Guideline 10.2 – Advanced Life Support (ALS) Training

Summary

Definitions

For the purposes of this guideline, the terms Basic Life Support (BLS), Advanced Life Support (ALS) and Health Care Professional are defined in the Australian and New Zealand Resuscitation Councils glossary.

ALS courses are mainly directed at healthcare professionals and may cover management principles for newborns, children or adults. In general, they cover the knowledge, skills, attitudes and behaviours needed to function as part of (and ultimately lead) a resuscitation team.[1]

Who does this guideline apply to?

This guideline applies to ALS trainers and trainees.

Who is the audience for this guideline?

This guideline is for ALS training curriculum developers and providers and health care professionals who provide and receive ALS training

Conflict of interest statement

Both the Australian Resuscitation Council and New Zealand Resuscitation Council (ANZCOR) are providers of resuscitation education and generate income from these activities.

Recommendations

1. ANZCOR suggests that precourse preparation is provided (strong recommendation, very low to low certainty of evidence).
2. ANZCOR suggests that ALS training programmes include 6-8 hours of instructor-led training time (ungraded, good practice statement). ANZCOR suggests ALS training can be delivered by either a spaced learning approach or a 1-2 day block ALS course (weak recommendation, very low certainty of evidence).
3. ANZCOR recommends that team and leadership training should be included as part of ALS training for healthcare providers (weak recommendation, very low-quality evidence).
4. ANZCOR suggests that cognitive aids may be considered for use in ALS training (ungraded,

good practice statement).
5. ANZCOR suggests the use of feedback devices that provide directive feedback on chest compression rate, depth, release, and hand position during training (weak recommendation, low-quality evidence).
6. ANZCOR suggests that summative assessment at the end of ALS training should be considered as a strategy to improve learning outcomes (ungraded, good practice statement).
7. ANZCOR suggests the use of high-fidelity manikins when training centres/organisations have the infrastructure, trained personnel, and resources to maintain the programme (weak recommendations based on very-low-quality evidence).
8. ANZCOR suggests the use of low-fidelity manikins if high-fidelity manikins are not available (weak recommendations based on low-quality evidence).
9. ANZCOR suggests that high fidelity scenarios (those that integrate psychomotor skills, non-technical skills and clinical decision making) are more important than the fidelity of the manikin (ungraded, good practice statement).
10. ANZCOR suggests frequent manikin-based refresher training for students of ALS courses to maintain competence compared with standard retraining intervals of 12 to 24 months (weak recommendation, very-low-quality evidence).
11. ANZCOR suggests that all ALS courses should have a robust process for continuous evaluation and quality improvement (ungraded, good practice statement).

1.0 | ALS courses

This guideline is based on the assumption that the quality of resuscitation and patient outcomes are improved with the acquisition of ALS knowledge, skills, attitudes and behaviours.[2] This is supported by a 2019 International Liason Committee on Resuscitation (ILCOR) systematic review and CoSTR, demonstrating that ALS courses have a positive impact on return of spontaneous circulation and survival.[3,4]

Section 1 covers the content for initial ALS training and Section 2 covers refresher training.

1.1 | Pre-course preparation

A demonstrated ability to perform basic life support (BLS) skills is a pre-requisite to enrolment and attendance at an ALS training course.

Pre-course preparation should:

- be made available to participants
- be tailored to participants’ learning needs
- be aligned with intended learning outcomes
- optimise participant engagement and active learning

Pre-course preparation (e.g. computer-assisted learning tutorials, written self-instruction materials, video-based learning, textbook reading, and pretests) is recommended as part of ALS courses.[5] However, any method of pre-course preparation that is aimed at reducing instructor-to-learner face-to-face time should be formally assessed to ensure equivalent or improved learning outcomes compared with standard instructor-led courses.[5]

There are various strategies of precourse learning. Large published studies have investigated diverse methods of pre-course learning (e.g. manuals, online simulators) as well as how pre-course learning interconnects with the ALS course (e.g. whether it provides. additional material or replacement of material within the course). Blended learning models (e.g. independent electronic learning coupled with a reduced-duration face-to-face course time) have been reported to acheive similar learning outcomes and substantial cost savings.[6]

In the 2020 CoSTR, ILCOR recommend the option of precourse e-learning as part of a blended learning approach for participants of ALS courses. (strong recommendation, very-low to low certainty of evidence).[7] The highest quality evidence on pre-course preparation comes from one randomised control trial (RCT) examining the addition of e-learning (interactive simulations with feedback) to providing ALS manuals 4-weeks before the course.[8] While this RCT found no additional benefit of providing e-learning for skill performance or knowledge, user evaulations favoured e-learning and stated that it contributed to their understanding of course materials.[8]

ANZCOR suggests precourse preparation is provided (strong recommendation, very-low to low certainty of evidence). At a minimum, this should include the course objectives, pre-requisite knowledge, course outline, method of delivery (online, face-to-face) and assessment criteria. This information should be provided with sufficient time for participants to assimilate knowledge. There is insufficient evidence to make clear recommendation for a specific method or timeframe.

1.2 | Course content

ALS courses involve the acquisition of specific knowledge, skills (psychomotor, teamwork, communication), and attitudes with the goal of maximising resuscitation performance, and therefore patient outcomes.[2] ALS courses should be designed with the target patient population in mind. ALS courses should have core components that may be supplemented by context-specific components. As a minimum, ALS training programmes should include the following core elements or recognition of prior learning:

Adult and paediatric courses	**Neonatal courses**
Recognising and responding to deteriorating patients	Recognition of antenatal and intrapartum risk for needing resuscitation
Reversible causes and rhythms associated with cardiac arrest	Assessment of need for resuscitation at birth
Management of shockable or non-shockable arrest rhythms	Initial steps in resuscitation of the neonate
Advanced airway management	

Ventilation	
Vascular access	
Drug therapy	
Defibrillation	Special circumstances – e.g. the very or extremely preterm neonate, the neonate with congenital anomalies
Teamwork and communication	
Post resuscitation care	
Legal and ethical issues related to resuscitation	
Communication with and care of families, significant others and bystanders	Communication with and care of parents
Other techniques or interventions related to role, scope and context of practice	

1.3 | Course duration

The optimum duration and structure of ALS training programmes is unknown,[6] however course duration should provide sufficient opportunity for participants to achieve the intended learning outcomes (knowledge, skills, attitudes and behaviours).

A pre-test, post-test study of deliberate practice using high fidelity simulation to teach ALS to internal medicine residents showed that performance improved after training. After baseline testing, participants received four 2-hour blocks of training with peer feedback: 80% (33/41) of participants passed the assessment after the scheduled 8-hour course, whereas 20% (8/41) required an additional 15 to 60 minutes to achieve the minimal passing score on all 6 ALS cases.[9] The amount of practice time needed to reach the minimum passing score was a negative predictor of post-test performance.[9]

ANZCOR suggests that ALS training programmes include 6-8 hours of instructor-led training time. There is insufficient evidence to recommend whether courses are modular in nature or take a comprehensive all-at-once approach supported by pre-course learning. ANZCOR suggests ALS training can be delivered by either a spaced learning approach or a 1-2 day block ALS course.

1.4 | Course delivery

There is insufficient evidence to recommend any specific method of training, compared with traditional lecture/practice sessions, to improve learning, retention, and use of ALS skills.[5]

Pre-briefing is an important strategy to create a safe learning environment, acknowledge to learners that mistakes are expected and are seen as valuable learning opportunities, and to build rapport between learners and educators.[2] Further, pre-briefing should make explicit performance targets and outline the key elements of performance feedback (timing, sources, intent) so learners have clear expectations.[2]

The traditional approach to ALS provider courses has been 1-2 day courses culminating in assessment of skill acquisition and renewal after a variable period of time, typically 1 – 4 years.[2] Whilst this approach has been effective for short term learning and most candidates pass the assessment, skills and knowledge are known to deteriorate within 1 to 6 months without practice.[2] The risk of poor resuscitation performance with this deterioration has been a driver for increasing training frequency.

Spaced, or distributed practice, involves spreading content across different sessions or repeating content at separate sessions.[2] There is some evidence from cognitive psychology that spacing results in better learning outcomes than practice that is clustered together, however the optimum number of repetitions or time intervals is unclear.[2]

The 2020 ILCOR CoSTR suggests that spaced learning (i.e. training or retraining distributed over time) may be used instead of massed learning (training provided at one single time point) (weak recommendation, very low certainty of evidence).[10] This recommendation was based on the growing body of evidence suggesting that spaced learning can improve skill retention (performance 1 year after course conclusion), skill performance (performance between course completion and 1 year) and knowledge at course completion.

ANZCOR suggests ALS training can be delivered by either a spaced learning approach or a 1-2 day block ALS course (weak recommendation, very low certainty of evidence).

1.5 | Knowledge

There are a number of ways to teach the required knowledge that underpins ALS, however, the method used must align and achieve the intended learning outcomes. It is acknowledged that participants will have varying levels of prior knowledge and this needs to be considered in decisions regarding the most appropriate teaching method. For example, new learners may require more detailed initial explanations. Options for delivery of knowledge should be flexible and may include: self-directed learning, use of written or online materials, lectures or small group sessions.

1.6 | Skills

Participants must demonstrate satisfactory integration of ALS skill(s) in a simulated team training environment. Mastery "implies that a learner can consistently demonstrate a predefined level of competence for a specific skill or task".[2p e4] Therefore resuscitation education experiences should enable learners to practice fundamental resuscitation skills, receive directed feedback, and improve their performance until mastery is achieved.[2]

Participants must demonstrate satisfactory performance in:

- both component (e.g. 'skill station') and scenario based skills
- capacity to operate within a team

Participants must demonstrate an understanding of the:

- indications for resuscitation
- indications for equipment and potential complications of procedures
- sequencing and prioritisation of resuscitation interventions

1.7 | Teamwork, communication and leadership

Team training in a resuscitation context should focus on the key elements of crisis resource management, such as leadership, followership, communication, situational awareness, and resource use.[2,11]

There are no RCTs testing the effect of specific leadership or team training on the critical outcome of patient survival. However, two observational studies[12,13] have shown team training had a positive effect on survival from in-hospital paediatric cardiac arrest [12] and severity-adjusted surgical mortality.[13]

Studies of the effect of teamwork training on skill performance in actual resuscitation have produced conflicting results. One RCT showed no effect on CPR quality[14] and two observational studies that showed positive effects on neonatal resuscitation[15] and improved coordination and deployment of extracorporeal membrane oxygenation during CPR.[16]

A number of studies have examined skill performance for patient interventions, teamwork performance and leaders' performance at course conclusion from 4 to 12 months. Team and leadership training have been shown to improve CPR hands-on time and time to initiation of various patient interventions (8 RCTs[17-23] and 4 observational studies[24-27]) at course conclusion and improved CPR hands-on time (chest compression fraction) and time to initiation of various patient interventions at follow-up assessment (two RCTs[17,18]). Teamwork-trained learners exhibited more frequent teamwork behaviours at course completion (6 RCTs[17,19-21,23,28] and 3 observational studies[26,29,30]) and at follow-up assessment (one RCT[17] and one observational study[29]). Leadership-trained instructors (4 RCTs[18,22,24,31] and 2 observational studies[27,32]) demonstrated more frequent leadership behaviours at course conclusion and at follow-up assessment (one RCT[18] and one single observational study[29]). For the important outcome of cognitive knowledge, there is no current published evidence.

The ILCOR 2020 CoSTR suggests that specific team and leadership training be included as part of ALS training for healthcare providers (weak recommendation, very low certainty of evidence).[33]

ANZCOR recommends that team and leadership training should be included as part of ALS training for healthcare providers (weak recommendation, very low-quality evidence).

1.8 | Cognitive aids

It is reasonable to use cognitive aids (e.g., checklists, flow charts) during resuscitation training, provided that they do not delay the start of resuscitative efforts. It is preferable that these cognitive aids should be the same or similar, where practical, to those available to participants in clinical practice. Aids should be validated using simulation or patient trials, both before and after implementation, to guide rapid cycle improvement.[5] Current evidence supporting the use of cognitive aids highlights a number of issues. One study of simulated paediatric cardiac arrest showed that 85% of participants used cognitive aids, but in 25% of cases there were errors in management.[34] However, a seminal study from 1990 showed that the introduction of cognitive aids while performing bag-mask ventilation did not significantly affect psychomotor performance by paediatric residents.[35]

ANZCOR suggests that cognitive aids may be considered for use in ALS training (ungraded, good practice statement).

1.9 | Performance Feedback and Assessment

Performance Feedback

Feedback is defined as information regarding performance compared with a specific standard; whereas, debriefing is defined as a reflective conversation regarding performance, which may include some elements of feedback.[2] Performance feedback is vital to maintaining and improving clinical skills, even for experienced clinicians.[2,36] Effective feedback should be specific, timely, actionable, and be learner specific. Feedback should also enable the learner to identify positive aspects of performance and those requiring improvement.[2,37] Instructors should be cognisant that learners have difficulty using feedback that threatens their self-esteem or conflicts with their perceptions of self.[14,38] Careful consideration must be given to feedback, as the effect of feedback can be positive or negative on learning.[14,38]

A systematic review and meta-analyses of the effectiveness of feedback during procedural skills training using simulation based medical education showed that feedback was associated with significantly improved skill outcomes.[39] There was no significant difference between formative and summative feedback, for skill outcomes assessed immediately at the end of the intervention or when skills were assessed at least 5 days post-training.[39] When compared to a single source of feedback, multiple sources (e.g. instructor and visual) of feedback enhanced learning outcomes[39]

Establishing a Safe Learning Environment

Establishing a psychologically safe training environment includes: clarifying expectations; engaging in an explicit and collaborative agreement in which both instructors and learners commit to what can reasonably occur to make the situation as real as possible whilst acknowledging the limitations of a simulation environment; and enacting a commitment to respecting learners and their psychological safety. The instructor-participant relationship should be collaborative and there should be consistency between what instructors say and do.[37] Instructors should be aware of the intended learning outcomes so that training can be tailored to specific learners or learner groups.[2] Intended learning outcomes should be patient focused and not solely meet the requirements of content delivery.[2] Instructors should have a sound and clear understanding of the key instructional design features that enhance learning in an ALS course and should have specific training in feedback and debriefing.[2]

CPR prompt or feedback devices

CPR prompt or feedback devices may be considered during CPR training for health care professionals. The use of CPR feedback or prompt devices during CPR in clinical practice or CPR training is intended to improve CPR quality as a means to improving ROSC and survival.[5,40] The forms of CPR feedback or prompt devices includes audio and visual components such as voice prompts, metronomes, visual dials, numerical displays, wave-forms, verbal prompts, and visual alarms. Visual displays enable rescuers to see compression-to-compression quality parameters, including compression depth and rate.[40] Audio prompts may guide CPR rate (e.g., metronome) and may offer verbal prompts to rescuers (e.g., “push harder,” “good compressions”).[40]

The 2015 ILCOR CoSTR[6] did not identify any studies related to the use of real-time audiovisual feedback and prompt devices during CPR training and the critical outcomes of improvement of patient outcomes and skill performance in actual resuscitations. A review of 5 studies (four studies of 1029 participants in adult CPR training [41-44] and one study of 36 participants in neonatal CPR training [45]) showed substantial skill decay 6 weeks to 12 months after training with and without the use of a feedback device. For the important outcome of skill performance at course conclusion, a review of 28 studies [41-68] showed limited improvements in CPR quality (i.e. compression depth, compression rate, chest recoil, hand placement, hands-off time, and ventilation) with a feedback device.

ANZCOR suggests the use of feedback devices that provide directive feedback on compression rate, depth, release, and hand position during training (weak recommendation, low-quality evidence).[6] If feedback devices are not available, we suggest the use of tonal guidance (examples include music or metronome) during training to improve compression rate only (weak recommendation, low-quality evidence).[6]

Summative assessment

Assessment is defined as “any systematic method of obtaining information from tests and other sources, used to draw inferences about characteristics of people, objects or programmes”.[69] In the context of ALS courses, the domains that may be assessed include resuscitation knowledge, technical skills (e.g. chest compressions) and nontechnical skills (e.g. leadership or communication). These domains are complex so the construct being assessed must be clearly identified.[2] Assessment methods may include written assessments (e.g. multiple-choice questions) and assessments of performance (e.g. a simulated resuscitation scenario or demonstration of a specific technical skill).[2] Assessments should measure elements of resuscitation that are important for patient outcomes rather than what is easy to assess,[2] and should be performed for both the individual (e.g. delivery of guideline compliant chest compressions) and team performance.[2]

Assessment data may be derived from direct observation, retrospective video review, or CPR feedback devices.[2] Assessment *for* learning should occur throughout the course, to inform instructor feedback and coaching. Assessment *of* learning typically occurs at the end of an ALS course as a measure of the effectiveness of the educational intervention and for certification.[2] Assessment tools should be valid, reliable and reflect the course learning outcomes. Assessment results should be reproducible.[2] Summative assessment at the end of ALS training should be considered as a strategy to demonstrate achievement of learning outcomes. Summative assessment of ALS knowledge and skills following a course should include written and practical testing components. The use of written assessment alone is insufficient.[4]

ANZCOR suggests that summative assessment at the end of ALS training should be considered as a strategy to improve learning outcomes.[5]

1.10 | Equipment/resources

High fidelity manikins are computerised, full-body manikins that can be programmed to provide realistic physiological response to learners actions. There is insufficient evidence to support or refute the use of techniques such as high-fidelity manikins and in situ training compared with training on low-fidelity manikins and education centre-based training.[5]

High-fidelity training compared with low-fidelity training has been shown to have a moderate effect on improved skills performance at course completion (very-low-quality evidence from 12 RCTs with 726 participants[17,70-80]), but no benefit in skills performance at 1 year (low-quality evidence from one RCT with 86 participants[70] and very low-quality evidence from one RCT with 47 participants[71]). High-fidelity training compared with low-fidelity training had no benefit in knowledge at course conclusion (low-quality evidence from 8 RCTs with 773 participants[71-74,79-82] and 1 non-RCT with 34 participants).[83]

ANZCOR suggests the use of high-fidelity manikins when training centres/organisations have the infrastructure, trained personnel, and resources to maintain the programme (weak recommendations based on very-low-quality evidence). If high-fidelity manikins are not available, ANZCOR suggests that the use of low-fidelity manikins is acceptable for standard ALS training in an educational setting (weak recommendations based on low-quality evidence).

In making these recommendations, ANZCOR considered the well-documented, but self-reported participant preference for high-fidelity manikins (versus low-fidelity manikins) and the likely impact of this preference on willingness to train.[84] ANZCOR considered the positive impact of skill acquisition at course completion, as well as the lack of evidence of sustained impact on the learner, and the relative costs of high- versus low-fidelity manikins. High-fidelity manikins can provide physical findings, display vital signs, physiologically respond to interventions (via computer interface), and enable performance of procedures.[85] When considering physical realism, high-fidelity manikins are more expensive but are increasingly more popular with candidates and faculty, however there may be marginal benefits for the intervention. In reviewing the science, it was clear that there was a benefit to high-fidelity manikins but less clear whether the incremental costs justified the added expenses.[6]

ANZCOR recommends that technology needs to be appropriate in order to generate skills, therefore at a minimum, there should be learner access to basic manikin with an airway and the ability to simulate the display of cardiac rhythm.

ANZCOR suggests that high fidelity scenarios are more important than the fidelity of the manikin (ungraded, good practice statement). When high- and low-fidelity simulations of neonatal resuscitation were compared, there was also no significant difference in non-technical skills performance or in the stress responses of learners.[78]

2.0 | Advanced Life Support re-training and refresher training

Health professional exposure to cardiac arrest is relatively low. Victorian data shows that paramedics are exposed to an average 1.4 (IQR=0.0-3.0) out-of-hospital cardiac arrests per year and it takes, on average, 163 days for paramedics to be exposed to out-of-hospital cardiac arrest.[86] Annually, there are approximately 10.2 million hospital admissions in Australia[87] and 1.1 million in New Zealand.[88] A systematic review of the frequency, characteristics and outcomes of adult in-hospital cardiac arrests in Australia and New Zealand showed that the frequency of in-hospital cardiac arrests ranged from 1.31-6.11 per 1000 admissions in four population studies and 0.58-4.59 per 1000 in 16 cohort studies.[89] In contrast, newborn resuscitation is more frequent. While one in five newborn infants is reported to receive some form of resuscitation intervention, one in twenty received assisted ventilation (which is often the most important neonatal resuscitation intervention). Nevertheless only about 3 per 1000 receive chest compressions, suggesting a low frequency of exposure of newborn care providers to the need to provide extensive resuscitation.[90]

Retraining cycles of 12 to 24 months are not adequate to maintain competence in resuscitation skills.[6] . The optimal retraining intervals are yet to be defined, but more frequent training may be helpful for providers.[6]

For the important outcome of skill performance at 1 year, there were 4 studies[91-94] using varying refresher techniques (simulation-enhanced booster 7 to 9 months after ALS course, monthly use of an eLearning tool, 3-monthly information mail-outs related to course objectives or patient management, in situ monthly simulation for 6 months) and outcome measures (procedural skills and teamwork behaviour; composite scoring of written test and cardiac arrest simulation test, mock arrest, compression, and ventilation performance, changes in Clinical Performance and Behavioural Assessment scores).[91-94] The use of simulation boosters showed benefit in terms of procedural skills and teamwork behaviour scores (very-low-quality evidence, downgraded for indirectness and imprecision).[94] There was no benefit from periodic eLearning and mail outs except in mock arrest performance (very-low-quality evidence, downgraded for indirectness and imprecision).[91,92] One study compared frequent refreshers to standard retraining intervals, using manikin-based simulation[93] and showed improvement in Clinical Performance and equivalence Behavioural Assessment scores using shorter retraining time (4.5 versus 7.5 hours) (low-quality evidence, downgraded for imprecision). [93]

For the important outcome of skill performance beyond course completion and before 1 year, there was one study that compared a single refresher using video and self-guided practice or a single 2-hour hands-on session with no retraining: there was no benefit from refresher training (very-low-quality evidence, downgraded for serious bias, indirectness, and imprecision).[95] For the important outcome of knowledge, there were four studies using a variety of refresher techniques (simulation-enhanced booster, video and self-guided practice, knowledge examination, and mock resuscitation training or mail-outs): there was no benefit from refresher training (very-low-quality evidence, downgraded for serious bias, indirectness, and imprecision).[92,94-96]

The optimal frequency and duration of this retraining is yet to be determined. There is also no definitive answer to how frequently training should be delivered because outcomes are dependent on the type of training. For example, the use of different types of manikins can lead to improved outcomes in the short term.[97] To date, studies related to ALS refresher training are of relatively poor quality, limited in sample size, and lack the use of consistent high-quality assessment tools.[6]

Refresher training, in the form of frequent low-dose in situ training using manikins, may be a practical cost-effective solution given sessions can be integrated into daily workflow thus decreasing the need to remove staff for standard refresher training and retraining times can be reduced.[95] Further, learning from “frequent, low-dose” compared with “comprehensive, all-at-once” instruction is effective and preferred by learners.[98] Initiatives such as Rapid Cycle Deliberate Practice (RCDP),[99] a novel instructional method for simulation-based learning that incorporates multiple repetitions of short simulations with interspersed feedback warrant further consideration. In a prospective pre-post interventional study of RCDP for cardiac arrest management, RCDP was associated with improvement in key performance measures for high quality life support in the first five minutes of resuscitation.[100] A recent study of nurses randomised participants to 1, 3, 6 and 12 month CPR training.[101] Training included a verbal briefing about the components of high quality CPR and two minutes of CPR using an adult CPR torso manikin with real-time performance feedback.[101] The proportion of participants who were able to deliver high quality CPR was: 58% in the 1-month group; 26% in the 3-month group ($p = 0.008$); 21% in the 6-month group ($p = 0.002$) and 15% in the 12-month group ($p < 0.001$).[101] The role of experiential learning and clinical exposure with feedback or peer-review in retraining is unclear.

ANZCOR suggests that more frequent manikin-based refresher training for students of ALS courses may be better to maintain competence compared with standard retraining intervals of 12 to 24 months (weak recommendation, very-low-quality evidence). In making this recommendation, ANZCOR considers the rapid decay in skills after standard ALS training to be of concern for patient care.

3.0 | Governance and administration

Governance structures and processes are the essential systems and procedures of oversight for consistent delivery; maintenance of standards and review of outcomes. They should guide all courses making statements to the rules, procedures, and other informational guidelines. In addition, governance frameworks define, guide, and provide for enforcement of these processes.

Models for the governance will vary but should incorporate aspects of:

- Defined rules and regulations
- Organisational and individual accountability
- Administration requirements before/during and following the course
- Review processes
- Information storage
- Health and safety requirements
- Fiscal probity
- Equity
- Participant requirements
- Instructor proficiency and conduct
- Candidate selection /eligibility
- Assessment systems
- Appeal process
- Certification

The governance must comply with statutory legislative requirements and be available to all participants for review. Ongoing review of the material, structures and participant feedback of the course should occur to ensure the substance of the course is current in the clinical and governance scope. ANZCOR suggests that all ALS courses should have a robust process for continuous evaluation and quality improvement.

References

1. Greif R, Lockey AS, Conaghan P, Lippert A, De Vries W, Monsieurs KG. European Resuscitation Council Guidelines for Resuscitation 2015: Section 10. Education and implementation of resuscitation. *Resuscitation* 2015; **95**: 288-301.
2. Cheng A, Nadkarni VM, Mancini MB, et al. Resuscitation Education Science: Educational Strategies to Improve Outcomes From Cardiac Arrest: A Scientific Statement From the American Heart Association. *Circulation* 2018; **138**(6): e82-e122.
3. Lockey A, Lin Y, Cheng A. Impact of adult advanced cardiac life support course participation on patient outcomes—A systematic review and meta-analysis. *Resuscitation* 2018; **129**: 48-54.
4. Lockey A, Bray J, on behalf of the International Liaison Committee on Resuscitation EIT Task Force. Patient outcomes as a result of a member of the resuscitation team attending an ALS course Consensus on Science with Treatment Recommendations. *https://costrilcororg/document/patient-outcomes-as-a-result-of-a-member-of-the-resuscitation-team-attending-an-als-course-tfsr-costr* 2019.
5. Soar J, Mancini ME, Bhanji F, et al. Part 12: Education, implementation, and teams: 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. *Resuscitation* 2010; **81**(1): e288-e330.
6. Finn JC, Bhanji F, Lockey A, et al. Part 8: Education, implementation, and teams 2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Resuscitation* 2015; **95**: e203-e24.
7. Breckwoldt J, Beck S, on behalf of the International Liaison Committee on Resuscitation Task Force Education iaT, . Pre-course preparation for advanced courses: Consensus on Science with Treatment Recommendations. *https://costrilcororg/document/precourse-preparation-for-advanced-courses-systematic-rev*

iew 2020.
8. Perkins GD, Fullerton JN, Davis-Gomez N, et al. The effect of pre-course e-learning prior to advanced life support training: a randomised controlled trial. *Resuscitation* 2010; **81**(7): 877-81.
9. Wayne DB, Butter J, Siddall VJ, et al. Mastery learning of advanced cardiac life support skills by internal medicine residents using simulation technology and deliberate practice. *Journal of general internal medicine* 2006; **21**(3): 251-6.
10. Yeung J, Djarv T, on behalf of the EIT Task Force and the NLS Task Force as collaborators. The use of Spaced Learning compared with Massed Learning among learners taking a resuscitation or first aid course Consensus on Science with Treatment Recommendations *https://costrilcororg/document/spaced-versus-massed-learning-in-resuscitation-training- eit-1601-systematic-review* 2020.
11. Gaba DM, Howard SK, Fish KJ, Smith BE, Sowb YA. Simulation-based training in anesthesia crisis resource management (ACRM): a decade of experience. *Simul Gaming* 2001; **32**(2): 175-93.
12. Andreatta P, Saxton E, Thompson M, Annich G. Simulation-based mock codes significantly correlate with improved pediatric patient cardiopulmonary arrest survival rates. *Pediatric critical care medicine : a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies* 2011; **12**(1): 33-8.
13. Neily J, Mills PD, Young-Xu Y, et al. Association between implementation of a medical team training program and surgical mortality. *Jama* 2010; **304**(15): 1693-700.
14. Weidman EK, Bell G, Walsh D, Small S, Edelson DP. Assessing the impact of immersive simulation on clinical performance during actual in-hospital cardiac arrest with CPR-sensing technology: A randomized feasibility study. *Resuscitation* 2010; **81**(11): 1556-61.
15. Nadler I, Sanderson PM, Van Dyken CR, Davis PG, Liley HG. Presenting video recordings of newborn resuscitations in debriefings for teamwork training. *BMJ quality & safety* 2011; **20**(2): 163-9.
16. Su L, Spaeder MC, Jones MB, et al. Implementation of an extracorporeal cardiopulmonary resuscitation simulation program reduces extracorporeal cardiopulmonary resuscitation times in real patients. *Pediatric critical care medicine : a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies* 2014; **15**(9): 856-60.
17. Thomas EJ, Williams AL, Reichman EF, Lasky RE, Crandell S, Taggart WR. Team training in the neonatal resuscitation program for interns: teamwork and quality of resuscitations. *Pediatrics* 2010; **125**(3): 539-46.
18. Hunziker S, Buhlmann C, Tschan F, et al. Brief leadership instructions improve cardiopulmonary resuscitation in a high-fidelity simulation: a randomized controlled trial. *Critical care medicine* 2010; **38**(4): 1086-91.
19. Chung SP, Cho J, Park YS, et al. Effects of script-based role play in cardiopulmonary resuscitation team training. *Emergency medicine journal : EMJ* 2011; **28**(8): 690-4.
20. Fernandez Castelao E, Russo SG, Cremer S, et al. Positive impact of crisis resource management training on no-flow time and team member verbalisations during simulated cardiopulmonary resuscitation: a randomised controlled trial. *Resuscitation* 2011; **82**(10): 1338-43.
21. Fernandez R, Pearce M, Grand JA, et al. Evaluation of a computer-based educational intervention to improve medical teamwork and performance during simulated patient resuscitations. *Critical care medicine* 2013; **41**(11): 2551-62.
22. Hunziker S, Tschan F, Semmer NK, et al. Hands-on time during cardiopulmonary resuscitation is affected by the process of teambuilding: a prospective randomised simulator-based trial. *BMC emergency medicine* 2009; **9**: 3.
23. Jankouskas TS, Haidet KK, Hupcey JE, Kolanowski A, Murray WB. Targeted crisis resource

management training improves performance among randomized nursing and medical students. *Simulation in healthcare : journal of the Society for Simulation in Healthcare* 2011; **6**(6): 316-26.

24. Blackwood J, Duff JP, Nettel-Aguirre A, Djogovic D, Joynt C. Does teaching crisis resource management skills improve resuscitation performance in pediatric residents?*. *Pediatric critical care medicine : a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies* 2014; **15**(4): e168-74.
25. DeVita MA, Schaefer J, Lutz J, Wang H, Dongilli T. Improving medical emergency team (MET) performance using a novel curriculum and a computerized human patient simulator. *Quality & safety in health care* 2005; **14**(5): 326-31.
26. Makinen M, Aune S, Niemi-Murola L, et al. Assessment of CPR-D skills of nurses in Goteborg, Sweden and Espoo, Finland: teaching leadership makes a difference. *Resuscitation* 2007; **72**(2): 264-9.
27. Yeung JH, Ong GJ, Davies RP, Gao F, Perkins GD. Factors affecting team leadership skills and their relationship with quality of cardiopulmonary resuscitation. *Critical care medicine* 2012; **40**(9): 2617-21.
28. Thomas EJ, Taggart B, Crandell S, et al. Teaching teamwork during the Neonatal Resuscitation Program: a randomized trial. *Journal of perinatology : official journal of the California Perinatal Association* 2007; **27**(7): 409-14.
29. Garbee DD, Paige J, Barrier K, et al. Interprofessional teamwork among students in simulated codes: a quasi-experimental study. *Nursing education perspectives* 2013; **34**(5): 339-44.
30. Sawyer T, Leonard D, Sierocka-Castaneda A, Chan D, Thompson M. Correlations between technical skills and behavioral skills in simulated neonatal resuscitations. *Journal of perinatology : official journal of the California Perinatal Association* 2014; **34**(10): 781-6.
31. Cooper S. Developing leaders for advanced life support: evaluation of a training programme. *Resuscitation* 2001; **49**(1): 33-8.
32. Gilfoyle E, Gottesman R, Razack S. Development of a leadership skills workshop in paediatric advanced resuscitation. *Medical teacher* 2007; **29**(9): e276-83.
33. Kuzovlev A, Monsieurs K, on behalf of the International Liaison Committee on Resuscitation Education IaTTF, . . Team and leadership training in advanced life support courses : Consensus on Science with Treatment Recommendations. https://costrilcororg/document/team-and-leadership-training-eit-631-systematic-review 2020.
34. Nelson K, Shilkofski N, Haggerty J, Saliski M, Hunt E. The use of cognitive AIDS during simulated pediatric cardiopulmonary arrests *Simulation in Healthcare* 2008; **3**: 138-45.
35. Kanter R, Fordyce W, Tompkins J. Evaluation of resuscitation proficiency in simulations: the impact of a simultaneous cognitive task. *Pediatr Emerg Care* 1990; **6**: 260-2.
36. Davis DA, Mazmanian PE, Fordis M, Van Harrison R, Thorpe KE, Perrier L. Accuracy of physician self-assessment compared with observed measures of competence: a systematic review. *Journal Of The American Medical Association* 2006; **296**(9): 1094-102.
37. Rudolph JW, Raemer DB, Simon R. Establishing a safe container for learning in simulation: the role of the presimulation briefing. *Simulation in Healthcare* 2014; **9**(6): 339-49.
38. Kluger AN, DeNisi A. The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychol Bull* 1996; **119**(2): 254.
39. Hatala R, Cook DA, Zendejas B, Hamstra SJ, Brydges R. Feedback for simulation-based procedural skills training: a meta-analysis and critical narrative synthesis. *Advances in Health Sciences Education* 2014; **19**(2): 251-72.
40. Perkins GD, Travers AH, Berg RA, et al. Part 3: Adult basic life support and automated external defibrillation. 2015 International Consensus on Cardiopulmonary Resuscitation

and Emergency Cardiovascular Care Science With Treatment Recommendations. *Resuscitation* 2015; **95**: e43-e69.
41. Oermann MH, Kardong-Edgren SE, Odom-Maryon T. Effects of monthly practice on nursing students' CPR psychomotor skill performance. *Resuscitation* 2011; **82**(4): 447-53.
42. Spooner BB, Fallaha JF, Kocierz L, Smith CM, Smith SC, Perkins GD. An evaluation of objective feedback in basic life support (BLS) training. *Resuscitation* 2007; **73**(3): 417-24.
43. Mpotos N, Lemoyne S, Calle PA, Deschepper E, Valcke M, Monsieurs KG. Combining video instruction followed by voice feedback in a self-learning station for acquisition of Basic Life Support skills: a randomised non-inferiority trial. *Resuscitation* 2011; **82**(7): 896-901.
44. Zapletal B, Greif R, Stumpf D, et al. Comparing three CPR feedback devices and standard BLS in a single rescuer scenario: a randomised simulation study. *Resuscitation* 2014; **85**(4): 560-6.
45. Dold SK, Schmölzer GM, Kelm M, Davis PG, Schmalisch G, Roehr CC. Training neonatal cardiopulmonary resuscitation: can it be improved by playing a musical prompt? A pilot study. *American journal of perinatology* 2014; **31**(03): 245-8.
46. Cheng A, Brown LL, Duff JP, et al. Improving cardiopulmonary resuscitation with a CPR feedback device and refresher simulations (CPR CARES Study): a randomized clinical trial. *JAMA pediatrics* 2015; **169**(2): 137-44.
47. Yeung J, Davies R, Gao F, Perkins GD. A randomised control trial of prompt and feedback devices and their impact on quality of chest compressions—a simulation study. *Resuscitation* 2014; **85**(4): 553-9.
48. Fischer H, Gruber J, Neuhold S, et al. Effects and limitations of an AED with audiovisual feedback for cardiopulmonary resuscitation: a randomized manikin study. *Resuscitation* 2011; **82**(7): 902-7.
49. Noordergraaf GJ, Drinkwaard BW, van Berkom PF, et al. The quality of chest compressions by trained personnel: the effect of feedback, via the CPREzy, in a randomized controlled trial using a manikin model. *Resuscitation* 2006; **69**(2): 241-52.
50. Sutton RM, Niles D, Meaney PA, et al. "Booster" training: evaluation of instructor-led bedside cardiopulmonary resuscitation skill training and automated corrective feedback to improve cardiopulmonary resuscitation compliance of Pediatric Basic Life Support providers during simulated cardiac arrest. *Pediatric critical care medicine: a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies* 2011; **12**(3): e116.
51. Wik L, Thowsen J, Steen PA. An automated voice advisory manikin system for training in basic life support without an instructor. A novel approach to CPR training. *Resuscitation* 2001; **50**(2): 167-72.
52. Beckers SK, Skorning MH, Fries M, et al. CPREzy™ improves performance of external chest compressions in simulated cardiac arrest. *Resuscitation* 2007; **72**(1): 100-7.
53. Perkins GD, Augré C, Rogers H, Allan M, Thickett DR. CPREzy™: an evaluation during simulated cardiac arrest on a hospital bed. *Resuscitation* 2005; **64**(1): 103-8.
54. Skorning M, Derwall M, Brokmann J, et al. External chest compressions using a mechanical feedback device. *Der Anaesthesist* 2011; **60**(8): 717.
55. Dine CJ, Gersh RE, Leary M, Riegel BJ, Bellini LM, Abella BS. Improving cardiopulmonary resuscitation quality and resuscitation training by combining audiovisual feedback and debriefing. *Critical care medicine* 2008; **36**(10): 2817-22.
56. Handley AJ, Handley SA. Improving CPR performance using an audible feedback system suitable for incorporation into an automated external defibrillator. *Resuscitation* 2003; **57**(1): 57-62.
57. Skorning M, Beckers SK, Brokmann JC, et al. New visual feedback device improves performance of chest compressions by professionals in simulated cardiac arrest. *Resuscitation* 2010; **81**(1): 53-8.

58. Elding C, Baskett P, Hughes A. The study of the effectiveness of chest compressions using the CPR-plus. *Resuscitation* 1998; **36**(3): 169-73.
59. Sutton RM, Donoghue A, Myklebust H, et al. The voice advisory manikin (VAM): an innovative approach to pediatric lay provider basic life support skill education. *Resuscitation* 2007; **75**(1): 161-8.
60. Isbye DL, Høiby P, Rasmussen MB, et al. Voice advisory manikin versus instructor facilitated training in cardiopulmonary resuscitation. *Resuscitation* 2008; **79**(1): 73-81.
61. Oh JH, Lee SJ, Kim SE, Lee KJ, Choe JW, Kim CW. Effects of audio tone guidance on performance of CPR in simulated cardiac arrest with an advanced airway. *Resuscitation* 2008; **79**(2): 273-7.
62. Rawlins L, Woollard M, Williams J, Hallam P. Effect of listening to Nellie the Elephant during CPR training on performance of chest compressions by lay people: randomised crossover trial. *Bmj* 2009; **339**: b4707.
63. Woollard M, Poposki J, McWhinnie B, Rawlins L, Munro G, O'meara P. Achy breaky makey wakey heart? A randomised crossover trial of musical prompts. *Emergency medicine journal : EMJ* 2012; **29**(4): 290-4.
64. Khanal P, Vankipuram A, Ashby A, et al. Collaborative virtual reality based advanced cardiac life support training simulator using virtual reality principles. *Journal of biomedical informatics* 2014; **51**: 49-59.
65. Park C, Kang I, Heo S, et al. A randomised, cross over study using a mannequin model to evaluate the effects on CPR quality of real-time audio-visual feedback provided by a smartphone application. *Hong Kong Journal of Emergency Medicine* 2014; **21**(3): 153-60.
66. Williamson L, Larsen P, Tzeng Y, Galletly D. Effect of automatic external defibrillator audio prompts on cardiopulmonary resuscitation performance. *Emergency medicine journal* 2005; **22**(2): 140-3.
67. Mpotos N, Yde L, Calle P, et al. Retraining basic life support skills using video, voice feedback or both: a randomised controlled trial. *Resuscitation* 2013; **84**(1): 72-7.
68. Roehr CC, Schmölzer GM, Thio M, et al. How ABBA may help improve neonatal resuscitation training: auditory prompts to enable coordination of manual inflations and chest compressions. *Journal of paediatrics and child health* 2014; **50**(6): 444-8.
69. American Educational Research Association, American Psychological Association, National Council on Measurement in Education. The Standards for Educational and Psychological Testing. Washington, DC: American Education Research Association, 2014.
70. Lo BM, Devine AS, Evans DP, et al. Comparison of traditional versus high-fidelity simulation in the retention of ACLS knowledge. *Resuscitation* 2011; **82**(11): 1440-3.
71. Settles J, Jeffries PR, Smith TM, Meyers JS. Advanced cardiac life support instruction: do we know tomorrow what we know today? *Journal of continuing education in nursing* 2011; **42**(6): 271-9.
72. Cheng Y, Xue FS, Cui XL. Removal of a laryngeal foreign body under videolaryngoscopy. *Resuscitation* 2013; **84**(1): e1-2.
73. Cherry RA, Williams J, George J, Ali J. The effectiveness of a human patient simulator in the ATLS shock skills station. *The Journal of surgical research* 2007; **139**(2): 229-35.
74. Conlon LW, Rodgers DL, Shofer FS, Lipschik GY. Impact of levels of simulation fidelity on training of interns in ACLS. *Hospital practice (1995)* 2014; **42**(4): 135-41.
75. Coolen EH, Draaisma JM, Hogeveen M, Antonius TA, Lommen CM, Loeffen JL. Effectiveness of high fidelity video-assisted real-time simulation: a comparison of three training methods for acute pediatric emergencies. *International journal of pediatrics* 2012; **2012**: 709569.
76. Curran V, Fleet L, White S, et al. A randomized controlled study of manikin simulator fidelity on neonatal resuscitation program learning outcomes. *Advances in health sciences education : theory and practice* 2015; **20**(1): 205-18.
77. Donoghue AJ, Durbin DR, Nadel FM, Stryjewski GR, Kost SI, Nadkarni VM. Effect of high-

fidelity simulation on Pediatric Advanced Life Support training in pediatric house staff: a randomized trial. *Pediatr Emerg Care* 2009; **25**(3): 139-44.
78. Finan E, Bismilla Z, Whyte HE, Leblanc V, McNamara PJ. High-fidelity simulator technology may not be superior to traditional low-fidelity equipment for neonatal resuscitation training. *Journal of perinatology : official journal of the California Perinatal Association* 2012; **32**(4): 287-92.
79. Hoadley TA. Learning advanced cardiac life support: a comparison study of the effects of low- and high-fidelity simulation. *Nursing education perspectives* 2009; **30**(2): 91-5.
80. Owen H, Mugford B, Follows V, Plummer JL. Comparison of three simulation-based training methods for management of medical emergencies. *Resuscitation* 2006; **71**(2): 204-11.
81. Campbell DM, Barozzino T, Farrugia M, Sgro M. High-fidelity simulation in neonatal resuscitation. *Paediatrics & Child Health* 2009; **14**(1): 19-23.
82. King JM, Reising DL. Teaching advanced cardiac life support protocols: the effectiveness of static versus high-fidelity simulation. *Nurse educator* 2011; **36**(2): 62-5.
83. Rodgers DL, Securro S, Jr., Pauley RD. The effect of high-fidelity simulation on educational outcomes in an advanced cardiovascular life support course. *Simulation in healthcare : journal of the Society for Simulation in Healthcare* 2009; **4**(4): 200-6.
84. Mancini ME, Soar J, Bhanji F, et al. Part 12: Education, implementation, and teams: 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Circulation* 2010; **122**(16 Suppl 2): S539-81.
85. Cheng A, Lang TR, Starr SR, Pusic M, Cook DA. Technology-enhanced simulation and pediatric education: a meta-analysis. *Pediatrics* 2014; **133**(5): e1313-23.
86. Dyson K, Bray J, Smith K, Bernard S, Straney L, Finn J. Paramedic exposure to out-of-hospital cardiac arrest is rare and declining in Victoria, Australia. *Resuscitation* 2015; **89**: 93-8.
87. Australian Institute of Health and Welfare. Admitted patient care 2014–15: Australian hospital statistics. Canberra: Australian Institute of Health and Welfare. Health services series no. 68. Cat. no. HSE 172. Retrieved 6 September 2018 from https://www.aihw.gov.au/reports/hospitals/ahs-2014-15-admitted-patient-care/contents/table-of-contents, 2016.
88. New Zealand Ministry of Health. Publicly funded hospital discharges – 1 July 2015 to 30 June 2016. 2018.
89. Fennessy G, Hilton A, Radford S, Bellomo R, Jones D. The epidemiology of in-hospital cardiac arrests in Australia and New Zealand. *Int Med J* 2016; **46**(10): 1172-81.
90. Australian Institute of Health and Welfare. Australia's mothers and babies data visualisations. *https://wwwaihwgovau/reports/mothers-babies/australias-mothers-babies-data-visualisations/contents/summary* 2019.
91. Stross JK. Maintaining competency in advanced cardiac life support skills. *Jama* 1983; **249**(24): 3339-41.
92. Jensen ML, Mondrup F, Lippert F, Ringsted C. Using e-learning for maintenance of ALS competence. *Resuscitation* 2009; **80**(8): 903-8.
93. Kurosawa H, Ikeyama T, Achuff P, et al. A randomized, controlled trial of in situ pediatric advanced life support recertification (“pediatric advanced life support reconstructed”) compared with standard pediatric advanced life support recertification for ICU frontline providers. *Critical care medicine* 2014; **42**(3): 610-8.
94. Bender J, Kennally K, Shields R, Overly F. Does simulation booster impact retention of resuscitation procedural skills and teamwork? *Journal of Perinatology* 2014; **34**(9): 664-8.
95. Kaczorowski J, Levitt C, Hammond M, et al. Retention of neonatal resuscitation skills and knowledge: a randomized controlled trial. *Family medicine* 1998; **30**(10): 705-11.

96. Su E, Schmidt TA, Mann NC, Zechnich AD. A randomized controlled trial to assess decay in acquired knowledge among paramedics completing a pediatric resuscitation course. *Academic emergency medicine : official journal of the Society for Academic Emergency Medicine* 2000; **7**(7): 779-86.
97. Cheng A, Lockey A, for the Education IaTT. International Liasion Committee on Resuscitation Worksheet: 623: High-Fidelity Manikins in Training: International Liasion Committee on Resuscitation. Retrieved 7 July 2017 from https://volunteer.heart.org/apps/pico/Pages/PublicComment.aspx?q=623, 2015.
98. Patocka C, Khan F, Dubrovsky AS, Brody D, Bank I, Bhanji F. Pediatric resuscitation training-instruction all at once or spaced over time? *Resuscitation* 2015; **88**: 6-11.
99. Eppich WJ, Hunt EA, Duval-Arnould JM, Siddall VJ, Cheng A. Structuring feedback and debriefing to achieve mastery learning goals. *Academic medicine : journal of the Association of American Medical Colleges* 2015; **90**(11): 1501-8.
100. Hunt EA, Duval-Arnould JM, Nelson-McMillan KL, et al. Pediatric resident resuscitation skills improve after "rapid cycle deliberate practice" training. *Resuscitation* 2014; **85**(7): 945-51.
101. Anderson R, Sebaldt A, Lin Y, Cheng A. Optimal training frequency for acquisition and retention of high-quality CPR skills: A randomized trial. *Resuscitation* 2019; **135**: 153-61.

About this Guideline

Search date/s	See attached worksheets: - Feedback - Simulation - Pre-course Learning;
Question/PICO:	In ALS course participants, does pre-course learning assists compared with no pre-course learning improve course outcomes (knowledge acquisition, skills performance, successful course completion) In ALS courses, does a modular approach (eg. two hours per week for 6 weeks) compared with a block approach (eg. 1-2 day course) improve course outcomes (knowledge acquisition, skills performance, successful course completion)
Method:	This Guideline was developed unders the processes outlined in Guideline 1.4. Evidence review included: reviews of existing evidence (worksheets), and review of the ILCOR systematic reviews and published CoSTRs (including peer-review and draft version on website).

Primary reviewers:	Julie Considine, Kevin Nation, Janet Bray, Judith Finn, Jason Acworth, Tracy Kidd, Finlay MacNeil, Peter Morley, Margaret Nicholson, Darryl Clare, Hugh Grantham, Mike Gale, Michael Parr, Richard Aickin, Jenny Ring
Approved:	21/03/2020
Guidelines superseded:	N/A

Resources for Guideline 10.2 - Worksheets

Pre Course Learning

Simulation

Feedback