151
future developments 262, 263
teaching environment 158–60, 159
trauma team 33, 209, 214, 215, 253
what to teach
attitudes 158
cognition 157–8
teamwork behaviours 151–7, 153–5
TeamSTEPPS 147
teamwork 146–67
assessment 160–3
behaviours 150–7, 153–5
cognition 157–8
dimensions of 152
fluid teams 148
personal attributes 66
see also team training
technical skills 4–5, 111–30
animal training models 115
assessment 116
box trainers (endotrainers) 113–14, 114
curriculum development 116–17
future developments 126, 261–2
haptic feedback 120–1, 263–4, 264
high-fidelity simulators 118–20, 119, 120
interventional specialities 121–3
MIST-VR 115–16, 117
simulation in future potential 121, 122
infrastructure 125–6
selection and revalidation 124–5
training 123–4
validity 113, 113, 116
training content 116
translation into operating room 117–18, 118
virtual reality simulators 12, 17–18, 115
technical support 187
technological change, impact of 259–66
To Err is Human 254, 259
traditions 148
training
assessment 3, 35–6
clinical educators 105, 187–8
cockpit resource management 132
event-based approach 7
evidence 2–3, 26–42
faculty 92–4
future developments 273–82, 277, 278
history 2
incorporation of simulation activities 172–3
needs analysis 171, 171
requests for 172
scenario-based see scenario-based training
scholarship in 271
skills 4–5, 5
standardized patients 103–4
feedback and facilitation 105
history and consultation 104
portrayal of physical signs 104–5
teams see team training
see also education; non-technical skills; technical skills
trauma team training 33, 209, 214, 215, 253
two challenge rule xiii, 155, 156, 158
UK Higher Education Academy (HEA) 88
standards 95
undergraduate leadership skills 238–9, 240
US Accreditation Council for Graduate Medical Education 147
Utstein xiv
Vaihinger, Hans 53
validity of assessments 73–4
van der Vleuten, Cees 61–2
video recording 181–2
assessments 69
consent for 182
use during debriefing 29
virtual reality simulators 12, 17–18, 115
MIST-VR 115–16, 117
Visible Human Project 17
vocal cues xiv, 222
ward-based scenarios 262–3
wireless manikin 62
workplace-based assessments 244
wound prosthetics 208
Zoom Lens model xiv, 198