Setting up a simulation training unit within an Ambulance Service Trust: A practical guide

Abstract:
Education and training departments are a core element of UK ambulance services. There is an emphasis on ensuring the adequate provision of Continuing Professional Development opportunities to staff as well as an increased focus on patient safety across all aspects of healthcare provision. In the light of technological developments the ways of delivering certain aspects of training or monitoring competencies, the actual physical infrastructures of educational facilities sometimes requires to be adapted. This article explores this very fact in relation to simulation-based training by providing guidance on how to set up a simulation training unit within an Ambulance Service by either reconfiguring existing facilities or starting from a blank canvas. Some of the key points covered in this article details include the development of a simulation strategy, considering the physical location and layout of the new facility, working with the architects and contractors, ~~considering the criteria on which to base the selection~~making the right choice in terms of technology to invest in with regards to patient simulators and Audio/Visual systems, how to staff such training facility, and what additional training may the instructors need to ensure they provide the best educational experience possible .

Key words:
Training centre, Simulation training, Clinical skills, Patient simulator, Continuing education, Facility design

Key ~~phrases~~points:

- Simulation is taking an increasingly important place in the Department of Health agenda with respects to all healthcare professions
- Developing a modern simulation training facility should be seen as an asset rather than a financial drain
- Each ambulance service should develop an advanced simulation training facility for regular use by its front line staff
- Simulation training facilities need to be staffed by appropriately trained personnel who understand the pedagogy and intricacies of simulation-based education

> **Comment [A1]:** This is also the recommendation made by the Chief Medical Officer for England and what the DH will push forward (without any extra cash to my knowledge)

The education of paramedic trainees has made use of some form of more or less advanced simulation models and learning approaches for a very long time and for a diverse range of skills (Alinier, 2009; Gordon, Issenberg, Mayer, & Felner, 1999; Stewart, Paris, Pelton, & Garreston, 1984; Stratton et al., 1991). In 1964, the first low-fidelity simulation educational study involving paramedics and lay people was conducted to investigate the acquisition of cardiopulmonary resuscitation skills using a Resusci-Ann mannequin (Winchell & Safar, 1966). While using the simplest technology may be used for rehearsing protocols or practising basic skills as in the above example, "*newer technologies, such as advanced patient simulators coupled with digital audio and video recording systems may bring fresh opportunities that can help staff develop better team working skills. Such types of higher level skills can only be addressed through*

highly realistic simulation training, which are safe re-enactments of real life situations that may involve other emergency services." (Alinier, 2009) (p369). Non-interactive mannequins are usually used purely for skills acquisition wherever they need to be used by whoever needs to master these specific skills. At the other end of the spectrum, some of today's mannequins are much more advanced and may require not only to be operated within a specifically designed environment, but also by staff who have been trained to operate them. This can be illustrated by Figure 1~~Figure 1~~ which shows some first year paramedic students in the highly technological environment of ~~the~~ a simulation centre interacting among themselves and with the patient simulator whose voice and vital signs are remotely controlled by one of their tutors. This brings us to the topic of this ~~paper~~article, namely how to set up a modern simulation training unit within an Ambulance Service.

Figure 1: Road traffic accident scenario involving two ambulance crews.

The key steps to developing a simulation unit

Setting up a simulation unit or centre is nothing like creating ~~standard~~ a basic teaching environment with classrooms however well equipped they may be. Specific points need to be considered for it to be a successful development and to allow valuable learning activities to take place. The following sections of this article will cover the key steps in developing a simulation training unit which are;

1. To form a core simulation project team
2. To develop a simulation strategy
3. To identify the most suitable location or mode of delivery
4. To choose the patient simulator(s)
5. To choose the Audio/Visual technology
6. To work with the architects and contractors
7. To design the layout of the simulation training environment
8. To train additional simulation instructors

1. Forming a core simulation project team

The aim of this section is not to start a debate to differentiate andragogy (helping adults learn) (Darbyshire, 1993; Delahaye, Limerick, & Hearn, 1994) ~~to differentiate andragogy (helping adults learn)~~ from pedagogy (helping children learn) (Knowles, 1980) (p.43) but to bring to your attention the fact that technological developments have brought about changes in the learning opportunities that we can offer learners and that this requires some special consideration.

Ambulance services education or training departments have been in existence throughout the UK since their development was urged in 1966 by the Millar report (1966) to ensure basic training of ambulance personnel (Kilner, 2004) and re-emphasised by "*the promulgation of a national paramedic training syllabus based on clinically approved national protocols, in 1986*" (Caple, 2001) (p.297) but many of them were setup much earlier because of civil defence responsibilities, notably in London (Newton, 2010). ~~They~~ Training departments have for major responsibility to ensure that front line staff are regularly and appropriately trained to a high level of competency skills and professionalism to care for the public while on duty. They also often play an indirect but vital role in ensuring that pre-hospital emergency services fulfil several elements of their corporate mission statement. Although ambulance services training departments have been providing training using some forms of simulation for the training of ambulance staff for over four decades, they have done so using relatively basic mannequins and in standard settings, whether inside or outside a building or vehicle.

As any new activity undertaken by a department, the adoption of a new or modernised form of education~~al approach~~ involving physical resources should be considered as a project and be led by a core project team. Depending on the nature and size of the project that core team may include people from outside the training department such as a "building and estates" representative. Although the core team should be led by a manager who ~~keeps~~ has oversight of the budget and any fundraising activity, it should also include someone who will actually facilitate the simulation training and who has received training and mastered the "art of simulation". ~~At the default (?) of having someone~~If there is not anyone with such expertise within the ambulance service, an external simulation consultant can be appointed to help shape the project and advise the core team on technical and educational issues. Even if the designated simulation ~~trainer or~~ trainers have not yet received any formal education to facilitate realistic scenario-based simulation training, it is important to involve them at the earliest possible stage ~~of~~ in the project so they can take part in the decision making and take ownership and lead the simulation delivery strategy as their own.

2. Developing a simulation strategy

One of the first activities of the core simulation project team will be to draw a simulation strategy in line with the ambulance service's needs, capacity and budget, the staff training needs, and the latest professional and governmental guidelines. Some of the other aspects to consider will be the impact of the strategy on the delivery of current educational programmes to avoid unnecessary duplication because of the cost implications, the logistical impact on the day to day service delivery, the sustainability of the plan, and the potential future opportunities that may arise as a result of the new facilities and expertise developed.

Budget will probably be the most significant limiting factor dictating of the simulation strategy of any ambulance service as it is widely recognised that simulation training, due to its very nature of being so close to reality, is expensive to resource (Alinier, 2009; Issenberg & Scalese, 2008; Jansen, Johnson, Larson, Berry, & Brenner, 2009; Okuda et al., 2009) there is however evidence starting to appear that demonstrates it may also be a cost saving strategy on other types of expenditures (Barsuk, Cohen, Feinglass, McGaghie, & Wayne, 2009). The budget will impact on the size of the core simulation training team, the size of the facilities, the number of patient simulators and mobile units, and more importantly on the number of hours and opportunities each ambulance staff will be able to benefit from simulation-based training. One of the potential solutions to overcoming financial limitations is cross-services collaboration whereby two or more ambulance services could collaborate to develop, staff, and run a simulation training facility and programme in a more cost-effective manner (Metcalfe, Hall, & Carpenter, 2007; M. Seropian, Dillman, & Farris, 2007). Table 1Table 1 provides an idea of the costs involved in setting up a simulation unit, whether static or mobile.

Once developed the simulation strategy should be in the form of a clear and informative implementation plan in which realistic objectives are set. The strategy will define whether the simulation training unit should be mobile, static, or both as discussed in the next section.

3. Identifying the most suitable location or mode of delivery

Without going into too much detail,Although three modes of delivery are usually identified in terms simulation training, namely: static, in-situ and mobile, for ambulance services the latter two can often be regrouped. For example a scenario taking place in an ambulance during transport, which one may qualify as "in-situ" (real setting), can also be considered as "mobile" (the ambulance is moving) or even "static" as the patient is not moving in relation to the ambulance. In the pre-hospital care setting, a mobile simulation training unit could be defined as a training vehicle such as an ambulance especially equipped to run scenario-

based simulation training sessions wherever required. On the other hand, a static simulation training unit could be referred to as a simulation centre. It is a specifically designed facility to which ~~candidates~~ students or staff requiring training have to go to in order to take part in a simulation-based educational activity. It would differ from a standard training facility because of its specific room configuration (Simulation platform, control room and observation room) (Alinier, 2008a) and the usually more high-tech educational equipment present such as one or more patient simulators, adult or paediatric, in a simulated pre-hospital setting, and the presence of cameras and microphones (Alinier, 2007a).

Both modes of delivery, static and mobile, present their advantages and disadvantages whether in terms of throughput capacity per training event, impact on service delivery, cost, access, opening of opportunities, and flexibility of usage. In the case of a static simulation training facility, its location should be as central as possible in relation to the default geographical position of the frontline staff which will probably be greatly governed by the population density and emergency calls made. This means that the best location is not necessarily in the exact central ~~spatial~~ geographical location of a territory covered by an ambulance service. The use of a mobile simulation training unit would probably be limited to a maximum of two ambulance crews taking part in a scenario or simulated event at a time, possibly in the compound of their base station between calls. The main limitation is that at any point during the simulation session, the crew(s) could be called out to respond to an emergency call, however it may allow for in-situ training (Miller, Riley, Davis, & Hansen, 2008) which may be more realistic than training in the recreated setting of a simulation training centre. In the case of a static simulation training facility, more crews could attend at a time and they would not be interrupted as it would be at a time when they are not assigned to a vehicle.

Comment [A11]: Can't think of another way of describing this…the fact that over a geographical territory covered by an ambulance service, there is not necessarily an even distribution of ambulance crews on duty… high calls areas will be covered by more ambulances than areas totally unpopulated…

4. Choosing the patient simulator(s)

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Although patient simulators are not the only medium with which one can run scenario-based simulation sessions (Alinier, 2007b), they ~~are much more willing than~~do present some unique advantages over standardised or simulated patients (actors) (Levine & Swartz, 2008) ~~to be used for~~when it comes to invasive procedures. ~~and~~They are hence increasingly being utilised for the training of qualified healthcare professionals in a range of settings for team-working as well as emergency clinical procedure training (Freeth, Ayida, Berridge, Sadler, & Strachan, 2006; Wisborg et al., 2005). There are a number of factors which need to be taken into consideration when choosing which model and make of simulator to purchase. The key elements are:
- Robustness, durability, and reliability
- Ease of use and installation
- Functionality
- Realism

- Customer service
- Price
- Maintenance
- User community
- Integration with Audio/Visual system

Taking ambulance crews out of the road for training during service can be quite a logistical exercise as an appropriate level of service provision need sto be ensured in all geographical areas of a territory. For the latter reason,, so it would not be permissible for any simulation session to be cancelled due to a technical issue with the patient simulator. Mannequins and pPatient simulators used by ambulance services are usually very heavily used and age very rapidly, hence the need for them to be robust and supported by a good customer service, preferably by a manufacturer which can offer a local technical service for maintenance. Paramedics represent a significant proportion of ambulance services staff and their roles are still evolving (Kilner, 2004) which impacts on the required functionality of patient simulators so they may be used for the practice of all relevant clinical skills within the pre-hospital setting. The latest and most advanced patient simulators allow for heart, chest, and abdominal sounds auscultation, pupil reaction, monitoring of physiological parameters, palpable pulses at several locations, variable airway resistance and lung compliance, needle or surgical cricothyroidotomy, decompression of a tension pneumothorax, and chest tube insertion (Alinier, in press; Issenberg & Scalese, 2008).

Comment [A12]: Because they are not treated as well as real people, i.e. they get pulled by one arm, leg or head when moved around! (Despite manufacturer recommendations to treat them as real patients)

5. Choosing the Audio/Visual technology

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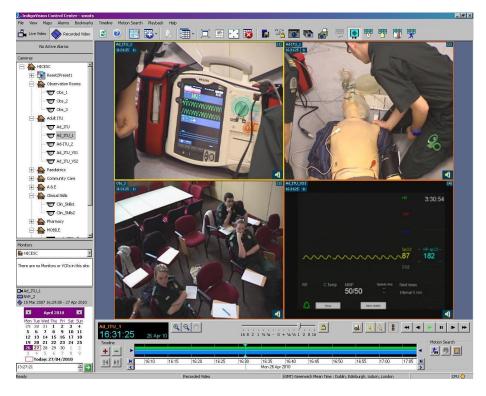
The supplementation of patient simulators with video cameras has already been discussed in an article published in this journal (Alinier, 2009). Although some patient simulator manufacturers may recommend a specific Audio/Visual (AV) solution, it is not necessarily the best and most cost effective. In the first instance one may wonder what is the benefit or purpose of installing cameras and microphones in a training environment, but they do bring educational advantages. When there are a large number of participants with some not involved in the scenario, the AV system can be used to allow them to remotely observe their peers from another room, to analyse and discuss as a group what is happening without distracting the scenario participants (See Figures 5a and b in (Alinier, 2009) and (Alinier, 2007b; M. A. Seropian, 2003)). The recording may also be played back to the scenario participants to support the debriefing or be given as a personal record of staff development for independent review to encourage reflection (Alinier, 2009; Jones & Cookson, 2000).
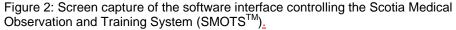
There is a range of technological options available, some of which are more or less appropriate depending on the size of the simulation training centre and the number of cameras (Alinier, 2008b, in press). Ease of use is an important non-negligible (?) factor, as the dynamic control of Pan/Tilt/Zoom

(PTZ) cameras, for example, should not distract from the control of the patient simulator. The ability of the AV system to be ~~expended~~ expanded to incorporate additional cameras at a later stage should also be taken into account. The AV system should also provide easy access to recordings so they can be played back or transferred onto DVDs or other data storing devices in the shortest possible time. Figure 2~~Figure 2~~ shows the simultaneous video playback of four cameras ~~views~~ installed in the Hertfordshrie Intensive Care & Emergency Simulation Centre (HICESC) from a range of cameras shown on the left hand side of the software interface.

Figure 2: Screen capture of the software interface controlling the Scotia Medical Observation and Training System (SMOTS™).

In the case of a mobile simulation unit, the cameras and microphones may either need to be set up at the back of an ambulance or used outside on a stand. In any case the system should be quick and easy to install and ideally not require the support of an AV expert. Usually in a mobile or in-situ simulation case there is no need for a live video relay to an observation area. This opens up access to a very wide range of AV recording options starting from basic and low cost

camcorders to more expensive networked PTZ cameras controllable from a single computer via a special software interface.

Item:	Cost: (x £1,000)
Refurbishment of an existing facility	5 to +100
Building of a new facility	70 to +500 (ranging from prefabricated hut to a new bulding)
Mobile simulation unit	50 to 70 (Price of vehicle)
Patient simulator	8 to +50 depending on the model
AV system (per camera and recording system)	0.5 to +6 depending on number of cameras and technology
External consultant fee per day	0.6 to +2 depending on the activity (site visit, review of plans, training of facilitators...)
Equipment	0.5 to +20 ranging from a basic response bag to the complete kit including monitor defibrillator

Table 1: List of initial costs for the development of a simulation unit

6. Working with the architects and contractors

If you are fortunate enough to be involved in a relatively large scale development, in addition to working with the patient simulator(s) manufacturer or distributor and maybe the AV installation company, the core simulation project team will have to work with the architects and building contractors. It is important for immediate stakeholders to monitor closely the development of the project and be involved in all discussions to ensure any changes to the plans, however minor they may seem, will not impact negatively on your final setup. In this case the immediate stakeholders refer toare the simulation facilitators and not the managers or building and estate representatives. The simulation facilitators, who may consult an external simulation expert, will have a better insight than anyone else about the impact of any physical alterations to the agreed plans. It usually ends up being more expensive to fix things once they are finished rather at the design stage. Similarly, if required, it is more economical to use an external consultant from the beginning of a project rather than when the plans have already been agreed by the contractors as any changes will incur extra costs and delays. For architects and contractors to understand what you are trying to achieve, it is advisable to arrange visits with them to other centres during an actual simulation session so they can witness how it is used and after it so they may ask questions to the host centre.

7. Designing the layout of the simulation training environment

When setting up a simulation centre, the two usual starting points are either a blank canvas or the refurbishment of an existing space where it is hopefully possible to make small alterations. In either case, the final product should be an environment fit for the delivery of highly realistic and high quality education. In that respect, for the training of ambulance personnel, the simulation centre should aim to reproduce environments where they commonly work as well as a corresponding number of rooms where observers can sit and where to conduct the debriefing and potentially review the video, and also separate rooms from which the patient simulators and scenarios can be controlled. The typical environments that could be incorporated in a simulation centre include a household setting, the back of an ambulance or helicopter, car wreckage, a call/dispatch centre, or even the section of a street or road. It is often possible to use a ~~same~~ single room to mimic several environments by using custom designed backdrops that may show a road side or even a restaurant setting, hence eliminating the need for superfluous equipment. In refurbished environments, the most likely alterations required are the positioning of new doors and internal windows, the addition of partitions, and the repositioning of lights and electrical and network points.

In terms of layout, there are a few points to follow such as:
- Making sure participants are never required to enter the control room to access the observation room or the room where the scenarios will take place .
- Avoiding having an observation room adjacent to the simulation room (depending on the technology used) because of noise contamination.
- Making sure there is sufficient space for storage of equipment.
- Having an individual control room for each simulation room.
- Ensuring people can enter and exit the control and observation rooms without walking through the simulation rooms .

If appropriately designed, it should be possible to run several simulation training sessions in parallel in a centre with multiple simulated environments without being required to share at any point in time the observation room, simulation room, or control room.

8. **Training additional simulation facilitators**

The simulation trainers or instructors "*should receive training in facilitating simulation sessions irrespective of their prior educational expertise or discipline*" (Alinier, 2007b) (p.e249). This point is advocated by many experts in the field (Dieckmann & Rall, 2008; Issenberg, 2006) and was even recognised in a recent Chief Medical Officer's report (Chief Medical Officer, 2009). Their role will be to help deliver the organisation's simulation strategy discussed earlier. In many ~~respected~~ aspects, they are even more important than the equipment or actual physical facilities or environment where the training will take place. Rather than

Comment [A14]: Because that is where all the scenarios paperwork are kept as well as some of the props sometimes. That is also a room for trainers to speak about scenarios or prepare the points they will want to discuss during the debriefing with the candidates.

Comment [A15]: Not the same as the first point which still allows you to have a control room in the closed corner of a room for example…

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simulation instructors they should be referred to as "simulation facilitators" (Alinier, 2009).

As opposed to ~~straight and~~ traditional pedagogical principles, the use of modern simulation training technology allows the adoption of a slightly different teaching approach. There is no need for the trainer to stay at the side of the patient simulator to prompt the scenario participant(s). In highly realistic scenario-based simulation training, also known as high-fidelity simulation, the orientation to learning may not necessarily be based around subject matter but rather around the actual points raised by the participants as an outcome from having taken part in the simulation experience. The training approach should be less didactic and prescriptive than adopted in other training interventions. "Mastering the art of simulation facilitation" has become a common point of discussion for the past few years at simulation conferences across the continents. There is a recognised need to instate a requirement for new simulation facilitators to undertake an officially accredited training programme. This is to ensure that all simulation facilitators have a sound theoretical base with regards to providing simulation-based ~~education~~ training while having the ability to appropriately facilitate the learning experience and debriefing of learners without discouraging or offending them. This has led to the recent development of a new postgraduate programme at the University of Hertfordshire due to be validated in June 2010 in the form of a Master in Healthcare and Medical Simulation.

Comment [A16]: Simply to highlight or "coin" this sentence

Conclusions

The development of every single simulation unit will differ because of organisational, operational, and funding variations. This means that there is no one size fits all solution and that every single development will have its own specificities which may be imposed by the refurbishment of an existing facility or preferences regarding the use of a specific manufacturer for examples. Although the discussion presented in this article relates to setting up a simulation training unit within an Ambulance Services Trust, much of it would also be valid for other settings as the educational principles are the same. The simulation user community is also a great source of information and knowledge and is expanding at an impressive pace with increasing number of delegates at the various annual meetings (www.aspih.org.uk, www.sesam-web.org, www.ssih.org). New simulation technological solutions are emerging every year especially with the regular launch of new patient simulators from the various leading manufacturers, but also from the AV side which provide more comprehensive and user friendly systems.

Comment [A17]: New website due to recent merger of associations together but new website design company in the process of being commissioned to redevelop website, hence it will be a useful link

Comment [A18]: Key simulation community in Europe with strong UK representation that people need to know of

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paramedic students for giving their permission to publish the pictures shown in this article.

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