



Simulation Based Education in Healthcare

Standards for Practitioners

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Introduction

The Association for Simulated Practice in Healthcare (ASPiH) is the national learned body in the UK that focuses on the development of and application of simulation based education (SBE) and technology enhanced learning (TEL) to healthcare workforce education as well as training and patient safety improvement. It is a not-for-profit company bringing together a multi-professional membership drawn from higher education, clinical practice, and academic disciplines allied to healthcare. The overarching aim of ASPiH is to enable high quality practice of simulation in all health care contexts, which is promoted through wider sharing of knowledge, expertise, and educational innovation amongst practitioners, providers, commissioners and professional bodies.

In 2012/13 ASPiH conducted a National Scoping Project, supported by Health Education England and the Higher Education Academy, to map the resources and implementation of SBE and TEL across the United Kingdom. One of the key issues identified in this report was the need for national guidance related to quality indicators and SBE standards of practice that would be relevant and of value to the increasing number and breadth of institutions, departments and individuals designing and delivering SBE.

ASPiH established a SBE standards committee which consulted a wide range of educationalists and professionals in the field of simulation based education, experts in undergraduate and postgraduate curricula and those with expertise in human factors and ergonomics. The standards are based on published evidence and a number of existing quality assurance processes currently in use across the UK and internationally including the General Medical Council (GMC) [1], the Nursing and Midwifery Council (NMC) [2], General Pharmaceutical Council (GPhC) [3] and the Health and Care Professions Council (HCPC) [4].

In this context, SBE in healthcare includes a spectrum from simple role playing, through to simulated patients, part-task trainers, hybrid models, full body manikins and simulated environments.

The standards are intended for all healthcare professionals involved in simulation education at pre and post registration, undergraduate and postgraduate training environments. They are designed for use by both novice and experienced simulation faculty. These standards will also enable education providers and commissioners to focus on designing and delivering high quality SBE to benefit patient care in clinical practice.

The standards describe the attributes required to design and deliver effective simulation education. They have been grouped around three broad themes: **faculty**, **activity** and **resources**.

The standards are underpinned by a guidance section which details the best practice and current evidence in the literature in that particular area.

For the accreditation process and application, please refer to the accompanying document entitled “simulation based Education in Healthcare: accreditation for Practitioners and Institutions”.

FACULTY

Theme 1: Faculty

1.1 Faculty Development

Simulation programme faculty members are recruited from a pool of educators who may be experienced in simulation based education, content experts in the subject being delivered, or both. Faculty designing and delivering simulation based education should be appropriately trained to undertake this role [3].

The role of an effective facilitator or faculty member is key to delivering effective learning in SBE [5] [6]. A good facilitator should be able to [7]:

1. Set learning objectives which are appropriate to the skill or behaviour being taught, at a level appropriate to the learner and makes participants aware of these [2] [3] [4].
2. Create and maintain a safe environment [8] during a simulation exercise.
3. Maintain and encourage the appropriate level of 'fidelity'.
4. Act as a role model to learners and promote professional behaviour and integrity [2] [3] [4].
5. Encourage self-reflection on learning [2] [3] [4].
6. If appropriate to their role, provide clear and constructive feedback on whether learning objectives were achieved and propose refinement in future practice through the process of debriefing [9].

With regards to the last two aspects raised above, debriefing is a facilitator-led activity that follows a simulation learning session (and can function as a formative assessment), in which the participant's reflective thinking is encouraged and feedback is provided regarding their performance [10]. It is widely accepted that that the debriefing process is the most important component of simulation-based medical education [6]. All scenario-based simulation learning or formative assessment activities should include a planned debriefing session to optimise participant reflection and enhance learning.

1.1.1 Standards

1. Educators should hold undergone introductory training to SBE, including exposure and orientation in the principles of adult learning theory and underpinning educational theories/pedagogy relevant to the spectrum of simulation.
2. Educators should ensure that educational content adheres to best practice standards in education.
3. Educators should ensure that a safe learning environment is maintained for learners and encourages self-reflection on learning.

4. Educators must identify pertinent elements of the simulation to discuss and relate to the objectives.
5. Educators should engage with the SP faculty (if present) in order to enable and incorporate their feedback.
6. Educators should act as a role model to learners and promote professional behaviour and integrity.
7. Educators should engage in continuing professional development with regular evaluation of performance by both participants and fellow faculty.
8. Educators should be competent in the process of debriefing;

1. Debriefing should be conducted in an environment that is safe, positive and non-threatening.
2. Duration and timing of debriefing is crucial but should be flexible enough to allow progression through the phases of debriefing (e.g. reaction, analysis and summary).
3. The facilitator must identify pertinent elements of the simulation to discuss and relate to the objectives.
4. Facilitators should engage with the SP (if present) in order to access, enable and incorporate their feedback.
5. Facilitators, SPs and technological support personnel should engage in an additional debrief after the session without learner presence, to reflect, develop self-awareness.

1.1.2 Guidance

1.1.2.1 In General

1. Attracting, recruiting and retaining faculty is key to delivering courses effectively and in a sustainable fashion. A supportive environment for faculty with protected time to develop simulation activities should be key considerations for faculty retention and development [8].
2. The skills and expertise of simulation technicians should be both recognised and fully utilised in developing and sustaining faculty.
3. Engagement from management of healthcare organisations and educational institutions is vital to ensure continued support for faculty development. This should be through explicit time in job plans/contracts and linked to regular appraisal and evidence of professional development in the role [2] [3].
4. In designing SBE activities or courses, faculty should ensure content adheres to best practice standards in education where applicable [11] [12] [2] [3] [4].
5. SP involvement as a specialist group of faculty should be supported, with the same considerations as other faculty members.
6. Content should adhere to best practice when engaging with simulated patients such that the four principles of biomedical ethics are adhered to: autonomy, beneficence, non-maleficence and justice [13].

1.1.2.2 Debriefing facilitator

1. The facilitator should be a person competent in the process of debriefing [14] [15]. Evidence from research suggests that the perceived skills of the debriefer have the highest independent correlation to the perceived overall quality of the simulation experience [16].
2. The facilitator must identify pertinent elements of the simulation to discuss and relate to the objectives [17]. This should include relevant technical and non-technical aspects of performance as well as the human factors approach to patient safety.

3. Facilitators should engage with the SP (if present) in order to access, enable and incorporate their feedback. SPs should be competent in the process of debriefing and feedback from their perspective – as agreed on with the facilitator – in role, in neutral or out of role.
4. Facilitators and SPs will benefit from an additional debrief after the session as and when required, without learner presence.

1.1.2.3 Conducting debrief

1. Debriefing should be conducted in an environment that is safe, positive and non-threatening. An environment of trust, respect, and confidentiality is necessary for all participants to feel comfortable to share [18] [19].
2. Duration and timing of debriefing is crucial but should be flexible enough to allow progression through the phases of debriefing (e.g. reaction, analysis, and summary).
 1. It should occur immediately (less than 5 minutes) after simulation so thoughts, feeling, and actions are captured without degradation or distortion [18].
 2. There are several popular models of debriefing, which the facilitator may wish to use as a structure for the process such as the advocacy enquiry model, 3D Model of debriefing, the Mayo clinic model or the Lederman model [20] [21] [22]. However, we recognise that there is currently no standardised process or model of debriefing.

1.1.2.4 Novice Faculty

1. An introductory course (or courses) should expose and orientate novice simulation faculty to the principles of adult learning theory and explore underpinning educational theories/pedagogy relevant to the spectrum of simulation [14] [15].
2. The introductory course (or courses) should provide a definition of simulation, clarify terminology used, and describe the simulation process and how scenarios are developed. The course should also provide an introduction to the technical aspects of specific simulation equipment and how to engage with simulated patients (SPs) if these are to be utilised [23] [15] [3].
3. Specific training in debriefing should be provided to faculty as effective debriefing is recognised to be the most important element of learning in the simulated environment [5].
4. Faculty delivering human factors training should have undergone bespoke training in systems engineering, human factors or other systematic approaches to tackling workplace error and patient safety concerns [24].
5. New faculty should observe or co-facilitate existing courses alongside a more experienced educator or mentor and receive feedback using validated tools [25] [26].
6. The facilitator(s) and where appropriate the SP(s) should acquire specific training provided by a formal course, a continuing medical education offering, or targeted work with an experienced mentor.
7. The process of becoming faculty should be streamlined as much as possible; keeping faculty training to an effective minimum as a lengthy process requiring multiple days of study leave could deter potential candidates.

1.1.2.5 Experienced Faculty

1. Faculty development is a lifelong process and faculty should engage in continuing professional development (CPD) activities recognised by the individual's professional body [23] such as, but not restricted to; courses, conferences, e-learning, academic activities and regular appraisal of literature [3].
2. A record of these CPD activities should be maintained for evaluation.
3. Regular evaluation of faculty performance is required by both participants and fellow faculty and could be achieved using a peer observation process [27] [3].

ACTIVITY

Theme 2: Activity

2.1 Programme

Simulation based educational programmes should be developed in alignment with formal curriculum mapping or learning/training needs analysis [28] [2] [3] [4] undertaken in clinical or educational practice. Specific attention should be paid to describing how the use of simulation enhances existing educational/training interventions, or provides learning opportunities to address current or anticipated gaps in curriculum and/or training. The patient perspective should be considered and demonstrated within educational planning. The design and planning of SBE programmes is vital to ensure learners obtain the optimal benefit.

The design and planning of Simulation based educational programmes is vital to ensure that learners obtain the best possible benefit. The following standards have been created using evidence-based best practice in this area.

2.1.1 Standards

1. Simulation based educational programmes should be developed in alignment with formal curriculum mapping or learning/training needs analysis undertaken in clinical or educational practice. The patient perspective must be considered and demonstrated within educational planning.
2. A learning needs assessment of all stakeholders must be used to develop the learning objectives.
3. A faculty member with expertise in simulation based education must oversee the simulation programme design and ensures that it is regularly peer reviewed, kept up to date and relevant to the organisation goals, clinical needs and curriculum that it is mapped to.
4. Training in silos should be avoided and every effort to incorporate inter-professional education into simulation programmes should be made.
5. Regular evaluation of programmes and faculty must be undertaken to ensure that content and relevance is maintained.
6. Higher levels of Kirkpatrick's evaluation should be achieved through assessment of skills, knowledge or behaviours in the clinical setting before and after an educational intervention using validated metrics.

2.1.2 Guidance

2.1.2.1 Activity Design and Planning

1. Consultation with learners, managers and patient groups, as appropriate, should assist in identifying the training needs. A learning needs assessment of all stakeholders should be

- used to develop the learning objectives. This is the only way to achieve reliable and valid coverage of the curriculum outcomes, goals of the organisations and clinical need [2] [3] [4].
2. Learning objectives should be appropriate to the level of the learner and, at the same time, designed to be challenging but achievable [29]. Objectives will need to be linked where applicable to individual technical or procedural skills, teamworking, non-technical skills and to organisational goals and requirements [2] [3] [4].
 3. Domains (cognitive/affective/psychomotor) of learning involved in the activity should be described using educational theory (Bloom's taxonomy or higher). This encourages the facilitator to aim to provide holistic teaching on the skill or task set for learners [30].
 4. Consideration should be given to the incorporation of the human factors approach in SBE programmes to develop better healthcare practitioners with an improved understanding of the role of human factors. This will help build resilience in individual practice, increase team performance and produce systems improvement.
 5. Ensure that a pre brief occurs where learning objectives are set beforehand and discussed as part of the debriefing process which takes place after completing a simulated scenario or in feedback on completing a practical skill [10].
 6. The pre brief should include elements such as expectations including professionalism, etiquette, confidentiality, roles and an introduction to the simulated environment.
 7. Incorporate up-to-date evidence based practice in course content [31] [3]. Training in silos should be avoided and every effort to incorporate inter-professional education into simulation programmes should be made.
 8. Promote holistic care and appropriate values set out in regulatory body guidelines guidelines [32] [1] [2] [3] [4] and/or those of other relevant professional bodies.
 9. A manual should be maintained to ensure consistency between design and delivery of programme and reproducibility between trainers.
 10. The faculty should be appropriate to the needs of the learners and content of the programme [24] [1] [2] [3] [4].

2.1.2.2 Evaluation of Activity

1. A faculty member with expertise in simulation based education should oversee the simulation programme design [14] [15] and ensures that it is regularly peer reviewed and kept up to date and relevant to the organisational goals, clinical needs and curriculum that it is mapped to [24].
2. Regular evaluation of programmes [33] [2] [3] [4] and faculty should be undertaken to ensure that content and relevance is maintained [34]. This should be achieved at a minimum through feedback from participants and other simulation educators [5].
3. Higher levels of Kirkpatrick's evaluation such as level 4 should be achieved through assessment of skills, knowledge or behaviours in the clinical setting before and after an educational intervention using validated metrics. This could also be achieved through surveying patient satisfaction and demonstrating improved patient safety through a review of critical incidents, complaints and serious untoward incidents in the workplace [35].

2.2 Procedural Skills

The major advantage of attaining procedural skills in a safe environment [36] has made simulation-based training attractive across medical and surgical specialties. Research has shown that simulation improve trainees' skills and knowledge [37] and that skills acquired are substantially retained long term even after a single simulation activity [38]. The use of a mastery learning model to develop skills among trainees has been successfully implemented in routine and life-threatening procedures [39]. Activities intended to facilitate procedural skill acquisition should comply with the relevant features of best practice including feedback, deliberate practice, curriculum integration, outcome measurement, skill acquisition and maintenance, mastery learning and transfer to practice [40].

2.2.1 Standards

1. The fidelity of the simulator in procedures must be dictated by the objectives of the session taught.
2. The equipment used to perform the procedure should be identical (or as close as possible) to the equipment used in real clinical practice.
3. Equipment must be able to produce reproducible experiences- providing the same experience to multiple learners within predefined limits of variance.
4. Variations of the simulator experience from clinical practice must be explained to the candidates in the pre-brief period.
5. Testing of all simulators and equipment should be undertaken prior to every course to ensure that they are in good working order.
6. Dedicated personnel should be responsible for the maintenance and record of equipment.
7. Clear and specific objectives for a procedural skills course or activity should be set prior to delivery.
8. A formal evaluation by the candidates at the end of each session should be undertaken and fed back to improve the activity.
9. Standards for achieving mastery learning should be pre-agreed prior to the course delivery if appropriate.
10. Validated tools must be used to demonstrate achievement of mastery learning if required.
11. Higher levels of Kirkpatrick evaluation should be undertaken to demonstrate transfer to clinical environment and impact on patient safety.
12. The facilitators of procedural simulation courses should be experts in the procedure taught and have specific simulation training by a simulation mentor prior to their independent ability to facilitate a course in procedural simulation.

2.2.2 Guidance

2.2.2.1 Fidelity

1. The fidelity of the simulation in procedures should be varied depending on the objectives of the session taught [41].
2. If possible, the equipment used to perform the procedure should be identical to the equipment used in real clinical practice, and the anatomy of the training equipment (part task trainer, whole body trainer or virtual reality simulator) should be identical to the real body anatomy, given the freedom of real anatomical variations.

3. Variations of the simulator and differences from “normal” anatomy and physiology should be explained to the candidates in the pre-brief period.

2.2.2.2 *Equipment*

1. Testing of all simulation equipment should be undertaken before and after every session to ensure that they are in good working order.
2. Dedicated personnel should be responsible for the maintenance of equipment and associated records. Aforementioned dedicated personnel should be able to provide this information to healthcare professionals and simulation educators to ensure and support the uninterrupted delivery of education.

2.2.2.3 *Activity*

1. Clear and specific objectives for a procedural skills course or activity should be set prior to delivery.
2. Pre-course material should be provided to candidates. Acceptable modalities include but are not limited to; videos, hand-outs and power point presentations.
3. When pre-course material is distributed among course candidates, minimum inclusion material should be: equipment needed, pre procedure preparation, asepsis techniques, formal patient consent, possible complications and dealing with complications.
4. A formal evaluation by the candidates at the end of each session should be undertaken and the results of this evaluation should be acted upon to continuously improve and optimise the course.
5. Standards for achieving mastery learning should be pre-agreed prior to the course delivery.
6. Mastery learning should be sought and improvement in knowledge and skill acquisition should be documented after each course, or after a cycle of courses.
7. Validated tools should be used to demonstrate achievement of mastery learning.
8. Mastery learning models used for a course or cycles of courses should clearly demonstrate the six features of baseline testing, clear objectives, engagement in educational activities, formative testing, advancement to consecutive educational units if necessary and continued practice [40].
9. Courses should aim for a statistically significant increase in candidates’ confidence level of performing each procedure taught in the simulation lab as a minimum.
10. Higher levels of Kirkpatrick evaluation should be undertaken to demonstrate transfer to clinical environment and impact on patient safety.

2.2.2.4 *Faculty*

1. Facilitators in procedural simulation should be experts in the procedure taught.
2. Facilitators in procedural simulation should have hold specific simulation training by a simulation mentor prior to their independent ability to facilitate a course in procedural simulation.
3. Candidate feedback for facilitators should be provided for their continuous development and refinement of programmes.

2.2.2.5 *Candidates*

1. The faculty to candidate ratio should be designed to allow candidates to practice each procedure with supervision along with taking formal consent and appropriate preparation for the procedure.

2. Candidate selection into a group for a session or a course should be based on the candidates' individual previous exposure to simulation, level of clinical training, specialty and clinical experience of performing the specific procedure in clinical practice.
3. Pre-course survey of candidates should be undertaken to enable appropriate candidate group selection ahead of the simulation course.

2.3 Assessment

SBE is an effective tool as formative assessment to aid learning. Increasingly simulation is being used in summative, high-stakes assessment.

2.3.1 Standards

1. The assessment must be based on the intended learning outcomes of the exercise, with clarity regarding the knowledge, skills and attitudes and appropriately tailored to professional curricula to be evaluated.
2. The assessment activities must be targeted at the level of experience and ability of the learner.
3. Facilitation of effective performance assessment within simulation must rely on robust, realistic, and specific learning objectives.
4. Psychological safety of the participant must be taken into account and must be appropriately supported.

2.3.1.1 Additional standards for summative assessment

1. In addition to the above (2.3.1);
2. Participants must have prior experience and familiarity with simulation prior to summative evaluation.
3. Summative minimum expected performance standards should be agreed and explicitly shared between participants and trainers, taking into consideration relevant curricula and regulatory body standards.
4. Summative assessment should be based on evaluation tools previously tested with similar populations for validity and reliability.
5. Assessors must be appropriately trained in rating to ensure that there is good inter-rater reliability and accuracy of scoring.
6. Under-performance should be identified as early as possible to facilitate appropriate investigation and intervention to ensure that underperformers are managed effectively and successfully.
7. Educators have a responsibility of patient safety and must raise concerns regarding participant performance within educational settings, including SBE interventions.

2.3.2 Guidance

2.3.2.1 Formative Assessment

Formative assessments can be highly effective in simulation-based learning experiences. This can give learners ongoing feedback on their progress toward the development of knowledge, understanding, and skills. Feedback can be from assessors and SPs. The intended outcome of formative assessment is the improvement of learners' performance.

1. The formative assessment must be based on the intended learning outcomes of the exercise, with clarity regarding the knowledge, skills and attitudes to be evaluated [2] [3] [4] [42].

2. The choice of skills to be evaluated should be guided by curricular information, competency guidelines, and the limitations of the chosen simulation methods [2] [3] [4] [43]. These may relate to technical or procedural skills, and also skills relating to communication.
3. Specific skill sets such as team work, leadership, clinical decision making and communication should be assessed using simulation scenarios based on multidisciplinary teams or stand-alone simulation scenarios using SPs. Certain skills can be assessed using hybrid or bi/multimodal simulation which can include SPs.
4. To be effective, the assessment activities must also be targeted at the level of experience and ability of the learner [44].
5. The formative assessment should be specific to provide supplemental strategies for achieving participant outcomes [45].
6. Feedback/debriefing should be carried out as above if not provided in another format.

2.3.2.2 Summative Assessment

Simulation environments are traditionally recognised as "safe" learning environments for the learner to make mistakes safely and learn from them. Hence SBE has focused primarily on formative assessment in healthcare. However considerable interest in summative assessment has resulted in SBE being used as an evaluation tool of healthcare professionals [2] [3] [4] [46].

Summative assessments, also known as high stakes testing, can be used in SBE for assessment and measurement of outcomes or achievement of objectives, with a view to determining competency, judging if progression to the next level of training is indicated and demonstrating readiness to practise independently [2] [3] [4]. However it is important that SBE is used as part of a number of assessment tools rather than as a stand-alone tool.

2.3.2.2.1 Assessment

1. Performance standards should be agreed and be explicitly shared between participants and trainers before the assessment.
2. Summative assessment should be based on evaluation tools previously tested with similar populations for validity and reliability [45].
3. Simulated patient-based simulation can be used as a summative assessment modality to assess communication skills, professional behaviour and information gathering.
4. Consideration should be given to the fact that several assessments will be required to make a valid judgement of a participant's competence in a particular area and therefore judgements should not be made on isolated simulation encounters.

2.3.2.2.2 Participants

1. Participants need prior experience and familiarity with simulation prior to summative evaluation.
2. Psychological safety of the participant should be taken into account. They may experience heightened anxiety at the prospect of making mistakes potentially leading to negative consequences.

2.3.2.2.3 Assessors

1. Facilitation of effective performance assessment within simulation should rely on robust, realistic, and specific learning objectives appropriately tailored to professional curricula,

taking into consideration the regulatory body standards from the outset [2] [3] [4]. These should reference the minimum expected standard, which should the participant fail to demonstrate, would be considered as under performance [2] [3] [4].

2. Raters of the summative assessment should be appropriately trained to ensure that there is good inter-rater reliability and accuracy of scoring.
3. Recognition that candidate underperformance is a 'symptom, not a diagnosis', which should be identified as early as possible to facilitate appropriate investigation and intervention to ensure that underperformers are managed effectively and successfully [2] [3] [32] [47] [48] [49].
4. There should be recognition that patient safety is at the forefront of patient care and therefore educators have a responsibility to raise concerns regarding participant performance within educational settings, including simulation [2] [3] [4] [34] [50] [51] [52].

2.4 In Situ Simulation

In situ simulation (ISS) is simulation-based training (SBT) that occurs in the actual clinical environment [53]. The focus in recent years has shifted from delivering SBT out with the working area to the real clinical environment. Evidence suggests that this can lead to more natural responses to training interventions and improve team working and clinical performance [54]. Further ISS can lead to the identification and resolution of latent errors [53], which are potential hazards in the system that can lead to patient harm. ISS has also been successfully employed to test run a new facility [55] in a patient safe environment.

2.4.1 Additional standards for the use of in situ simulation

1. A formal educational needs analysis should be conducted to identify the needs of the learners, the team, other stakeholders and the organisation within which the in situ exercise will be held.
2. Every ISS exercise must have clearly defined learning objectives that achieve individual, team, unit level and/or organisational competencies.
3. Local processes and procedures should be carefully reviewed in order to deliver ISS activity authentically.
4. Close collaboration should be established between the ISS training team and the parent unit where the ISS activity is to take place to ensure maximum gain from the activity with minimal disruption to the day to day clinical work of the parent unit.
5. Faculty delivering the ISS activity must be proficient in SBE and have the required expertise on a given topic (Refer to standards on faculty development above).
6. Adequate time must be factored in to the planning for the session to allow setup and disbanding of equipment and personnel.
7. A multidisciplinary approach to evaluating team interactions must be undertaken with a focus on human factors approach to evaluate impact of latent errors and to identify remedial steps to overcome such errors.
8. Latent errors identified during ISS must be discussed in the debriefing after the session to capture learning and identify preventative strategies.
9. Latent errors should be graded using appropriate systems such as the NPSA risk matrix to quantify the threat to patient safety. The risks must be notified to the organisation and recommendations should be drawn to avert these errors in the future.
10. Educators must evaluate ISS activity by using appropriate measurement tools, which demonstrate not only improvement of knowledge but also transfer of learning to clinical environment.
11. Constant re-evaluation of the ISS services should be employed in order to ensure smooth delivery.

2.4.1 Guidance

2.4.2.1 Planning

1. A formal educational needs analysis should be conducted to identify the needs of the learners, the team and the organisation within which the in situ exercise will be placed.
2. Involvement of all stakeholders will ensure that the expertise of various specialties and teams are utilised at the inception phase of the ISS activity to generate a well-defined programme with appropriate complexity that achieves the learning objectives of individuals, team and the organisation [56].
3. Every ISS exercise should have clearly defined learning objectives that achieve individual, team, unit level and/or organisational competencies [34] [57].
4. Every effort should be made to deliver training in an environment which closely resembles the real life situation. Local processes and procedures should be carefully reviewed in order to deliver ISS activity authentically.
5. Consideration should be given to costs incurred during the delivery of ISS in the clinical area. This may be due to personnel, equipment and consumables costs [55].
6. Close collaboration should be established between the ISS training team and the parent unit where the ISS activity is to take place, if these are different individuals. This will ensure maximum gain from the activity with minimal disruption to the day to day clinical work of the parent unit. There should be a clear decision making process and final accountability for scheduling and implementing ISS in view of potential risk to patient care by drawing resources away for purpose of ISS activity. Close liaison will also ensure that clinical staff is released from clinical duties to participate in the ISS.

2.4.2.2 Delivery

1. Faculty delivering the ISS activity should be proficient in SBE and have the required expertise in a given topic as detailed in faculty development above. They should be able to adapt to changing demands of the in situ environment, utilise different resources and data capture methods, focus on individual and team learning and integrate both for wider organisational learning. Ideally faculty delivering ISS should undergo specific faculty development courses [23] [57].
2. ISS activity could entail the use of a variety of equipment, the logistics of which should be carefully planned in order to avoid delays or even cancellations.
3. Adequate time should be factored in to the planning for the session to allow setup and disbanding of equipment and personnel. This will avoid unnecessary delays when resuming clinical work.
4. In order to avoid any patient safety issues, equipment and devices used during ISS activity must be replaced and the clinical environment returned to what it was before prior to the ISS activity.
5. ISS activity will depend on the availability of the clinical area and team and could be prone to cancellations. Participants should be clearly informed that the session might not be delivered [56] if the space is utilised for actual clinical activity.

2.4.2.3 Feedback and debriefing

1. Sufficient time needs to be allocated to debriefing immediately post-simulation in the clinical settings to gain the maximum benefit. A multidisciplinary approach to evaluating

team interactions should be undertaken with a focus on human factors approach to evaluate impact of latent errors and to identify remedial steps to overcome such errors.

2. Latent errors identified during ISS should be discussed in the debriefing after the session to capture learning and identify preventative strategies. Sharing personal and team experiences will help translate training experience into improved patient outcomes.
3. Latent errors should be graded using appropriate systems such as the NPSA risk matrix [58] to quantify the threat to patient safety. The risks should be notified to the organisation and recommendations should be drawn to avert these errors in the future.

2.4.2.4 Evaluation

1. Educators should evaluate ISS activity by using appropriate measurement tools, which demonstrate not only improvement of knowledge but also transfer of learning to clinical environment. Observational tools should be designed to capture system improvements through the identification of latent errors during ISS activity [2] [3] [4] [57].
2. Constant re-evaluation of the ISS services should be employed in order to ensure smooth delivery.

RESOURCES

Theme 3: Resources

Participants should be taught in an educational environment with appropriately trained faculty using robust educational programmes and where relevant, on suitable equipment and with appropriate expert feedback [59] [2] [4].

3.1. Simulation Facilities and Technology

3.1.1 Standards

1. An appropriate variety and level of simulation modalities e.g. simulated patients, part task trainers, virtual reality simulation equipment and high fidelity mannequins should be incorporated into simulation programmes to achieve appropriate realism of the learning environment.
2. Training must be provided to educators and trainers to ensure that they are competent to use simulation equipment.

3.1.1.1 Additional standards where a simulation centre exists at an institute

1. The facility must have well defined aims and objectives relevant for all healthcare groups and should be pertinent to the needs of the organisation within which the facility is situated or attached to.
2. The facility must have a clear strategic plan which addresses wider organisational and stakeholders needs. The strategy should address how simulation is supported across the organisation and identify standards for faculty development, programme creation and regular review of courses and programmes.
3. A designated individual must oversee the strategic delivery of SBE programmes and ensure that appropriate maintenance of simulation equipment is undertaken.
4. A designated individual must ensure that ongoing simulation technology procurement continues to be appropriate to learning needs.
5. Key stakeholders must be involved in centre management and governance.
6. In situ simulations should complement simulation centre based SBE programmes, where possible.

3.1.1.2 Additional standards where a simulated patient programme exists

1. A simulated patient programme, with robust infrastructure should be accessible, with SPs engaging with learners and users.

2. A designated individual must ensure that appropriate and ongoing training and review of SPs occurs.
3. An individual with technological expertise must provide guidance and instructional support for the simulation programme.
4. A regular review of all SBE programmes should be undertaken to ensure that ongoing SP recruitment continues to be appropriate to learning and clinical need.
5. Training must be provided to educators and trainers to engage with simulated patients.

3.1.2 Guidance

1. The Department of Health Technology Enhanced Learning (TEL) Framework document emphasises the need for investment in simulation equipment to 'deliver value for money' and 'ensure equity of access and quality of provision' across the health and social care workforce [60]. Simulation equipment can be extremely costly, thus careful thought and planning should precede its procurement.
2. The aim of any technology used in SBE should be to enhance training, improve productivity and reduce duplication in a cost effective manner; not simply to use technologies as an end in itself [60]. Ultimately the aim of the educational experience should be to improve patient experience and safety [2] [4].
3. An appropriate variety and level of simulation modalities e.g. simulated patients, part task trainers, virtual reality simulation equipment and high fidelity mannequins should be incorporated into simulation programmes to achieve the appropriate realism of the learning environment [24].
4. Training should be provided to educators and trainers to ensure that they are competent to use simulation equipment [24] [14] [15] [2] [3] [4].

3.1.2.1 *Where a simulated patient programme exists*

1. A simulated patient programme, with robust infrastructure should be accessible, with SPs engaging with learners and users as a standalone modality or as a bi/multi or hybrid modality.
2. The aim of engaging with SPs should be to enhance training and assessment.
3. A designated individual should ensure that appropriate and ongoing training and review of SPs occurs. The should also oversee a regular review of all SBE programmes to ensure that ongoing SP recruitment continues to be appropriate to learning and clinical needs.
4. Training should be provided to educators and trainers to engage with simulated patients.

3.1.2.2 *Where a simulation centre exists at an institution*

1. A designated individual should oversee the strategic delivery of SBE programmes and ensure appropriate maintenance of simulation equipment occurs [2] [4].
2. A designated individual should ensure ongoing simulation technology procurement continues to be appropriate to learning and clinical needs [24].
3. An individual with technological expertise should provide guidance and instructional support for the simulation programme. This can include but not limited to; daily operation of the simulation facility; maintenance of equipment; management of consumables; management of simulators; programming responsibility of simulators and collaboration with faculty and staff [61].

3.2 Technological Support Personnel

The Department of Health Technology Enhanced Learning (TEL) Framework [60] notes that “healthcare, social care and education providers should ensure that educators and trainers are competent to use the required simulation facilities or equipment, e-learning and any other technological tools.”

Technological support personnel are important for the maintenance, preparation, operation and consultation on the successful use of TEL in simulation and clinical skills activities. Access to high quality training opportunities that are supported by skilled technological support personnel will positively impact on the service, patient outcomes, experience and safety. The role of technological support personnel is rapidly evolving and the Gatsby review [62] referred to a ‘strategy to identify and support workforce sectors where technicians have particular requirements.’

This section of the document provides recommendations to support the training and development of technological support personnel involved in the delivery of TEL in simulation and clinical skills facilities. It sets out standards in this area based on best practice.

3.2.1 Standards

1. There must be an appreciation of the knowledge and skills that technological support personnel bring and their contribution to the development of facilities and faculty, support for SBE programmes and facilitating new training methods.
2. A realistic technical needs analysis should be undertaken to ensure that the workforce delivering the differing types of skills training have the necessary capabilities for safe and effective patient care.
3. Technological support personnel should receive training that is *‘fit for purpose.’*
4. The development of technological support personnel should be planned in consideration of advancing technology, strategic direction and education needs of facility/organisation, with financial support put in place.
5. Technological support personnel who are likely to be responsible for integrating or operating equipment should be involved in the procurement process.

3.2.2 Guidance

3.2.2.1 Recognition of the role

1. There should be an appreciation of the knowledge and skills that technological support personnel bring and their contribution to the development of facilities and faculty, support for SBE programmes and facilitating new training methods.
2. There should be an acknowledgement of their *‘innovation capabilities’* which increases the quality and realism of simulation-based-education and potentially contributes to return-on-investment, in the following areas;

1. Championing innovation by developing training and providing assistance to the users and;
2. Acquisition, translation and distribution of external technical knowledge to their colleagues.

3.2.2.2 Identifying support required for activities

1. A realistic technological support needs analysis should be undertaken to ensure that the workforce delivering the differing types of skills have the necessary capabilities for safe and effective patient care. The analysis should link the type of activity to its demands on equipment, staffing and maintenance, as well as the skills to perform said actions [2] [3] [4].
2. The expectation of skills and remit of technological support personnel should be primarily determined by a centre's facilities, equipment and the expectation of provision, not necessarily by its size or employing organisation.
3. Technological support personnel should receive training that '*fits their purpose*'. Structuring of training around the eight Professional Simulation Domains [63] put forward by the Gathering of Healthcare Simulation Technology Specialists (SimGHOSTS) may be considered.

3.2.2.3 Involvement with procurement

1. Technological support personnel who are likely to be responsible for integrating or operating equipment should be involved in the procurement process.
2. The procurement process should involve the following elements of technological support;
 - i. maintenance factors;
 - ii. equipment lifespan;
 - iii. cost savings and return-on-investment (ROI);
 - iv. integration with current systems;
 - v. suitability for facility;
 - vi. service contracts and consumables;
 - vii. relationship with industry.

3.2.2.4 Professional development, skills and knowledge

3. The development of technological support personnel should be planned in consideration of advancing technology, strategic direction and education needs of facility/organisation.
4. Consideration should be given to the areas of;
 - i. professional registration;
 - ii. acquisition of accredited or recognised skills and knowledge;
 - iii. competency frameworks;
 - iv. delivery of education programmes;
 - v. academic related activities such but not limited to; research, academic presentations, posters and publications;
 - vi. network involvement and knowledge sharing;
 - vii. engagement with industry and new product developments.

3.3 Management, Leadership and Development

Where a simulation centre exists or is to be set up, a designated lead with organisational influence and accountability is required to manage the simulation facility. The lead must ensure a supportive environment for delivery of SBE programmes, oversee appropriate and responsive programme design, develop and retain faculty and sustain SBE programmes [34]. Appropriate management and administrative staff should be available and trained to support the delivery of simulation activities.

3.3.1 Standards

1. A designated lead with organisational influence and accountability must manage the simulation activity.
2. There must be a clear vision and mission statement to demonstrate aims and objectives of the facility.
3. There must be a clear alignment to the wider organisational and stakeholders needs, acting as a quality and risk management resource for organisations to help achieve the goals of improved patient safety and care quality.
4. The simulation lead must ensure a supportive environment for the delivery of multi-professional SBE programmes, oversee appropriate and responsive programme design, develop and retain faculty and sustain SBE programmes.
5. There should be a clear strategy which identify standards for faculty development, programme creation and regular review of courses and programmes.
6. Appropriate management and administrative staff should be available and trained to support the delivery of simulation activities.

3.3.2 Guidance

3.3.2.1 Strategy

1. The facility should have a clear strategic plan which addresses wider organisational and stakeholders needs. The strategy should address how simulation is supported across the organisation. Furthermore, the strategy should identify standards for faculty development, programme creation and regular review of courses and programmes [35] [2] [3] [4].
2. The facility should have well defined aims and objectives relevant for all healthcare groups and should be pertinent to the needs of the organisation within which the facility is situated or attached to [2] [3] [4].
3. Key stakeholders should be involved in centre management and governance [2] [3] [4].
4. Ensure adequate emphasis is placed on recruitment and retention of simulation faculty.
5. Appropriate recognition of faculty must be provided to allow retention. This can take the form (but is not limited to); certificates, teaching observations for their e-portfolio and evidence that can be incorporated towards appraisal and revalidation where appropriate (e.g. CPD points).
6. Ensure mentoring of novice SBE faculty. Please refer to section on Faculty development above [2] [3] [4].

7. Consider establishing a Simulation Fellowship Programme [64]. Such programmes could contribute to the creation of a faculty base for the future and ensure a high quality of programme creation and faculty development.
8. Recruitment of simulation champions must be considered to forward the cause of simulation within educational and healthcare institutions and must be linked to strategic goals and objectives of the facility.
9. Programmes should aspire to act as a Quality and Risk Management resource for organisations to help achieve the goals of improved patient safety and quality. In situ simulations can be used to identify latent errors in clinical environments and should be actively promoted as the future of SBE programmes [2] [3] [4].
10. In situ simulations should complement simulation centre based SBE programmes where possible.
11. A realistic feasibility and resource analysis should be conducted prior to the commencement of new programmes to ensure that there is equitable access for all learners in the region/programme and sharing of faculty can be arranged for long term sustainability of programmes [2].

3.3.2.2 Finance

1. Buy-in is particularly important from clinical/academic deans and hospital leads in terms of enabling dedicated time for development and financial support [65] [2] [3] [4].
 2. Funding streams for new simulation programmes can be challenging to arrange, but can be identified through collaboration between local education providers, as well as both local education and training boards [2] [3] [4].
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Glossary

Assessment refers to the process that provides feedback about performance to a participant or group of participants. Assessment can be summative or formative.

Bloom's Taxonomy is a system for the classification of learning objectives.

Continuing Medical Education (CME) is a formal system of further education in medical, nursing and other allied healthcare professional fields.

Formative Assessment is assessment for learning rather than of learning. The focus is the attainment of goals set by the learner in consultation with the trainer.

Fidelity refers to the degree to which a simulated experience approaches reality. It is also referred to as authenticity and is influenced by the environment, equipment and resources used to develop the simulation based educational programme.

Facilitator is the individual who provides guidance and support during simulation-based learning experiences.

Hybrid Simulation is the term used when two or more simulation modalities are used in training activity.

Human Factors is the discipline or science of studying the interaction between humans and systems and technology.

In-Situ Simulation refers to simulation activities which take place in the actual clinical environment.

Inter-professional education refers to educational activities that involve learners from more than one professional field.

Latent errors are potential hazards in the workplace which can lead to patient harm if left unidentified.

Non-technical Skills are behavioural skills which are skills of decision making (e.g. anticipation and planning, use of cognitive aids, avoiding fixation errors) or skills of teamwork and team management (workload distribution, communication, and/or role clarity) [66].

Objective is a statement of a specific result that the participant of a simulation activity is expected to achieve by the end of the activity.

Participant is a learner who participates in a simulation-based learning activity to gain knowledge, skills and/or attitudes to enhance their professional practice.

Reliability is reproducibility of a measure across repeated tests.

Scenario is the recreation of a clinical situation using a set of events and time lines to achieve programme objectives. Scenarios can be run 'ad hoc' or are programmed into the simulator and/or supporting devices.

Simulation Facility is the physical space where the simulation based educational event takes place.

Simulated Patient is a live person playing the role of a patient, staff or family member in a healthcare simulation

Simulation programme is an educational activity which uses simulation as the predominant modality to teach learners.

Summative Assessment is assessment of learning rather than for learning. Assessment in this context is used to pass or fail a learner and decides the future progress of a learner in their professional setting.

Validity is the degree to which a test or evaluation tool accurately measures the intended outcome of the test [66].

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