# E-learning and simulation in medical education: an opportunity to integrate?

Medical education has changed in many different ways over the past 20 years. However, two big changes have been the emergence and continuous growth of e-learning and simulation (Cook et al, 2011). E-learning barely existed 20 years ago and simulation was still relatively in its infancy.

Today many medical education resources are being put online, and the offering of the web ranges from small and discrete reusable learning objects to massive open online courses (MOOCs). Simulation has also been transformed from a niche offering that was dominated by a few specialties (for example emergency medicine) to a discipline in its own right with a wide range of offerings of varying technology, fidelity and cost. However, to date e-learning and simulation have largely grown along parallel lines. Computer-aided learning rooms and simulation suites are separated geographically; e-learning faculty and simulation instructors are separated pedagogically; and e-learning programmers and simulation designers are separated technologically. Whether or not this should have happened as it did is largely academic: what matters now is whether it continues to make sense for the disciplines of simulation and e-learning to continue to progress along separate lines or whether it would be better to integrate them. And if integration does make sense, it is worth considering how best to do this. This article makes the case for better integration of these two streams of activity and also suggests practical ways in which they can be aligned.

## Why integrate e-learning and simulation?

### Best practice

The first reason to integrate e-learning and simulation activities is that such integration represents best practice from a curriculum perspective. One modern curriculum approach is that of blended learning – where thought and planning is given to blending content offerings, formats and outcomes in effective ways (Rowe et al, 2012). So students might learn knowledge from simple text-based learning resources, and then skills and behaviours from their experiences in the simulation suite. When designing or redesigning curricula, it would make sense for all providers to know exactly what the other providers are doing and there is unlikely to be any better way of doing this than by simple integration of teams.

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### Cost effectiveness

A second reason to integrate is to control costs and ensure value. Medical education is expensive and so anything that can be done to save costs, albeit at the same time ensure value, is likely to be welcome. There is growing interest in developing cost-effective forms of simulation and cost-effective forms of e-learning. However, cost-effective technology-enhanced learning could represent an important step change in delivering value (Walsh et al, 2007; O'Donovan et al, 2016).

Current practice whereby e-learning and simulation provision work on completely different software systems is unlikely to offer best value. Different software systems need to be purchased separately and, just as importantly, need to be maintained separately. The same is true of hardware – although specific hardware is often required for physical simulation trainers. However, integrating faculty and technology teams is likely to reap most benefit in terms of value. Faculties that work across simulation and e-learning are likely to achieve much more – both as individuals and as small interdisciplinary teams. Similarly technologists should be able to maintain more technology to a higher standard when working on different products. Many technologists actively wish to do this – to broaden their expertise and develop new skills. An integrated team should simply be more productive and so should be able to give more high quality learning experiences to more learners.

### Providing a framework

Another reason to integrate is that it should help develop a more effective and programmatic assessment framework (Schuwirth and Van der Vleuten, 2011). This should help both students and faculty alike. An integrated e-learning and simulation assessment service should enable students to undergo continuous formative assessment of academic knowledge and applied knowledge, problem-solving skills and practical skills, academic behaviour and practical behaviour. Students should also thus receive continuous real time feedback on their performance. Faculty in turn will receive a dashboard view of overall performance, and if need be will be able to drill down into this dashboard to see how individual students are performing and who might need extra help. Medical education should ideally be tailored to the needs of individual students and this envisaged system should be a significant step towards achieving this ideal.

### Evaluation

Another foundation stone of medical education is evaluation (Chen, 2005). Medical education institutions need to be able to evaluate their performance and indeed to improve their performance in light of this evaluation. Evaluation can be a cumbersome and slow process with individual departments using their own processes of evaluation. Integrating systems should enable a joined-up approach. Electronic capture and analysis of evaluation data is an improvement on traditional means of gathering such data and so once again integrating the evaluation systems simply makes sense.

### Portfolio learning

A fifth reason to integrate is that it fits with the portfolio approach to medical education (Buckley et al, 2009). In this portfolio approach

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a learner pieces together all the learning that he/she has done in different environments and regularly summarizes, reviews and reflects upon his/her learning (Colbert et al, 2008). Electronic portfolios can enable the capture of much learning and indeed enable the articulation and capture of all important reflective notes. However, a common criticism of electronic portfolios is the lack of compatibility between different electronic portfolios. So for example a student might capture his/her e-learning on one system, his/her achievements on assessments on another, and his/her performances in simulations on a third. However, when the student tries to export data from one system to another he/she is faced with technological barriers – largely because of incompatibility between different portfolio software systems. The only way to capture all the learning in one place is often by manual transfer of data from one system to another. Integrated e-learning and simulation services would force the integration of portfolios into a single system – with a vastly improved learning experience as a result.

### Blurred boundaries

A sixth and final reason to integrate is that advances in technology are already making integration inevitable and are blurring the artificial boundaries between e-learning and simulation. For example learners can learn to improve their resuscitation skills by practicing chest compressions using the accelerometer on their iPads: is this e-learning or simulation? Equally learners can learn manual laparoscopic skills using a laptop with specialist software and some add-on hardware: is this simulation or e-learning? The answer to both questions is that it is both. Integration of e-learning and simulation is happening now – it is simply a matter of institutions making a leap that learners are already making.

And what name to give to this new integrated discipline? That is the most straightforward question to answer and the name exists already: learning enhanced by technology. With the emphasis on learning. **BJHM**

*Conflict of interest: none.*


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## KEY POINTS

- Integration of e-learning and simulation represents best practice from a curriculum perspective.
- Another good reason to integrate is to control costs and ensure value.
- Integration should help develop a more effective and programmatic assessment framework.
- Integration also fits with the portfolio approach to medical education.


## Central Medical Supplies Chosen To Supply All Patient Warming Devices To City Hospitals Sunderland


Central Medical Supplies Ltd (CMS) has been chosen to supply City Hospitals Sunderland NHS Foundation Trust with a range of warming products, which it distributes exclusively in the UK for The 37° Company. City Hospitals Sunderland will be the first Trust in the UK to use the new Fluido® Compact blood and fluid warmer, launched in the UK earlier this year. Fluido® Compact is an easy to use, accurate, safe and cost effective system for daily blood and fluid warming. Stephen Picken, Resource Manager, City Hospitals Sunderland, says: "During our trials, Fluido® Compact was shown to be preferable to other systems. It was easy to use, straightforward and we found it gave excellent clinical outcomes at no additional cost over our previous system."

CENTRAL MEDICAL SUPPLIES

CMS is also supplying the Trust with the Fluido® AirGuard System, which warms blood and fluids quickly and safely using infrared technology. It's suitable for all applications; from standard anaesthesia to high flow trauma.

Tracey Pavier-Grant, from CMS, says: "This is testimony to our expertise in the area of patient warming. The Trust chose to purchase from us as they were impressed by both our expertise and the range of products we offer. We've developed a great working relationship with the Sunderland team and I'm pleased they've agreed to become a reference site for us to use as an example of best practice. It's great that the Trust has already experienced great clinical outcomes, user benefits and cost savings."

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