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IMPLEMENTATION HANDBOOK FOR SIMULATION AND ICT-BASED LEARNING IN TRAINING AND HEALTHCARE CENTRES

The SIMBASE committee

Document authorised by:
THE MINISTRY FOR HEALTH AND SOCIAL WELFARE OF THE REGIONAL GOVERNMENT OF ANDALUSIA

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This project has been financed with the support of the European Commission. This publication is exclusively the responsibility of its authors and the Commission is not responsible for any use that is made of the content of the document.

Document Title	Implementation handbook for simulation and ICT-based learning in training and healthcare centres.
Project Title	Promotion of ICTs for improving simulation-based learning in healthcare centres (SIMBASE)
Deliverable	D4.2 – Implementation handbook for simulation and ICT-based learning in training and healthcare centres
Grant agreement number	2010-4079 / 001-001
Work package	WP 4 –Maximisation of impact and integration of ICT-based Patient Simulation
Confidentiality status	Public

Project number -511811-LLP-1-2010—1-ES-KA3-KA3MP
Programme: Lifelong Learning Programme
Sub-programme: KA3 ICT
Call for proposals: DG EAC/41/09
Action: Multilateral projects
Sub-Action: N/A

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1 Justification

At this time there exists an extensive bibliography relating to the use of simulation in the training of healthcare professionals, and there is a wide consensus regarding the need for training based on this methodology as it allows for preparation for real-life situations and, as a result, initiates the process of integration of knowledge with relational and technical skills, thereby ensuring best professional practises and maximum patient safety.

Healthcare centres and training providers, however, as well as all other types of professional training centre at all levels (graduate, post-graduate, specialised, or on-going training), need to find the most effective, efficient way of implementing simulation into their learning processes. Only by achieving this will they ensure their contribution to the creation of more meaningful learning methods that are safer for both professionals and patients alike, methods that will result in the greatest possible impact on the organisation and on the healthcare systems themselves.

For these reasons, and based on the results of the study performed by the SIMBASE European Project, a proposal has been put forward both for the development of this HANDBOOK TO SIMULATION IMPLEMENTATION in centres that incorporate elements considered as critical success factors, as well as for the use of ICTs throughout the development, monitoring and evaluation process in order to ensure maximum impact.

2 Objectives

General Objective:

Develop a support tool for the planning and implementation of simulation in healthcare and professional training centres.

Specific Objectives:

- Define the steps to be taken for the implementation of an integrated simulation programme in the centres.
- Provide recommendations for integrating simulation into professional healthcare training programmes.
- Provide recommendations adapted to the particular training stages catered for in the training centres (universities, healthcare centres, etc.)
- Define some of the elements that will allow us to approach the evaluation of the transfer and impact of the simulation implementation programme.
- Define the criteria for the administration of the required resources.
- Incorporate the use of ICTs in all these processes to maximise the impact of our programme.

3 To whom is it directed?

This handbook is directed towards those people within the centres who perform the role of expert in the design and planning of learning processes for both students and professionals.

While it is possible that this role, or reference, does not exist in some centres, its existence becomes a necessity if we are to ensure that the training programmes constitute a coherent process for students and professionals alike.

In the majority of healthcare centres there is generally an employee who is responsible for the planning and organisation of on-going training of healthcare professionals, and it is they who should ensure that simulation-based training responds to the known quality criteria, depending on the available resources.

In training centres for health science specialists (in some countries this refers to the universities, in others, to the universities in collaboration with healthcare centres and, in others still, to the healthcare system itself), there exists the role of guarantor of the combined learning processes and maintenance of accreditation status, and it is they who oversee the securing of specialist status.

And finally, in the graduate stage the situation is considerably diverse as regards the level of development of innovative learning strategies and, in many faculties, Education Units are beginning to emerge.

This handbook, or catalogue of recommendations for initiating a comprehensive programme of simulation implementation, is directed at all those mentioned above.

4 Methodology

a. Literature review

Upon performance of an extensive review of international databases relating to research on simulation-based medical education, approximately 1300 articles were found, from which the 50 most quoted on an international level were selected for analysis. Among these there are some which stand out for their particular relevance, such as those published by Issenberg and McGahie (2005; 1999), Epstein and Ronald (2007), Ziv et al. (2003), Bradley (2006), etc. Special emphasis was placed on the analysis of reviews of meta-analytical publications which provide relevant information about the best practises and critical success factors of simulation as well as possible tendencies in simulation-based training up to the year 2020 (Gaba, 2004; Issenberg and McGahie, 2005; Fessler, 2012, Bradley, 2006 and McGahie 2006, 2009, 2010 an 2011).

Strategies and recommendations provided by international organisms regarding the quality of training in general and, in particular, the training of healthcare professionals, were also reviewed (ISO/IEC 19796-1; WHO, 2012; WFME, 2012, Lindgren and Gordon, 2012; Grant, 2011).

b. Piloting the impact evaluation model of the SIMBASE Project

The SIMBASE Project has piloted a simulation-based training impact evaluation model which employs both a diachronic perspective of the entire training process based on the ISO model, as well as the integration of a variety of perspectives based on examination of the variables and tools employed in other impact evaluation models. The models selected were specifically those which emphasised the critical factors relating to the surroundings in which the training takes place, the training requirements detection methodology, and the culture of the organisation.

The constituent committee for this project comprises many different profiles, providing a polyhedral perspective on the problems of implementation and dissemination of this type of learning, a characteristic that has made us more aware of the relevance of these factors.

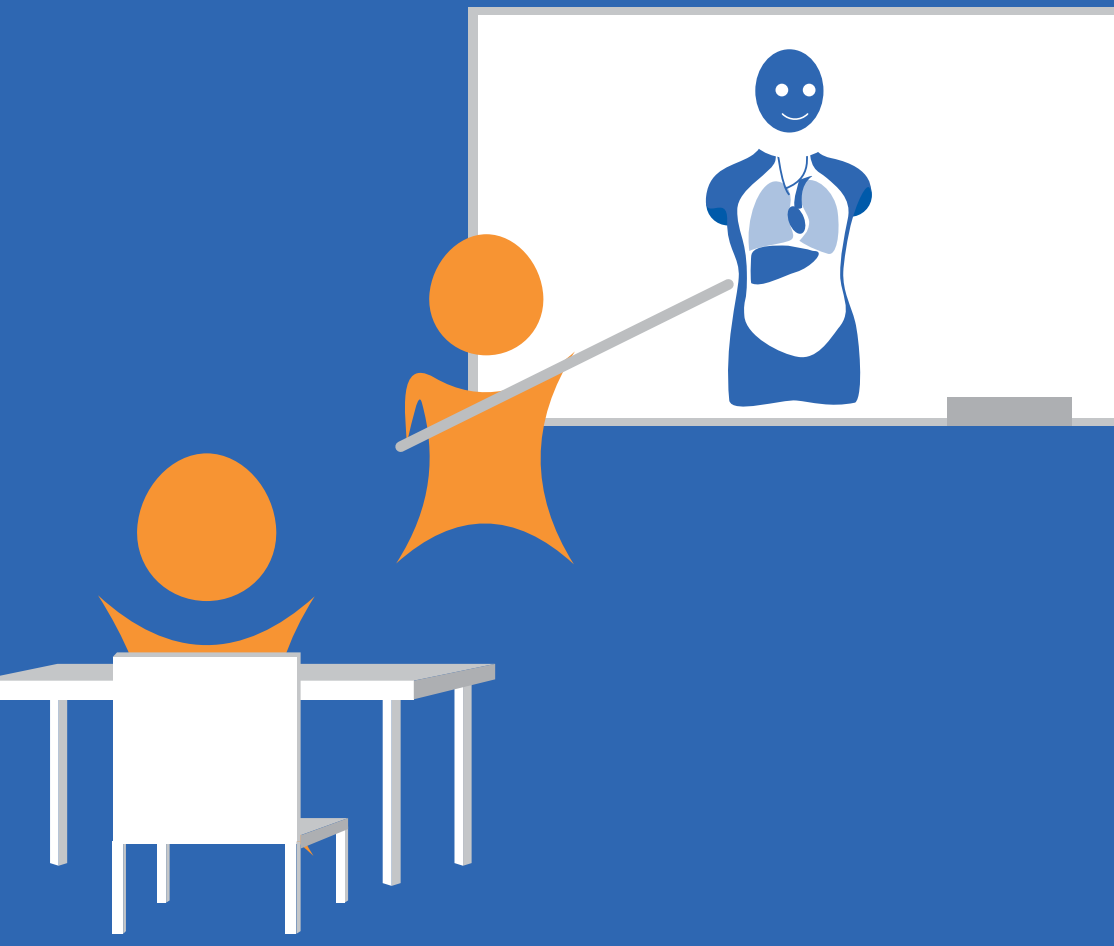
Training providers from different training stages have intervened in this pilot, including graduate medical students, medical training specialists and professionals from on-going nursing training. Coordination was maintained between an expert training innovation centre and

a public healthcare administration, the latter providing the perspective of a public healthcare body, the principle receiver of healthcare professionals, and therefore jointly responsible for their training.

This handbook has employed quantitative and qualitative analysis methodologies of critical success factors selected from relevant publications.

c. Analysis, information processing, synthesis and drafting of proposals.

Following an analysis of the information gathered from the pilot, in which some of the variables have not been open to examination with the proposed level of detail, and including the perspectives identified in the reviewed publications, a committee of international experts has clearly identified a group of best practises and critical success factors necessary for a effective, efficient implementation of simulation as well as the best methods for employing information and communications technologies, which provide support for our actions providing they are correctly focussed. The objective of this handbook is precisely that - to focus on the steps that should be taken by a healthcare centre (as training provider), a university, or a training centre in order to ensure success with the assistance of ICTs.



5 Best practises for the integration of simulation into healthcare and training centre learning processes:

It is important to point out that, before initiating simulation implementation, an analysis of the existing learning processes in the centre in question should be performed. The reason being that the aim of this handbook is to use simulation implementation as an additional element in the evolution towards a new paradigm or, where applicable, the promotion of existing best practises which allow for orientation of the training activities towards achievement of the greatest possible impact.

Quality standards in the learning, education and training process. Standards for the use of simulation

The conclusions reached on the basis of our efforts lead us to propose that the following factors be taken into consideration for an efficient, effective use of healthcare simulation:

- the healthcare requirements, which we wish to attend to with greater competence
- the available resources of the centre, or system, including possible collaborators
- suitable course design directed at the learners
- team-based learning design, bringing the model closer to the reality of the job
- the guarantee of learner-directed feedback
- the offer of staged deliberate practise by encouraging repetition and retention of competencies
- integration of simulated activities into the students' training itinerary and curriculum, as well as that of the specialists.
- particular emphasis and attention paid to suitable performance of the role of the instructor and suitable formation and training based on the competencies specifically required to perform the role
- the search for balance between the fidelity of the scenario and the available ICT resources

And, finally, ensuring the acquisition and retention of the skill being trained and, above all, its transfer to clinical

practise, which requires that elements of organisation and educational context be taken into account. In order to achieve all this, we need to measure the results in terms of health.

The impact of professional training in terms of health

We must insist on the idea that, in order to guarantee impact, we must have control over the aspects relating to the detection of training requirements, and whether or not these are in line with what the healthcare system requires in order to provide the best response to healthcare needs.

On many occasions a particular healthcare requirement which gives rise to the performance of a training activity designed to develop a specific professional competency gets lost during the planning and design processes. We must emphasise the importance of direct effect, prior identification of health indicators, and continual consideration of the final objective of the learning process, as this will surely help us to find more direct routes that will free us of unnecessary baggage and focus our efforts on the most efficient way to achieve our objective. This exercise alone greatly strengthens the alignment of the training activity with real-life requirements, which is precisely the revolution we are looking for

The actors and development of the implementation.

We are all aware that, for the realisation of any project, the most important factor is the people involved in providing motivation for the project. There is little doubt that this depends on the level of commitment to the learning process and whether or not this is coherent with the rest of their activities. This is true for organisers, teachers, instructors and students alike.

Therefore, we must consider it good practise to identify the various actors who appear during a learning process, as well as the elements that directly affect them and which, as critical success factors, must be taken into consideration. If we bear this in mind at the time of planning, designing or implementing an activity, whether it involves simulation or not, we can improve the results.

Aside from the simulation monitor and the student, we must take into consideration the knowledge area teacher in order to achieve the necessary curricular integration as well as to define the remainder of the levels of responsibility within the training centre.

On another level, the clinical service managers must consider the activity as both necessary and pertinent, which requires, on the one hand, recognition by the director and the centre where the activity is to take place and, on the other hand, their commitment to providing

time and place for their professionals to practise. The director of a university department responsible for a specific knowledge area will incorporate simulation practise as part of the curriculum and will afford it suitable import in the evaluation.

Therefore, we should bear in mind the areas in which the professionals carry out their duties and the role played by their respective managers when required to facilitate translational elements to the workplace and, as a result, facilitate the possibility of incorporating hours of simulation-based learning into the service timetable. It is often possible to put this into practise using the same materials and scenarios as are available in the usual workplace. In the case of educational centres, the incorporation of simulation prior to practise with real patients is a key success factor and requires a high level of coordination among the trainers.

In this way, the final actors to share the learning space, namely, instructor and students, can function with all the elements in their favour.

Simulation as a resource for promoting innovation and excellence in education.

Correct use of simulation methodology demands its incorporation as a further step in the learning process of the professionals prior to their coming into contact with patients, as we mentioned earlier. This demand may also be seen as an opportunity to integrate competency evaluation into the learning process.

This evaluation, coupled with the creation of scenarios for the performance of deliberate practises, also allows us to acquaint ourselves further with all the elements that intervene in good professional practises in real-life situations and with patients, and transforms simulation into a powerful tool for innovation and research into human behaviour for advancement in the education of healthcare sciences.

For the healthcare system and its professionals, these may also provide a source of technological innovation, as the healthcare professionals themselves are the best qualified to detect the necessity for new simulators, and may also be the source of possible technological proposals. This provides a great opportunity for the proposal and dissemination of design prototypes if the centre, and the system itself, are prepared for it and are willing to provide suitable stimuli and promotion.

6 Different learning scenarios

a. Medical and nursing faculties and any other training centres that provide healthcare graduate qualifications.

Simulation, as we have said, must be integrated into the learning processes from the beginning of the curriculum. Faculties must invest in specific simulators of greater or lesser complexity, a procedure that requires knowledge of the full potential of this methodology. The faculties should also make the most of the opportunity to create learning scenarios which allow for the training of the maximum number of possible competencies by integrating the training of several of these simultaneously.

We are aware that, for simulated activities, students require some prior knowledge, and we also know that this methodology permits training of attitudes and other emotional aspects and that these influence behaviour in real-life environments. For this reason it is convenient to incorporate simulation from the beginning of the training in the same way that it is important to incorporate contact with patients from the beginning of the graduate programmes.

We also know that, when applied correctly, both simulation and patient contact are important motivators for the students, and that motivation is a fundamental ingredient of effective learning. For this reason simulation should be strategically incorporated into the existing project for the centre.

b. Accredited healthcare centres and/or universities for the training of healthcare science specialists

With regard to specialist training, the explicit incorporation of deliberate-practise-based training before approaching certain activities with the patients, particularly where these may be at risk, is of paramount importance.

It is fundamental, therefore, to bear in mind, first of all, that we must have a training programme that defines the competencies that are to be developed by the specialists in training before they receive their qualification. Secondly, that this programme should include competencies that should be trained through simulation.

Thirdly, in healthcare centres that are accredited for specialist training, there must

be work spaces available for the performance of deliberate practises or simulations and these aspects must be incorporated into the qualification requirements. In many cases, these may simply refer to the same work spaces, or even the same resources, when used outside the normal activity timetable of the centre, or service. For the training of more technically complex competencies, agreements may be made with other centres in order to make the best of the significant investments made, where possible.

c. Healthcare centres for on-going professional training.

Over the course of a professional career, suitable orientation in on-going training is essential for maintenance of the competencies required for the performance of their duties and for their professional development.

If they wish to take into consideration the content of the previous section, healthcare centres must know, or define, the competencies required by their professionals in order that they may carry out their duties. They must also know which of these require performance of deliberate practises with a certain frequency.

This knowledge should be reflected in the organisation of services, resources and work spaces, so that the centre, in as far as possible, may provide the work space and time required for these practises. For this reason, the on-going training programmes must be consistent with these requirements and should employ a methodology that will guarantee their effectiveness and impact.

Suitable training with simulators should be an element that is taken into consideration in professional recognition, in other words, in their qualifications, or accreditations, as well as in their careers. In any case, the centres where the professionals carry out their duties should bear this in mind.

Similarly, training providers should offer training which, where required, includes simulation, particularly when this is difficult to provide in healthcare centres due to the significant investment required. They should also design activities that bear in mind on-going training in the healthcare centres. All this requires the configuration of resource networks that allow the application of a scaled economy to the training, making it more accessible to the professionals, centres and healthcare systems that are obliged to bear the financial burden of the training.


HISTORY
RECORDS
EXAMS
DIAGNOSIS
RESULTS
PRESCRIPTIONS
PRESCRIPTION
CALCULATING
INDICATORS

7 Steps towards implementation of simulation.

The steps to be taken (listed below) are conditioned by critical success factors selected by the SIMBASE Project for the implementation and promotion of deliberate practises. As a differentiating characteristic, the following factors, listed in publications, have been added: orientation towards healthcare requirements, design of the training activity, organisational and educational context and administration of available resources.

Critical success factors

1. Orientation towards healthcare requirements
2. Integration into the curriculum
3. Available resources
4. Design of the training activity
5. Fidelity in Simulation
6. Team-based learning
7. Feedback
8. Deliberate practises
9. Role of the instructor and training roles
10. Skills acquisition and retention
11. Translation to practise
12. Measurement of results
13. Organisational and educational context

1. Orientation towards healthcare requirements

Aspects to be taken into consideration:

- Who, or what organism, decides on the Training Programmes in the centre? Is there is a unit which specialises in medical or healthcare science training and proposes the training models for the centre? If this is so, it may greatly favour the implementation strategy.
- Are the programmes are based on competencies and the definition of best practises?
- How are the programmes aligned with the community healthcare requirements?
- How are the required competencies, which are incorporated into the training programmes, defined?

The identification of the health, or care indicators in the workplace are important and may provide information about the success of the training programme. Revision of the existing information systems in the professionals' workplace is recommended in order to avoid, as

far as possible, the development of new systems, unless they are considered necessary. In this aspect, the use of ICTs may facilitate access to numerous information sources.

Finally, any training programme in general, and simulation programmes in particular, should be able to rely on the assistance of representative clinical healthcare professionals, as these may facilitate the orientation towards the healthcare requirements.

Actions:

- Identify the specific healthcare requirements where training may result in change.
- Identify information systems and health indicators which we intend to modify, either directly or indirectly.
- Diagnose to what extent the training action is relevant to the organisation and its context.
- Identify the competencies to be trained, according to the identified requirements.
- Design the training action objectives and the possible results to be obtained depending on these requirements and the relevance of simulation-based training programmes for the relevant agents of the healthcare system.
- Identify representative clinical professionals.

2. Integration into the Curriculum

Both the publications consulted and our experience in this project serve to demonstrate that simulation in the context of medical education is a highly effective method of attaining learning objectives. It is an excellent complement to real-life clinical practises, though not a substitute for them, given that real-life experience possesses aspects that simulated environments cannot hope to reproduce.

Based on the SIMBASE experience, it is proposed that courses be planned, outlined and developed bearing in mind the context of the curriculum of the healthcare professional in question and as a complementary aspect to clinical education. Curricular integration is one of the characteristics of high fidelity simulation (Vásquez-Mata, 2009; McGahie 2010; Riancho, 2012; McGahie et al. 2009).

Regarding the necessity of including simulation in training plans, one of the experts consulted on the Spanish course considers that *"...From the moment the they leave the faculty, they receive purely theoretical training and, therefore, though it is important to have theoretical knowledge, they do not have the skills necessary to perform the techniques. This*

is due to the fact that the training plans established these days are based precisely on that, purely technical training that does not include skills training which, up until now, was obtained in the hospital with the patients themselves."

Simulation may be used to provide synthesis to the training experience, whereby the students apply their knowledge, develop their skills, and acquire the experience necessary to complete the training programme. For this reason, simulation based on deliberate practises should be an educational characteristic that is carefully integrated alongside other educational events, clinical experiences, problem-based learning, and others. As one of the project experts commented *"the students may be introduced to simulation at an early stage of their curriculum as a means of evaluating their level of practise and their psychomotor skills and, as the programme progresses, they may get involved in more complex scenarios as the complexity of both their knowledge and the competencies to be developed during the programme increases."*

While it is true that learning objectives should, from our perspective, stem from identified requirements, the design team, when developing the activity, should link it with the existing training timetable and make it as flexible as possible. A prior diagnosis should be performed to evaluate the level to which existing programmes are complemented by other educational methods and clinical practises in order to maximise learning and ensure retention of the competencies being trained. Furthermore, actions should be developed during the simulation training sessions to strengthen the correlation with their courses or training plans.

Actions:

- Encourage questions from the students relating to their individual requirements and their levels of knowledge, skills and experience prior to the training session.
- Allow the instructors to make small changes to the course material based on the requirements of the students, or where necessary for the group as a whole.
- Send information about the training session to the educational centres (university, those responsible for specialised training, healthcare centres), with references to the educational context.
- Get the tutors involved in all the course content.

Achieving suitable curricular integration of the simulation programmes may ensure successful integration of simulation into the organisational strategy and, as a result, into the educational strategy.

3. Available Resources

The implementation of simulation has a technical component and being able to rely on all the required resources may influence the level of satisfaction of both students and teachers and, as a result, in the success of the learning process. The training programme, therefore, should have suitable technical means at its disposal, namely, simulation rooms, instructors and the simulators themselves.

The availability of resources should be orientated in accordance with the previously identified requirements and should rely on the support of the centres, or training units, and the simulation models should be adapted according to these requirements.

The principle limitations for generalised application, with respect to resources and the benefits of simulation, are the costs inherent in the implementation, which are higher than those of other methodologies. Our results have shown that, in general, simulation is expensive, but its benefits are far greater and, therefore, more than justify the investment, a fact that is reflected in a variety of publications.

In any case, the required investment may be made using efficient models, bearing in mind the following factors:

First of all, the use of e-learning platforms for all activities that may be performed online, reserving onsite sessions for when strictly necessary.

Secondly, the provision of learning spaces and scenarios within the workplace, where possible, thereby saving on unnecessary costs in time and travel.

In third place, the search for synergies with other centres in the region so that, with the same expenditure in time and travel, the training possibilities may be extended, particularly those that require greater investment and generally have reduced attendance.

In fourth place, it is possible to begin with competencies that are more widely needed and that do not require expensive, highly complex simulators. Clear examples of this are the simulators for training basic or advanced cardiopulmonary resuscitation, or the primary training phase for endoscopic surgery using pelvitrainers.

And, in fifth place, any investment should be preceded by the guarantee of the availability of suitably trained instructors and an organisation that will provide the necessary time and work space for use by the professionals.

Actions:

- Identify the required resources: technological resources and suitable simulation rooms, depending on the number of students, groups, or instructors.
- Organise learning into small groups. Under no circumstances should there be more than five students together in the simulation scenario.
- Identify the communications tool and the e-learning phase platform (materials, forums, chats, etc.) that will make the best use of the students' time.
- Make use of accredited websites in order to access cases, incorporating the possibility of linking these to the available simulators.
- Identify the measurement indicators that allow for posterior analysis of cost/benefits, sources and recovery methods. For this purpose we should make use of platforms that allow us to register all the information required for general analysis and, in particular, for analysis of cost/benefits and impact.

4. Design of the training activity

A script and design for the training sessions are required. These should clearly reflect the situation we are trying to reproduce for the performance of deliberate practises.

The objectives and required results should be precisely defined. This requires identification of the competencies to be acquired according to the different learning domains in the simulation (cognitive, psychomotor, or affective).

The course script should be adapted to the student profiles and to the previously identified requirements. It should be clear to the student, or professional, that this practise is just another element in their educational strategy, in their timetable.

Actions:

- Identify the student profiles, their needs
- Clearly identify the competencies to be trained
- Define precise objectives for the training activity
- Identify the principle elements that characterise the deliberate practise and scenario to be used
- Define the evaluation methodology for the results of the learning

5. Simulation fidelity

In our experience it has been demonstrated that high fidelity simulation has been very well employed and highly regarded during this pilot. The simulation technologies have been selected according to the different learning scenarios and objectives. For training in surgical and primary care competencies, part-task trainers and video analysis have been used and, in other cases where we are dealing with highly complex operations, the use of virtual simulation has received very positive evaluations.

Furthermore, there are many authors (Issenberg et al. 2005; McGahie et al. 2010) who are of the opinion that one of the best practises in simulation implementation is to look for High fidelity simulation, as the simulation technology should come as close as possible to the reality of clinical practise.

We need to consider precisely what competencies and objectives we wish to achieve in order to find a balance between the required resources and the fidelity of the scenario.

While suitable technological resources are a requirement, as Scalese (2008) states, decisions regarding the use of simulation technologies must take into consideration the connection between learning objectives and tools.

As many authors say, the quality of simulation programmes depends more on educational integration in the centre, or on the programme being in line with the teachers and the context of the organisation, than with the level of fidelity and the type of simulator (K.E.Littlewood 2011), and that simulation is used to measure the results of simulated learning but, in the end, what we really need to gauge is behaviour in real-life situations and results with the patients.

6. Team-based learning

These days, group learning of the healthcare team is recognised as one of the objectives to be attained within the educational framework of future healthcare professionals. These people work together as a team and are interdependent in all their activities and, as a result, their affinity ensures success in healthcare. This is a competency, therefore, that should be incorporated into the training programmes and should be trained via simulation in conjunction with other technical competencies.

In our experience, not only is it one of the competencies that has been identified as imperative, it is also one that could possibly benefit from its own development through simulation and become a factor that encourages participation in the training activity, thereby increasing the efficiency of the activity.

This is one way of making an effort to facilitate transfer to clinical practise and to patient care. Healthcare is a "team sport", and this incorporation should allow us to provide training in the development of common objectives and help clarify the roles played by each member of the team. It helps raise awareness of the situation and of the importance of leadership and mutual support, all of which is reflected in the patients' results.

The fundamental message is that team training should be incorporated throughout the training cycle as a complement to the individual training needs, and will provide us with opportunities to practise teamwork skills in simulation environments and, subsequently, transfer these to patient care.

Actions:

- Identify teamwork as a competency to be trained and use it as one of the central points in content training during the simulation implementation.
- On completion of the training, emphasise the influence of teamwork as an influential factor in transfer to clinical practise.
- Encourage teamwork during the feedback and reflection (debriefing) phases.

7. Feedback

Feedback consists of the application of a variety of methods, sources and means of increasing the impact on the participants.

Our experience has demonstrated the effectiveness of the use of a variety of feedback techniques specifically orientated towards improving the clinical performance of the student through the use of different strategies in conjunction with performance of the simulation.

The reflection phase is of vital importance within the feedback strategy, and should be encouraged in order to obtain improved learning and performance results. The standards and suitable methods should be established for each of the expected results.

In short, simulation-based learning should be implemented with a focus on an overall feedback strategy that includes reflection. Feedback is an essential aspect that should be taken into consideration from the design phase of the activity and in relation to the scenario, the learning environment and the expected results. Research results have demonstrated that simulation-based training with a focus on feedback produces significantly better performance than a strategy that does not include feedback. This focus maximises transfer to clinical practise.

Actions:

- Incorporate reflection as a diagnostic tool to analyse both the strong points of the group as well as the aspects requiring improvement.
- Incorporate reflection into training as a complementary element to feedback, allowing the learning to extend beyond a purely mechanical exercise.
- Ensure that the organisation takes into consideration a learning environment which is suitable for the reflection (debriefing) phase.
- Ensure that the team participants are relaxed, confident and comfortable during the reflection phase.
- Encourage teamwork during critical analysis, describing beforehand the type of interactions expected.
- Focus on specific performance indicators during feedback to ensure maximum performance and subsequent transfer.
- Provide feedback results and integrate them into strategies for training and on-going improvement of the acquired competencies
- Provide suitable complementary activities for feedback on both individual and group levels, establishing the best moments for one or the other.
- Try to reduce the time between task-performance and feedback as much as possible.
- Store all possible results and established objectives during the reflection phase in order to facilitate future analysis in simulation-based learning programmes within the organisation.

8. Deliberate practise

Deliberate practise is an important property which should characterise simulation sessions in order to train, refine and conserve acquired knowledge, skills and attitudes through the promotion of repetition and actions designed for on-going improvement of these competencies. Deliberate practise using simulation has been shown to improve medical performance in many surgical specialities.

Actions which ensure deliberate practise through simulation:

- Ensure dissemination of the message that, in order to conserve the skills learned in the primary stages, the students must continue with simulator practise in the future.
- Ensure that the feedback is updated with new techniques to provide a response

to changing patient requirements, the principles of current education, and best practises.

- Once the course has been completed, provide opportunities for practise at all times and ensure that these opportunities continue to be available. Practise time is always short.
- Use an analysis and feedback process and keep a register of the sessions.
- Ask the students' opinion about the course.
- Introduce a learning method based on simulation problems.
- Maintain a high level of motivation in the students.
- Encourage deliberate practise through precise definition of the learning and task objectives.

Deliberate practise is a factor that is very much sought after by the students, and its relation to educational integration and training programmes must be coherent in order to ensure development and

retention of the trained competencies.

According to Riancho et al. (2012), students who are offered the opportunity to get involved in deliberate and repetitive practise with simulation appear to acquire the necessary skills more quickly than those who are exposed to routine clinical situations with real-life patients.

9. The role of the instructor and training roles

McGahie (2010) summarises that, with regard to simulation instructor training, clinical experience alone is no guarantee of the effectiveness of the simulation instructor, and neither is it a requirement that instructors and students come from the same healthcare area or even, it follows, from the same speciality.

From the experience of our study we can deduce the need for instructors to have experience in simulation and, with respect to instructor selection, some guarantee of prior experience in simulation, as a complimentary element to clinical experience, would appear to be a requirement.

In the SIMBASE experience, however, we have not been able to demonstrate the need for accredited experience in the precise simulation devices that will be used in the particular sessions, or whether or not more specific, or more general skills are required.

What is certain is that, bearing in mind the role of the instructor in simulated learning contexts, it is crucial that they play the role of facilitator, guide and motivator for the students in order to maximise their interaction, learning and retention. The most important factor, however, is to ensure that both feedback and reflection (debriefing) occur.

Investment in instructor training is one of the questions that should be taken into consideration in order to ensure greater benefits and results from simulation-based learning. In this regard, Riancho (2012) considers instructor training to be a key element requiring investment, and that this investment should form part of the implementation plan budget.

Actions:

1. Select instructors with prior experience in simulation
2. Define the requisite general competencies of the instructor
3. Facilitate education and training of these

10. Skills acquisition and retention

As the study has revealed, the acquisition of competencies should be the central objective of all training sessions, combining technical skills with others skills such as teamwork and communication.

We know, however, that over time, competencies cannot be maintained and begin to decline. Our teachers, as is recommended in certain publications, set in motion a series of actions that allow the development of strategies for improvement and retention of acquired competencies over time. This factor is closely related to deliberate practise.

The acquisition and retention of these competencies should be coherent with the requirements identified as well as with the objectives and results to be attained by the organisation. In this manner the organisation will promote and emphasise their retention.

Actions.

1. Connect directly with the interests of the centre, or service, to promote and strengthen these competencies

2. Design the programme emphasising the need to develop a plan which will allow the students to retain and improve these competencies, achieve systematic transfer to the workplace and, in the long term, maximise the effects of the training.

11. Transfer to clinical practise

Transfer to clinical practise is the principle objective of simulation-based training programmes, and it should be incorporated into the evaluation of results. We must be able to know the level to which the skills acquired have been applied to real-life clinical situations.

Due to time restraints, we have not been able to study this as part of our investigation. We do know, however, that ensuring the transfer of competencies to clinical situations in the workplace is a critical factor which must be evaluated, as it allows us to enhance the implementation and dissemination of clinical simulation.

Authors such as Kuduvalli (2009), Fraser et al., and Sturm et al. (2008), have shown through case studies that the transfer of skills acquired through simulation to real-life clinical environments improves the level of retention as compared to traditional teaching methods. Another study shows that medical interns who are trained to attend to a cardiac arrest as a team in a real-life environment tend to respond far more easily as a team to the application of protocols than more advanced residents' teams who have been trained using

methods that do not include simulation. In the surgical field, Seymour[1] has published, along with convincing evidence, that training with virtual simulation transfers directly to daily practise and improves patient care behaviour in the operating room.

Transfer may be conscious (intentional, or "high road" transfer), or automatic. Automatic transfer is enriched with the local learning contexts and includes the physical surroundings, suitable performance of the roles of the different actors and evaluation of the expectations of the students. Analysis of the environmental and contextual factors that affect transfer, either positively or negatively, is one of the most relevant aspects to be taken into consideration, and one which we are committed to on the basis of our experience.

Bearing this in mind, the inclusion of questionnaires from models such as Holten et al. (2007), or those esteemed by Tejada (2007) is a useful way of evaluating clinical learning.

Actions:

- Use of qualitative and quantitative tools for the gathering and analysis of information
- Evaluate the inclusion of the different actors involved in the transfer: students, managers, co-workers, service managers, etc.
- Take into consideration the factors that have a positive or negative impact on the transfer of acquired competencies to clinical practise.
- Bear in mind the retention of trained competencies and the role of the instructor in the learning attained.
- Evaluate the importance of communication and teamwork skills
- Consider the educational and organisational aspects of transfer to daily practise
- Evaluate, along with the students, the influence of the confidence acquired and encourage awareness of the limitations that still exist
- Consider the time factor as a fundamental variable in the evaluation of the retention and transfer levels

[1] Seymour NE. (2008). VR or OR: a review of the evidence that virtual reality simulation improves operating room performance. Word J Surg; 32:182-8.

12. Measuring the results

Measurement of results is essential in the implementation of a simulation programme, as it is in other aspects of medical education.

In general, the results to be taken into consideration are, first of all, evaluation of performance, in other words, measurement of the increase in the competencies acquired by the students. Secondly, measurement of the transfer to real-life situations, in other words, whether or not the students transfer what they have learned to clinical practise. Finally, we need to identify the changes in healthcare that result from the training, and whether or not these lead, directly or indirectly, to improved results in healthcare.

In the first case (performance measurement) it is essential to have reliable information about the competencies trained and how these have improved, and to develop measurement tools that are coherent with the learning objectives.

The three primary sources of information in the evaluation of simulation-based learning results, and which should always be used with caution, are:

- Direct observation of performance: to be performed under controlled conditions, after extensive training and with clearly defined measurement criteria.
- Responses of the students, either to multiple choice questionnaires or on the basis of written examinations. Direct measures of students learning outcomes are preferred as they more reliable and less influenced by individual responded characteristics[2].
- Simulator recording and filing of the behaviour of the students during training.

In the second case (transfer measurement), this should be done via measurement of: 1) transfer of competencies acquired to clinical practise, 2) the number of times this is performed, and the level of expertise, 3) the level of confidence shown by the student in the use of the technique, 4) The students' perception of the level of improvement in patient care, 5) the level of improvement in the use of resources. In order to achieve this, we need to take measurements beforehand and afterwards, and compare them.

This can be done using the following sources of information: a) Direct observation in the workplace, b) Surveys of the trainees, co-workers and area managers and c) Analysis of documents

[2] Downing SM. (2004). Reliability: on the reproducibility of assessment data. Med Educ; 38:1006-12.

in the workplace.

The following factors that are influential in transfer should be taken into consideration: teamwork, the availability of necessary resources, the existence of an open, positive attitude of the students during the learning, the coordination and supervision of the team by the managers, the resistance to change or the adaptation of the strategy of the organisation to simulation-based learning. These factors are discussed in more depth in the SIMBASE Impact Evaluation Model document.

In the third case (impact measurement), we can achieve this by measuring the level of satisfaction of the patient with the attention received, the level of improvement in waiting times, the level of influence on the improvement in hospital services and, in terms of surgery, by measuring the reoperation rates. Measurement may also be made by introducing changes to the centre's information systems and the

patient register.

Actions:

1. Select the variables and indicators to be studied for each of the fields
2. Where possible, select accredited tools or design and accredit other tools where necessary
3. Define the occasion and manner of application of the tools
4. Define the evaluation team who will apply the tools
5. Define the required resources, incorporating platforms that allow online access to all the actors involved in the evaluation
6. Consider evaluation feedback activities with trainers, teachers, managers and the organisation

13. Organisational and educational context

The inclusion of the organisational and educational context as a critical success factor for the implementation of simulation, in conjunction with orientation towards the training and organisational needs, is one of the objectives of this handbook.

Simulation-based training that ignores the organisational and educational context of teaching, evaluation and application to clinical practise, is a lost cause.

Each context is considered to contain a number of inherent factors that have profound effects on the essence and quality of the learning results and how healthcare professionals transfer them to clinical situations. There exist in-depth studies that approach the way in which simulation provides visible witness to the importance of context in both learning and practise[34].

While this factor requires more in-depth research than that performed by this project, we consider it necessary to bear in mind the influence of certain contextual variables, such as 1) organisational support for the training, 2) coherence and integration with the objectives of the organisation, 3) differences among the evaluated groups, 4) the changing rhythms of local contexts, 5) ease of communication within the organisation, 6) the local remuneration system, 7) cultural barriers, 8) the resistance to change in the organisation and 9) the existence of an open system that considers change as strategic and is capable of providing feedback of the results of the simulation to the organisation itself.

For the majority of these variables, actions

[3] Kneebone R. Simulation and transformational change: the paradox of expertise. Acad Med 2009; 84:954-7.
[4] Kneebone R et al. see article and copy reference.

have been proposed throughout the various steps considered in this handbook. In addition, however, we propose the following:

Actions:

1. Incorporate innovation and quality training into the strategic plan of the centre

2. Use training innovation as a tool for change via the design and development of a simulation implementation plan

3. Place the simulation implementation plan within the framework of process and resource reorganisation strategies for the centre: work spaces and times within the healthcare quality standards

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