



## The utilisation of a standardised educational framework to develop and deliver impactful programmes of simulation-based learning

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### Abstract

Simulation has become a well-integrated modality of learning in pre- and postgraduate healthcare education programmes. The use of advanced technologies and the delivery of complex simulation-based learning opportunities require adequate preparation of healthcare educators. This paper details a European collaborative development and utilisation of an educational framework designed to prepare educators for the delivery of simulation-based learning strategies. The framework was subsequently adapted by a commercial partner and an evaluative study identified the impact of this programme of education on United Kingdom Faculty and within the National Health Service utilising qualitative methods of enquiry.

The evaluation study demonstrated that the use of the educational framework effectively educates faculty to construct and deliver simulation-based learning. Furthermore, the valuation demonstrated positive impacts on patient safety by increasing the confidence and skills of frontline staff and by improving the 'preparedness' of systems. It has also contributed to significant economic benefits within healthcare organisations.

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## Introduction

This paper describes the development and validation of an educational framework that prepared nurse educators who teach in pre- and post-registration settings to utilise simulation-based learning (SBL). The framework was developed through a European collaboration between educational institutions and an industry partner.

SBL has become central in nurse education and is integrated throughout curricula worldwide to ensure that students develop clinical skills and clinical reasoning, to become competent caregivers (Aebersold, 2018). SBL is an effective, complex education strategy that can be used to replicate clinical practices in a safe learning environment and is ubiquitous within university and clinical settings (Johnston et al., 2018; Shin et al., 2015). Educators and facilitators are key to any successful learning approach and as such must possess adequate skills in developing and delivering SBL (Persico et al., 2021). As SBL became more prevalent within healthcare education, it became increasingly apparent that educators utilising this teaching and learning strategy would require suitable preparation and education to facilitate its potential (Morse et al., 2019). The last decade has witnessed a significant increase in the innovative technological advances in SBL with associated practices, and it has now become a modality of learning that spans the entire career of many healthcare professionals, including nurses, across their under- and postgraduate programmes of education and clinical practice (Morse et al., 2019). In the UK and USA, SBL has been used to replace significant elements of students' learning in clinical settings (Waxman et al., 2019). The associated investment in technology and infrastructure, which is often required, and the increasingly complex SBL opportunities provided have not always been matched with associated investment in the education and preparation of educators who have become immersed in this approach to teaching and learning (Topping et al., 2015).

Recognising such disparity with regard to their own experiences, educators and researchers from a range of academic institutions and industry shared their concerns and formed a collaborative research team.

The research team undertook a systematic rapid review and synthesis of the literature (Topping et al., 2015), investigating the competencies required to utilise SBL effectively. Delivery of SBL appeared to demand competencies associated with planning and designing simulations, facilitating learning in "safe" environments, expert knowledge based on credible clinical realism, with reference to evidence-based knowledge, and demonstration of professional values and identity. In 2013, the research team expanded to include an industrial partner that is a global company and significantly influential in the development and distribution of manikins and task trainers used for simulation (Laerdal Medical, 2023).

The research team successfully bid for European Union Transfer of Innovation funding (20013- 1-DK1-LEO05-07053: €250,000) to develop and test a framework to prepare educators to utilise SBL. The outcomes of the systematic review directly influenced the design of the framework now named NESTLED (Bøje et al., 2017). The initial framework

consisted of eight elements (Table 1). The testing of the NESTLED competency framework demonstrated a significant increase in participant confidence in preparing and running SBL events. This prototype was then refined and further tested in Finland and Estonia (Koivisto et al., 2018).

Table 1: The NESTLED Framework.

Phase	Session	Content	Suggested Teaching and Learning strategy
Preparation for SBL event	1. Background to simulation-based learning	Theories of learning through simulation and facilitation and definitions. Simulation-based learning cycle (SLC) and evidence-based competencies.	Pre-reading (directed reading) and didactic.
	2. Pre-planning	Curriculum, design and operationalisation (positioning SBL). Devising SBL (level, baseline, and contributory learning, audience [uni- or multi-professional], assessment [formative/summative]).	Group work activity including curriculum analysis. Lecture/discussion.
	3. Hypothetical case development	Devising and planning delivery. Case design. Operational planning (equipment, setting, staffing, instructions, guidance development, handouts, etc.).	Mini lecture. Discussion. Group work activity. Design and planning of delivery of a hypothetical case.
Delivering SBL event	4. Briefing	Creating the learning climate. Preparing the student: ground rules, engagement, and professional identity. Students as formative assessors and responsibilities/peer reviewers.	Simulation, video recording, and facilitated discussion.
	5. Delivery "running the sim"	Different roles of facilitator. Managing groups (large and small). Managing individuals, and trouble-shooting equipment. Time management including deviations from planning and disruptions. Improvisation. Acting.	Simulation (recorded). Discussion (face to face). Structured online discussion (recording available to participants online).
	6. Debriefing	Different forms of debriefing including theory, techniques, timing, familiarity with video, debriefing in groups and with individuals. Ethical issues to do with confidentiality	Mini lecture. Discussion. Role-play. Simulation (recorded).
Feedback and Evaluation of the SBL Event	7. Evaluation of student learning	Theory of assessment. Assessment strategies including formative and summative and competency assessment. Assessment schemas. Rater reliability and validity of assessment. Rater negotiation and consensus.	Pre-reading. Discussion. Interactive appraisal of an example of (recorded) assessment. Reflective writing.
	8. Evaluation of the SBL (the "learning experience")	Modes of evaluation. Theoretical input on different ways of evaluating.	Discussion. Workshop activity.

In 2016, the Laerdal Medical® Educational Services team adopted The NESTLED Framework and adapted this into a four-step programme, the NESTLED Faculty Development Program in Simulation (NESTLED FDP). The rationale was to increase the reach of this evidence-based programme, to better prepare educators in healthcare organisations and academic institutions across Europe to maximise the potential benefits of SBL. Since 2016, the NESTLED FDP has been delivered across healthcare and education sectors in seven European countries.

As the reach of the NESTLED FDP extended, the project team further investigated and evaluated the impact of completing the programme for both the individual and their organisation. The aim of this paper is to evaluate the

perceived impact of the NESTLED FDP.

### Adapting the NESTLED framework into a faculty development programme.

A requirement of the European Union Transfer of Innovation Fund was that a commercial partner was part of the core membership. Laerdal Medical® (Stavanger, Norway) was identified as a suitable commercial partner to support the stages of refining and validating the NESTLED framework. Once the framework was validated, discussions were held with the Educational Services (ES) team at Laerdal Medical® regarding the operationalisation of the framework.

A team of three educators from the ES team (1 UK, 1 Norway, and 1 Denmark) reviewed the components of the NESTLED framework to distil the eight sessions into the NESTLED FDP which met the following development goals:

1. The programme had to be agile in its construction. It had to be deliverable within any clinical environment and it had to have relevance for new and experienced educators.
2. It had to address current challenges in healthcare delivery or education. Multi-professional teams must be supported to identify and then develop a simulation activity that addressed current challenges faced in practice.
3. The programme must be hybrid in nature. A combination of face-to-face and online resources would support the translation of new learning into practice.
4. The simulation activities developed must be able to evidence impact.

Table 2 describes the integration of sessions from the NESTLED framework into the NESTLED FDP.

Table 2: The four steps of the NESTLED faculty development programme.

NESTLED Development Module	Faculty Programme	Content	NESTLED Framework sessions
1	Overview of Simulation Education (eLearning)	Conduct a workplace analysis to identify areas of practice that require improvement. Engage with literature relating to the use of simulation-based education.	1 and 2.
2	Simulation in Education in Practice (face to face)	Discuss and receive feedback on workplace analysis. Work in small teams to develop a simulation scenario based on the workplace analysis.	3 and 4.
3	Delivery of a High-Quality Simulation (face to face)	Deliver, test, and refine your simulation activity. Identify data capture points to show the impact of this solution.	5, 6 and 7.
4	Approaches to Change Practice (face to face)	Develop an implementation timeline for the validated solution. Consider how to report the impact of this intervention within your organisation.	7 and 8.

The NESTLED FDP was delivered across Europe by the ES team. All members of the ES team undertook a training the trainer's course before delivering the NESTLED FDP for the

first time. One educator would facilitate the delivery of a NESTLED FDP and they frequently ran multiple programmes at the same time. Each programme could accommodate a maximum of 12 attendees. The face-to-face modules were delivered at four-week intervals. This break in between modules was designed to allow attendees to test and refine their simulation activity within their area of practice.

It was essential that there was a logical process to support educators in identifying current challenges, develop and test appropriate solutions, and then implement their simulation activities within clinical or educational settings. The Circle of Learning (Figure 1) was developed by Laerdal Medical and comprises five stages which support individuals or healthcare teams to enact impactful change in a logical manner (Sautter & Eikeland, 2008).

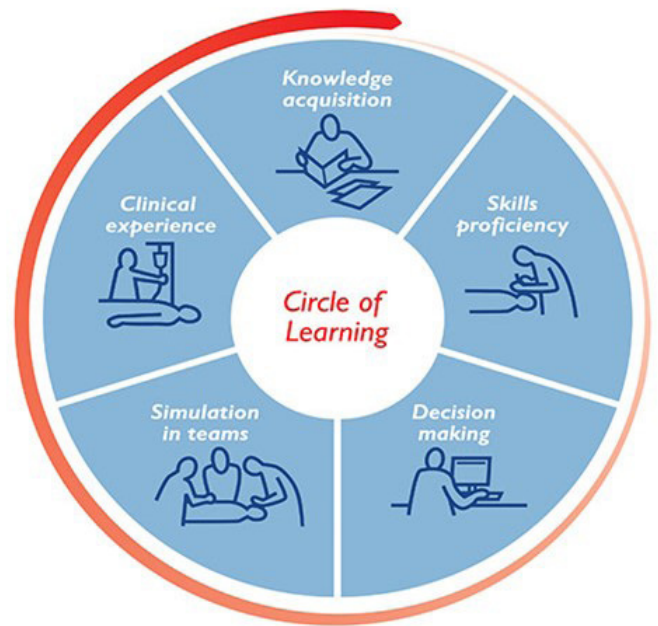


Figure 1: The Circle of Learning (Sautter & Eikeland, 2008).

The Circle of Learning is similarly constructed to Quality Improvement methodologies, such as the Model for Improvement (Langley et al., 2009). It supports a stepwise approach to the development and rapid testing of solutions at incremental stages. The Circle of Learning was utilised to support the core framework of the NESTLED FDP as it provided a clear road map for attendees to follow from the initial conceptualisation of a simulation activity to its implementation within clinical or educational settings. Table 3 demonstrates how the five stages of the Circle of Learning were used to underpin core work activity during the NESTLED FDP.

The Circle of Learning served as a bridge between the NESTLED FDP and real-life experiences within clinical or educational settings. This approach facilitated attendees in ensuring simulation activities they developed had direct relevance to their area of practice and developed momentum within their workplace in supporting colleagues engaged with this change process. The staggered delivery of modules ensured that support was provided by the ES team over 8 – 12 weeks, thus ensuring that the attendee felt prepared to deliver their simulation activity and thereafter report the

Table 3: How the Circle of Learning underpinned the NESTLED Faculty Development Programme.

	Stages in the Circle of Learning	Activity during the NESTLED FDP
1	Knowledge acquisition	Identifying relevant data that creates the basis for change.
2	Skills Proficiency	Forming a development team; define the challenge that the simulation activity will address.
3	Decision Making	How will the simulation activity enhance current practice; what are the impact measures that will be captured before, during, and after the implementation of the solution.
4	Simulation in Teams	Small-scale testing, refining, and validation of the solution.
5	Clinical Experience	Translation and integration of the simulation activity within clinical or educational settings.

impact of this intervention within their organisation.

## Methodology

The purpose of this evaluative study was to investigate the impact of the NESTLED FDP on UK Faculty and within the National Health Service (NHS) utilising qualitative methods of inquiry. Specifically, through interviews with Faculty and other NHS staff, the evaluation sought to investigate:

1. How Faculty evaluated the programme.
2. To what degree Faculty has acquired confidence to use SBL in their practice.
3. How Faculty applied what they had learnt when they were back in their own work settings.
4. What impacts occurred in the NHS because of Faculty completing NESTLED FDP.

A formal evaluation of the NESTLED FDP was undertaken by the University of Huddersfield in partnership with Laerdal Medical® and the international NESTLED project team, to investigate the impact of the programme on the participants' practice and their organisation.

## Study design

This evaluation used an overarching qualitative descriptive approach (Bradshaw et al., 2017). This approach, used widely in nursing research, focuses on the 'who? what? where? why?' of the phenomenon under investigation and can incorporate multiple approaches to analysis.

## Ethical approval

Ethical approval for this evaluation was obtained from the School of Human and Health Sciences Research Ethics Panel at the University of Huddersfield. Permission from each National Health Service (NHS) organisation was also obtained as the participants were predominantly NHS staff.

## Participants

Participants were identified and approached by the Laerdal ES team and invited for an interview. In total, 14 individuals volunteered and were subsequently interviewed. Nine attended the NESTLED FDP and will be referred to as 'Faculty'. These participants represented seven NHS Trusts in five counties in England and one NHS Trust in Scotland. The remaining five participants were individuals identified by the Faculty or the Laerdal ES Team, who could provide further evidence of the impacts of the NESTLED FDP in practice. Throughout the report, these are referred to as 'Snowball'.

## Data collection

The interviews were conducted in person, face-to-face, via Skype, or via the telephone. All interviews were audio recorded, transcribed verbatim for manifest content, and anonymised.

The Kirkpatrick Model for evaluating training programmes (Kirkpatrick & Kirkpatrick, 2006) was used to structure interviews to determine how effective the NESTLED FDP was in association with four different levels of complexity:

1. To what degree participants reacted favourably to the programme.
2. To what degree the participants acquired confidence to use SBL in their practice.
3. How participants applied what they had learnt when they were back in their work settings.
4. What impacts occurred because of the training programme and use in practice. An adapted VICTOR (Visible ImpACT of Research) (Jones et al., 2021) was used to identify the impact of the NESTLED FDP in practice.

## Analysis

Qualitative Content Analysis (Elo & Kyngäs, 2008) is a method developed for the thematic analysis of qualitative research data. It utilises both deductive and inductive processes and has three stages: preparation, organising, and reporting.

The study investigators independently coded the analysis of interview transcripts. This coding used the Kirkpatrick Model (based on the interview schedule and VICTOR) as a deductive framework, but content themes with this framework were inductively derived. The Lead Investigator coded all the interviews, and the other co-investigators coded four each. The Lead Investigator and two UK-based co-investigators agreed on a final coding framework. The Lead Investigator recoded all the interviews and produced analysis matrices.

## Impact

### Programmes delivered and healthcare teams impacted

NESTLED Faculty have utilised their training to deliver SBL across a wide range of clinical specialties and professional groups within their organisations. Table 4 reports the numbers of programmes delivered across Europe by country from 2017 – 2020; Table 5 identifies healthcare teams impacted by NESTLED FDP.

Table 4: Programmes delivered across Europe.

Year	Number of NESTLED FDP programmes delivered by country				
	UK	Norway	Denmark	Germany	Spain
2017	3		3		
2018	10	1	2	4	2
2019	17		2	3	1
2020	4				
<b>Total</b>	<b>34</b>	<b>1</b>	<b>7</b>	<b>7</b>	<b>3</b>

Table 5: Healthcare teams impacted by NESTLED FDP.

Clinical Specialties and Teams	Professional Groups
Emergency Departments	Overseas nurses
Trauma	Foundation medical trainees
Theatre	Cardiology trainees
Dementia teams	Physiotherapists
ITU	Consultants
Transfusion teams	Optometrists
Maternity teams	Anaesthetic nurses
Cardiology	Registered nurses
Paediatrics	Nursing assistants
Renal	Midwives
Medicine	<b>Other Groups</b>
Surgery	Medical students
Ophthalmology	Ward Clerks
Obstetrics and gynaecology	Schools
Palliative Care	

NESTLED Faculty (n=9) were predominantly Simulation Leads or Clinical Skills Facilitators, representing seven NHS Trusts in the UK and one Hospital board in Germany. Six out of nine were classified as 'experienced' SBL educators, with over two years of experience, versus three who were 'novices'. Faculty reported a range in the proportion of their role spent using SBL (see Table 6).

Five out of nine Faculty had received no previous training on how to effectively deliver simulation-based learning. Two reported previous one-day 'theoretical' courses and one a three-hour course about the Diamond Debrief Model (Jaye et al., 2015). Only one Faculty reported formal training from a Simulation Centre, some 15 years previously.

### Snowball participants

Five 'snowball' interviews were undertaken. These individuals included members of clinical skills teams who held an overview of the wider impact of the NESTLED FDP within their organisation. In addition, there were foundation medical staff, who had attended an in-house training session hosted by one of the faculty. Finally, a Specialist Nurse working alongside a colleague who had attended the NESTLED FDP

Table 6: Description of participants.

Domain	Details	N
<b>Faculty</b>		
Role	Simulation Lead	4
	Clinical Skill facilitator	3
	Medical staff	2
Background	Nursing	6
	Paramedical	1
	Medical	2
Years of experience using SBL	0 – 1.9 years (novice)	3
	2+ years (experienced)	6
Proportion of role spent using SBL	0 – 25%	2
	26 – 50%	3
	51%+	2
	Missing data	2
Previous SBL training	None	5
	1-day or less	3
	Formal training	1
<b>Snowball</b>		
Role	Clinical skills Lead (retired)	
	Clinical skills technician	
	2x Foundation Year 1 doctor	
	Diabetes Surgical Specialist Nurse	

devised an SBL event that resulted in significant impact on clinical practice.

### Experience of NESTLED FDP (Kirkpatrick Level 1)

#### Training style

The practical, 'hands-on workshop' nature of the NESTLED FDP was appreciated by the faculty, together with the capacity to make the training 'bespoke' for each participant. Undertaking the training with a mixed group facilitated peer-to-peer learning and support.

There was a lot of opportunity to look at what I needed as a facilitator and what would benefit my project, which I really appreciated. NESTLED had those moments where I could focus on specific things, like how do you do a proper debrief, rather than just give an overview of 'this is roughly how a debrief should run' and that was really useful (Faculty 1026 [novice]).

Several Faculty found the blended teaching of theory and practice particularly useful.

It gave you the background, and it also broke down the way to develop simulation and the questioning behind what you're trying to get across. So, it was a nice sort of process over the course, how to get there at the end, if you know what I mean. So, we, we built up to doing a scenario, and then at the end, obviously, we ran that with the colleagues that were on the course in groups and stuff, and then the idea was then to take it back into your own environment to run (Faculty 1024 [novice]).

Specific topics within the NESTLED FDP, such as learning outcomes, audit, evaluation, and debrief, were considered particularly useful. Eight out of nine Faculty highlighted the

debrief as an area where they had benefited (see Debrief for more details).

## **Impact of NESTLED FDP on Faculty (Kirkpatrick level 2)**

### ***Increased confidence***

Following the NESTLED FDP, 8/9 Faculty (1 missing data) reported an increase in their confidence to deliver SBL. This was evident in both novice and more experienced Faculty.

The biggest thing that I got was a sense of confidence from NESTLED (Faculty 1026 [novice]).

So, I was able to utilise some of the skills that I did learn there and be more confident in making things and also more confident in giving advice to other people when it came to them doing simulation (Faculty 1007 [experienced]).

When we are almost winging it, but it's not very nice, you know, when you have done a job, but you don't always get that job satisfaction from it. But following NESTLED, I'm more confident in designing, delivering, and debriefing... it has definitely changed my feeling toward simulation (Faculty 1006 [experienced]).

I think it definitely gave me the confidence to be able to plan the sessions better and then hopefully get the result I wanted (Faculty 1024 [novice]).

### ***Thinking differently***

Before their NESTLED FDP training, experienced Faculty had been delivering SBL with no (or minimal) formal training. They reported a shift in their thinking following NESTLED FDP. This shift in thinking led to the realisation that SBL is not just limited to teaching new clinical skills but can be used effectively to implement existing clinical knowledge e.g., to facilitate adherence to protocols and best practice and to promote communication and teamwork.

NESTLED made me think about how [SBL] is used as an educational tool. So rather than it's about teaching how to manage a particular condition, it's about how you implement skills you already have... NESTLED changed my view from that point of view, that you know, it's not about individual skill, but more about what people, the more human factor stuff, what makes people do what they do and yeah, that was an eye opener (Faculty 1002 [experienced]).

Improved communication within faculty and a change in how debriefing was delivered were also noted.

We all understand, we've all been trained the same, so we understand and work with each other better for having NESTLED training... I think [communication] is more professional, simulation language... we communicate differently... We communicate better why we are doing certain things ... So, we are more efficient, effective and yeah, I think it's better, a better working atmosphere (Faculty 1006 [experienced]).

As well as an increased understanding of the role of the debrief, there was a shift in thinking about the role of the pre-brief.

Just completely re-arranging how we're going to run our PROMPT training now and the amount of time we're going to allocate to each simulation within the day and how we're going to brief people on what we're expecting from them (Faculty 1015 [experienced]).

## **Faculty use of NESTLED FDP in practice (Kirkpatrick level 3)**

### ***Responsive SBL***

SBL was utilised in healthcare organisations in response to Serious Incidents (SI) and triggers such as complaints, incident reports, or audits, and was seen as part of action planning.

We had what's called NaDIA, which is the National Diabetes Audit... at this Trust we noticed that there were quite a lot of people experiencing hypoglycaemia... We did have an incident related to someone experiencing hypoglycaemia... when there wasn't a lot of staff around, and it was brought to my attention that perhaps we needed to look at the education of the staff around that (Snowball 1008).

So, you see it a lot as a solution, you have an incident, and we get a lot of people putting sim down as an action following an SI (Faculty 1002 [experienced]).

Incorporating knowledge and skills learnt from completing the NESTLED FDP, SBL has been used to 'springboard off' serious incidents and to practice 'never and rare' events. This approach has resulted in improved preparation in clinical areas to avoid potential patient harm.

This was off the back of one SI. So, they had a patient who deteriorated and became quite unwell, and when it was investigated, they'd stuck on the action plan as they sometimes do, simulation, the action plan. But when I met their manager, they didn't need simulation for that SI; that was all about process. They'd had a patient who they shouldn't have had. So, I kind of agreed with her that we do some sim about those patients they're not meant to get (Faculty 1002 [experienced]).

### ***Proactive SBL***

Several participants reported that they used SBL proactively as part of generic and explicit quality improvement approaches, noting the opportunities to encourage learning on broader, underlying issues and change attitudes within their organisations.

I very much try to push it as identifying risks before they happen, rather than, once they've happened, there's no point in me going and re-running some traumatic event because people have already spoken about it and debriefed it without our input... We look at the kind of core issues that led to that. So often,

when you have an SI, there... might be... a breakdown of communication. So, we'll do other simulations that look at communication skills but don't re-run that SI (Faculty 1002 [experienced]).

So recently, we've just had an overhaul of our triage process within the [Emergency] Department... we had to develop a whole new educational package around that and looking at [Standard Operating Procedures] and pathways for how we triage patients... we use the Royal College of Medicine Guidelines... But we've also run quite a lot of simulation around the new process. So, it's not just an education, they're learning how to use the new process (Faculty 1024 [novice]).

### ***Doing things differently***

A key challenge noted by Faculty was releasing staff from front-line care to attend training. Completing the NESTLED FDP resulted in a shift in the thought process amongst Faculty in how SBL sessions could be delivered. For example, reducing the duration of an SBL event increased the uptake for many clinical frontline staff to attend. The concept of 'coffee break simulation' was used as part of the NESTLED FDP to describe how participants might deliver simulation within a shorter period compared to what might be delivered within a simulation centre. The principle of coffee break simulation was to deliver a simulation activity within a maximum of ten minutes and thereafter conduct a debrief which meant that participants were returned to their clinical area within the time normally allocated to a coffee break.

I think our biggest challenge... was, you know, we want to do it, but people don't come for, you know, they can't be released and they'll tell you, 'we don't have an hour, two hours to come over,' and he [Instructor on Faculty Development Programme] was like, 'have you ever thought about [a shorter session] and having a ten minute debrief afterwards?' It was very, very useful because now we have people coming in their lunch hour for a scenario, we'll usually just have them for an hour, give a session, debrief and they're gone. So that has made a massive impact concerning our scenarios that way (Faculty 1006 [experienced]).

It's a massive task. So, as you can imagine, we don't necessarily have the time... we thought we didn't have the time to debrief, pre-brief, all of that. We did, however, figure out in NESTLED that it's completely doable and because of that, we are re-arranging our programme (Faculty 1015 [experienced]).

More experienced Faculty have incorporated knowledge and skills learnt from the NESTLED FDP into reviews and redesign of existing training e.g., more formal planning and communication of scenarios, noting the effect this has on participants' wellbeing and training uptake.

So, what we used to find before was that we didn't used to brief anyone, we just used to walk into a clinical setting, find a room, pretend to be a patient, call the emergency buzzer and expect people to act and people would run away and hide and think that

we were testing them and feel very intimidated. But now we tell people what we're going to do, what we're expecting them to do and that there will be a debrief at the end and a time for discussion and we're finding that the uptake rate is much higher... It's been really positive actually (Faculty 1015 [experienced]).

In addition to developing and delivering SBL in practice, novice Faculty used transferable skills learnt during the NESTLED FDP within other contexts such as supporting medical students and mentoring junior colleagues, sharing scenario templates with Trust staff so that scenarios could be codesigned, and improving aspects of external formal training.

The [NESTLED FDP] has led to me developing an additional section for stroke thrombectomy assessment and transfer to the thrombectomy centre in another health board (Faculty 1037 [novice]).

### ***Debrief***

The debriefing aspect was highlighted by all Faculty as being a particularly useful aspect of the NESTLED FDP.

I think the most benefit for me was the debriefing and having an example of how to debrief using factual stuff where it happened in the scenario was very useful (Faculty 1006 [experienced]).

NESTLED just sort of honed our skills in simulation and taking into consideration factors that we'd never considered before. So how people are affected by simulation in their clinical settings and how you almost take simulation with you unless you're debriefed out of it. I think we didn't really consider people in it at all, we kind of saw it as a task and had outcomes to meet that task without considering really the implications it had on people (Faculty 1015 [experienced]).

The NESTLED FDP educated Faculty about increasing the focus on the debrief which changed their existing approaches to this important step in the SBL process.

The biggest challenge for me was conducting the debrief... So being able to sit down and you know, deliver our scenario, I mean actually sit down with [Instructor on NESTLED FDP] and do a structured debrief, I found that very useful... I have a structured approach that I follow, and I think it has definitely helped vastly in the way I debrief (Faculty 1006 [experienced]).

What we didn't focus on [prior to attending the NESTLED FDP] at all was debriefing and I think what I took away most from NESTLED was how to debrief appropriately and how to get people out of the simulation mind frame, which I knew nothing about before (Faculty 1015 [experienced]).

Faculty used their developed debriefing skills in other teaching contexts, such as when training medical students.

Skills of debrief has actually come in handy for when I do teaching in the clinical environment with patients because sometimes I have students and I say 'oh go and take a history from this patient and come back and let me know' and that's actually debriefing skills, it's not simulation, but talking to them afterwards, I need to be able to debrief them (Faculty 1026 [novice]).

#### Impact of the NESTLED FDP in practice (Kirkpatrick Level 4)

The NESTLED FDP made a difference in the NHS in several ways, identified through four main impacts derived from the analysis of the data: increasing patient safety by improving the preparedness of staff and systems, increasing staff clinical communication skills and confidence, and economic impact through cost saving.

#### Impact of the NESTLED FDP on patient safety

SBL delivered by Faculty resulted in improved skills, better adherence to existing protocols, and the adaptation of systems and provision of appropriate equipment/supplies. It also influenced associated education and training, and the introduction of new safety-focussed protocols. Faculty contributed to these impacts by using SBL to highlight evidence of skills and knowledge gaps and by providing skills training in a 'real' clinical context to fulfil education and training needs. Examples of these impacts are illustrated in the following case studies.

#### Case study 1. SBL improves preparedness for hypoglycaemic incidents

I have been amazed at the results we've had... It is a brilliant and realistic method for learning for hospital staff (Snowball 1008).

In 2017, the National Diabetes Inpatient Audit (NaDIA) identified that one NHS Trust recorded higher than average rates of hypoglycaemia (23.6% vs. a national average of 16.7%). This led the Diabetes team to re-evaluate the hypoglycaemia education provided for staff. At the time, the approach to hypoglycaemia education and training was solely classroom-based teaching led by the Diabetes Specialist Nurses. The lead nurse approached their simulation lead, who had completed the NESTLED FDP about delivering hypoglycaemia-specific simulation-based training that aligned with local and national guidelines. A simulation-based training session was piloted with a multidisciplinary healthcare team, including clerical assistants and students.

Pre and post hypoglycaemia simulation-based training confidence scores were measured by the local team, of which 93% of staff felt more confident in recognising and treating hypoglycaemia following the simulation-based training. Confidence scores increased from 2.8 to 7.7 out of 10. Following the simulation-based training, staff evaluated that they felt more knowledgeable and confident in recognising

and treating hypoglycaemia (Beecroft et al., 2018).

Since the pilot, hypoglycaemia simulation training has been implemented across the wider surgical and medical teams. Simulation is now included in regular study days for registered nurses and nursing assistants, and there are other general Development Days facilitated by Matrons within the organisation that incorporate hypoglycaemia simulation. Simulation-based training is also delivered in ward areas, so staff receive the same education, but delivered in their own ward context, with the systems they use day to day.

A subsequent NaDIA audit was undertaken in 2019. The average rates of both mild hypoglycaemia and severe hypoglycaemia had significantly reduced (Table 7).

Table 7: Change in Hypoglycaemia rates between 2017 and 2019 in one NHS Trust.

NaDIA Audit Year	Hypoglycaemia rates, compared to England					
	Mild		Severe			
	Trust		England	Trust		England
	%	Quartile	%	%	Quartile	%
2017	23.6	4	16.7	7.3	3	7.1
2019	13.9	2	16.5	5.6	2	6.8

The simulation training has made a large contribution to our improved inpatient care when experiencing hypoglycaemia (Snowball 1008).

#### Case study 2. Impact of using authentic equipment during SBL sessions to improve patient safety

SBL has been used by Faculty to improve patient safety in one Emergency Department, as evidenced by a reduction in the number of Datix (a risk management information system used to collect and manage data on adverse events) complaints.

"We've had a huge number of complaints, 'wrongly labelled', 'not using the system properly', 'equipment' and that's dramatically dropped off" (Faculty 1024 [novice]).

Faculty observed that the issues recorded in Datix indicated a lack of practical skills with equipment, particularly in acute situations.

It seems to revolve a lot of the time around a practical skill with equipment, I think. So when you've got that really acutely ill unwell patient, you then have to use pieces of equipment that you haven't... used for a long time, or you've never used, or you think you know but you're not really sure, and you're suddenly the person that has to put it together, you know, run it and I think that's incredibly difficult (Faculty 1024 [novice]).

In response to this issue, Faculty focussed their scenarios on the use of equipment in the emergency setting.

The more you do something, from a practical, it's not necessarily difficult; it's just that you need to be confident and know how you're doing it because you don't want to have to learn when you're under pressure (Faculty 1024 [novice]).



Similar issues with equipment and the knowledge and skills needed to use it were highlighted by other Faculty, emphasising the changes that occurred in Trusts because of the approach taken and the added value of SBL in Quality Improvement.

There was one piece of equipment that they were supposed to be... universal fittings, but they weren't when it came together. If that had been a real situation, the patient would have died. So immediately, that stock was looked at. So, it... brings to light these real near misses (Faculty 1004 [experienced]).

"We did an in-situ simulation on ICU, and we discovered that not all the staff knew how to deflate the mattress... that resulted in staff getting training, being rolled out to all the staff so they knew to do that" (Faculty 1006 [experienced]).

### **Impact of NESTLED-based training on front-line staff**

#### ***Increased confidence and skills***

A common use of SBL was to create a learning space where staff could consolidate clinical skills and practice the use of those skills. This consolidation and practice of skills increased front-line staff confidence, leaving them feeling better prepared for their role.

I think obviously because, as a student, I think it would be just that increased confidence going to the first shift. I think that would be the biggest impact it had. Just kind of almost within that little safety net of 'well no I've done this before, even as a simulation, I know I do have the skills', so it just gives you that little bit of a safety blanket really (Snowball 1032).

#### ***Case study 3. SHOC (Simulated Hospital Out of Hours on-Call)***

Faculty 1026 [novice] created SHOC (Simulated Hospital Out of hours on-Call) for final-year medical students in their NHS Trust following their NESTLED FDP. SHOC was designed to give final-year medical students an opportunity to experience an on-call shift in a simulated environment. The training was based on challenges Foundation Year 1 doctors frequently encounter during an on-call shift. Tasks that provoke the most stress, such as handovers, cannulation, prescribing fluids or medication, and analysing blood results were included.

The SHOC course received positive feedback. An evaluation (Hodgson et al., 2019) demonstrated a 40% overall increase in confidence in preparation for on-call shifts, a 30% increase in confidence in prescribing, and a 46% increase in confidence in managing an acutely unwell patient. Feedback from SHOC trainees was very positive.

You don't tend to get actual experience of being on call as a medical student...the training was brilliant, I was less apprehensive about the little things, like how to bleep someone... how to find my way around the hospital. It definitely helped increase my

confidence... going into the first shift... in prioritising jobs, prescribing, communication skills, how to be on call (Snowball 1032).

It prepared me and made me create a document, which was essentially a mini handover to myself, which I could regularly refer back to over the shift and see what I had done, who needed follow-up and what jobs were outstanding... It has provided me with a foundation of how to properly assess an unwell patient as well as interact with different departments and keep myself organised... it applied very much over my surgical rotation. The SBAR was solidified with the help of SHOC, which helped me a great deal... It helped make the dreaded surgical rotation a walk in the park (Snowball 1028).

These trainees went on to deliver SHOC in Phase Two of its development within the healthcare organisation. SHOC is now delivered by junior doctors independently.

Faculty 1026 [novice] was awarded a Clinical Teaching Excellence Award and has subsequently worked on Phase 3 of SHOC, disseminating SHOC into other Trusts within the region, as well as expanding it to include other professions, such as nursing within the scenarios.

#### ***Communication***

Improved communication was a common consequence of training noted by Faculty, impacting in a range of clinical areas such as emergency care, theatres, and intensive care units.

You can see people's practice change when they are doing when we do our in-situ simulation in ITU; their ability to lead teams and communicate things changes and the impact they have on the nursing staff, the cross-multidisciplinary communication changes (Faculty 1007 [experienced]).

#### ***Economic impact***

#### ***Case study 4. NESTLED FDP helps save £1m per year in a single healthcare organisation***

One NHS Trust saved £1m per year on the Clinical Negligence Scheme for Trusts (CNST) Maternity Incentive Scheme (NHS Resolution, 2023) as a result of trainers who completed the NESTLED FDP delivering the Maternity Acute Illness Management (M-AIM) course and the PROMPT training (Practical Obstetric Multi-Professional Training).

Safety Action 8 states that 90% of each maternity unit staff group must have attended an 'in-house' multi-professional maternity emergencies training session within the last training year. In 2018/19, following its accreditation with M-AIM, the Trust achieved a 97% compliance rate across its two Birthing Centres, one of which is midwife-led. This was achieved due to NESTLED Faculty being considered eligible to attend M-AIM training and then offer M-AIM both within the Trust and across the wider region.

Another benefit for the Trust is that it can now draw down payment for each regional candidate on this course. A second Trust also reported saving £400,000 per year on their CNST premiums, because of changes made by colleagues who had completed the NESTLED FDP.

Our maternity component of our bill is four million, so that's four hundred thousand pounds we've saved by delivering that training. So... it's a big economic impact (Faculty 1002 [experienced]).

## Conclusion and recommendations

The NESTLED FDP is an effective way to educate and train faculty to facilitate and deliver programmes of education which utilise simulation-based teaching methods. It changes the way that faculty think about simulation-based teaching and learning and how it should be constructed and delivered. SBL facilitates learning in 'human factors' such as communication and teamwork, in addition to being a way to consolidate and implement clinical knowledge into practice.

This evaluation has demonstrated positive impacts on patient safety by increasing the confidence and skills of frontline NHS staff and by improving the 'preparedness' of systems. It has also contributed to significant economic benefits within healthcare organisations.

The COVID-19 pandemic accelerated the acceptance and use of the already prevalent and developing online strategies for delivering education and virtual education products. With the significant investments being made in developing further virtual and online resources (including Augmented Reality and Virtual Reality), we must learn from mistakes in the past where educators were expected to 'run with' developing SBL strategies and products without always receiving the necessary education and support to maximise their potential. We would recommend that the healthcare education academies invest in developing an understanding of these new ways of teaching and learning. This would enable educators to keep pace, feel supported and prepared in maximising the potential of SBL strategies.

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