OMS

OXFORD MEDICAL SIMULATION
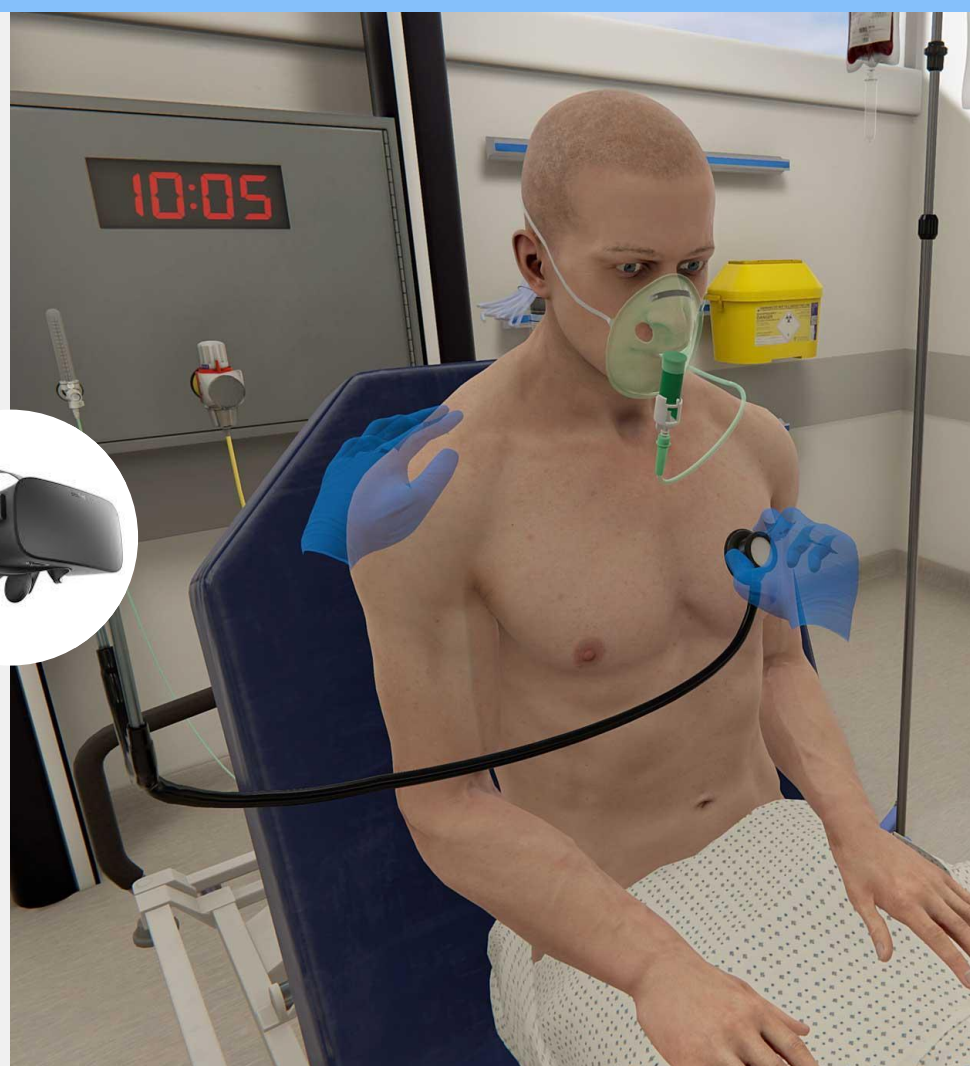
Virtual Reality Healthcare Simulation

VIRTUAL REALITY HEALTHCARE SIMULATION

—

At Oxford Medical Simulation we create virtual reality medical scenarios, giving learners the benefits of traditional simulation in a scalable model.

This allows learners to practice more, learn from their mistakes, and improve patient care.

WHY WE DO IT

- **INCREASE SIM DELIVERY**
  - Flexible, faculty-free, time saving
  - Integrate simulation with practice
- **OPTIMIZE PERFORMANCE**
  - Focus on confidence, competence and outcomes
- **IMPROVE SATISFACTION**
  - Engaging, immersive, 'real', enjoyable

HOW WE DO IT

- **VIRTUAL REALITY PLATFORM**
  - Immersive, engaging, relevant scenarios
  - Explicit learning outcomes
  - Reflection, feedback, scoring, blended learning
  - Repetition and deliberate practice
- **DATA**

WHAT WE DO

- **DECISION MAKING**
- **CLINICAL REASONING**
- **CRITICAL THINKING**

Competency-based education

WHO WE ARE

- **VR DEVELOPERS**
- **SIM PROFESSIONALS**
- **ARTISTS, MODELERS**
- **EDUCATIONALISTS**
- **ANIMATORS**
- **CLINICIANS**
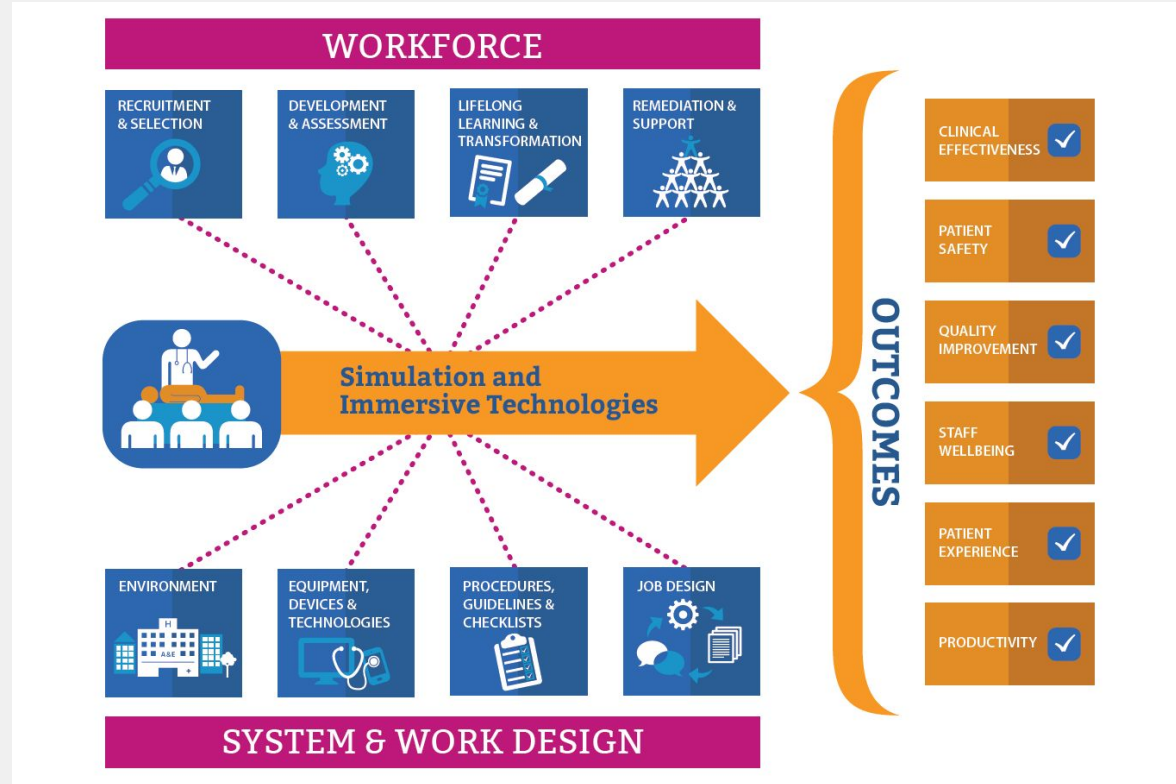
HOW CAN THIS BE DELIVERED?

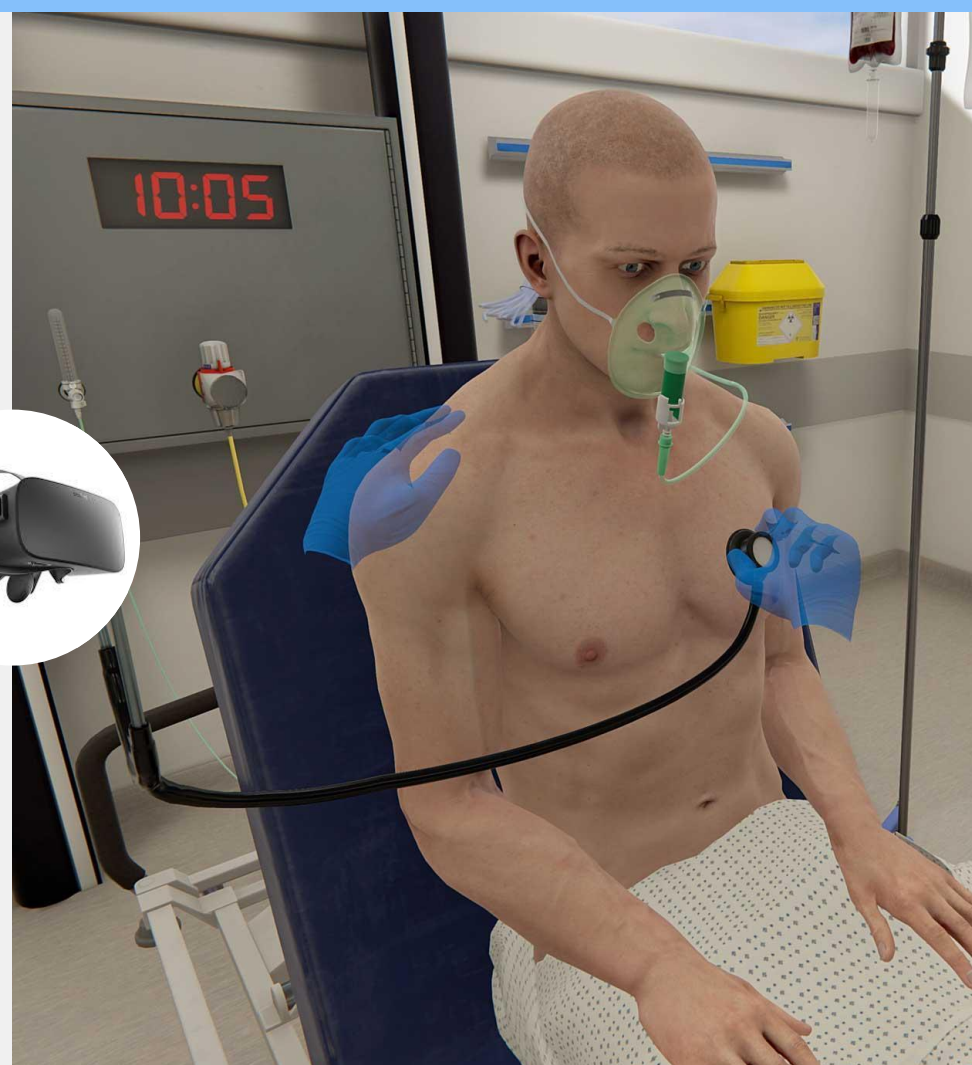Virtual Reality

or

On Screen

Simulation
Integration

HEE National Strategic
Vision (2020)

CHALLENGES IN CLINICAL EDUCATION

—

- Faculty
  - Numbers / quality / availability
- Materials
  - Equipment / teaching resources
- Time
- Space
- Scheduling
  - Throughput / accessibility
- Senior support
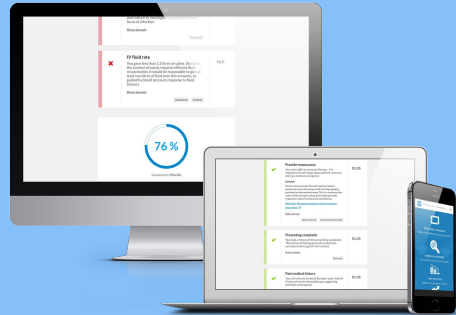- Financial
  - Making the case / return on investment

OVERVIEW OF OMS

Simulation Scenarios

VR or Screen-Based

Guided Reflection & Feedback

Data, Analytics & Reporting

Learning Management System

LEARNING MANAGEMENT SYSTEM

LEARNING MANAGEMENT SYSTEM

1. VIRTUAL REALITY SCENARIOS

Award-winning, high-fidelity scenario design allows learners to perform in clinical situations as in real life.

Immersive and engaging
- o Oculus Rift VR headsets provide unparalleled immersion and presence

Immediate usability
- o Simple interface allows complete user freedom with easy setup and portability

Evidence-based
- o All scenarios are peer-reviewed and based on simulation best practice

World-leading fidelity
- o Artificial intelligence, dynamic emotion and unwellness systems ensure realism

Adaptive
- o Scenarios seamlessly adapt to learner actions ensuring no attempt is the same

2. FEEDBACK & BLENDED LEARNING

Real-time feedback on learning performance covers technical and non-technical fields including teamwork, communication and prioritization.
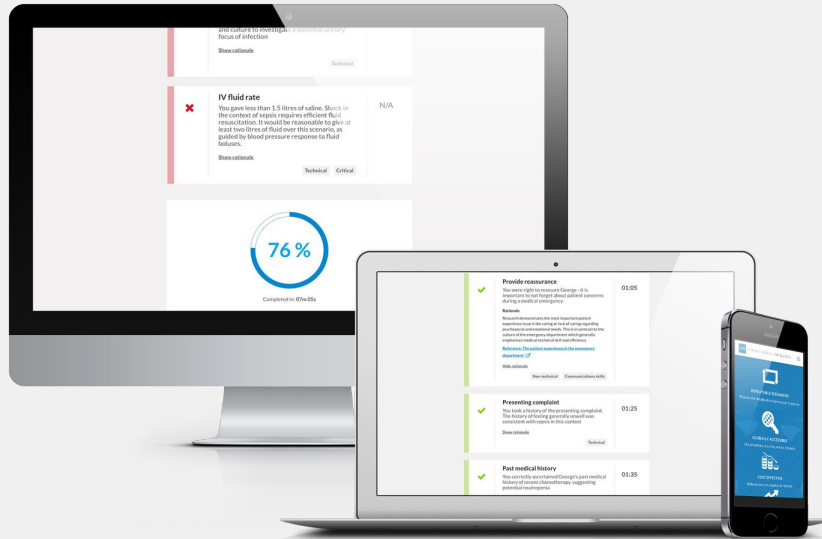
Performance-based
- Timestamped feedback identifies strengths and areas for improvement in technical and non-technical fields

Personal and interactive
- Intelligent, individualized feedback allows learners to engage and explore learning points in detail

Blended learning
- Blended learning links out to latest evidence and local protocols to meet curriculum requirements

Customizable
- All learning is instantly customizable to integrate with any organization's curriculum and protocols

Targeted to competencies
- Feedback is linked to relevant educational competencies to ensure learning requirements are met

3. DATA, ANALYTICS & REPORTING

A full data and analytics dashboard allows learners and institutions to view and act on real-time performance metrics.

Personalized
- Performance-derived analytics outline specific clinical strengths and areas for improvement

Motivating
- Clinically-weighted and transparent scoring system motivates learners to ensure ongoing engagement

Collaborative
- Analytics are available to learners and faculty simultaneously, facilitating performance review and mentorship

Flexible
- All data is available on the user's personal device and institutional computers to create a shared learning passport

Exportable
- Learner reflection, feedback and score can be exported as certificates for portfolios

CONTENT

Scenario Libraries

○ Scenarios in the OMS catalogue are divided into libraries. Each library is composed of up to twenty scenarios.

○ These libraries cover:

- **Medical Emergencies**

- **Nursing Emergencies (RN)**

- **Paediatric Emergencies**

- **Mental Health***

- **ALS**

- **Interprofessional**

Overleaf is the selection of clinical presentations that go into any library. Note specific scenarios can differ and libraries can be adapted to institutional requirements.

INTERPROFESSIONAL

OMS INTERPROFESSIONAL

Multiplayer design
o Scenarios designed for team training, focusing on human factors

Active, faculty & observer roles
o Multiple roles to fulfill learning needs: active, speech only or passive observer role

Full collaborative debrief
o Debrief suite allows interprofessional debrief based on team and individual performance

Timeline and detailed feedback
o Multiple feedback views, learning objectives & radiology to help facilitate debrief

VR and screen modes
o Blending immersion and accessibility with VR and screen-based multiplayer modes

Left panel

✓ **Presenting complaint**

You took a history of the presenting complaint. The history of feeling generally unwell was consistent with sepsis in this context

00:20 — Technical — George

✓ **Update nurse**

You correctly discussed the clinical situation with the nurse to ensure shared mental models and goals

00:35 — Non-technical, Teamwork — Denis

✓ **IV fluids**

You correctly gave fluids to a septic patient. It would be reasonable to give 1 to 2 litres initally, but reviewing after 500ml boluses is another option

00:30 — Technical, Critical — Michael

✗ **Hand hygine**

You correctly carried out hand hygiene to help prevent the spread of infection

Technical — Artur

Centre panel

SCENARIO TIMELINE

- user 1
- user 2

0:00   4:21

10:54   10:54

- 8:21 Chest X-ray
- 8:34 Medication Administration Record
- 9:00 Fluid Administration Record
- 9:00 Medical history
- 9:03 Medication Administration Record
- 9:17 Calcium gluconate 30ml of 10%
- 9:21 Medication Administration Record
- 9:35 Medication Administration Record
- 9:44 Insulin: 10 units in 25g glucose IV
- 9:47 Medication Administration Record
- 10:07 Cyclizine 50mg IV
- 10:09 Fluid Administration Record
- 10:14 Medical history
- 10:17 Medication Administration Record
- 10:32 Ask about pain
- 10:46 How are you feeling?
- 10:54 Leave scenario

Right panel

Vbg Results

Abg Results

Result 1

Result 2

Result 3

MANAGEMENT OF ANAPHYLAXIS IN ADULTS

1. Give IM Epinephrine:
2. Give Oxygen:
3. Give Fluid Bolus:
4. Give Hydrocortisone:
5. Give Diphenhydramine:
6. Albuterol if dyspnea/wheezing:
7. Monitor:
8. Review:

Presenting complaint ✓
You took a history of the presenting complaint. The history of feeling generally unwell was consistent with sepsis in this context

Technical | George | 00:20

Update nurse ✓
You correctly discussed the clinical situation with the nurse to ensure shared mental models and goals

Non-technical, Teamwork | Denis | 00:35

IV fluids ✓
You correctly gave fluids to a septic patient. It would be reasonable to give 1 to 2 litres initially, but reviewing after 500ml boluses is another option

Technical, Critical | Michael | 00:35 / 00:30

Hand hygine ✗
You correctly carried out hand hygiene to help prevent the spread of infection

Technical | Artur

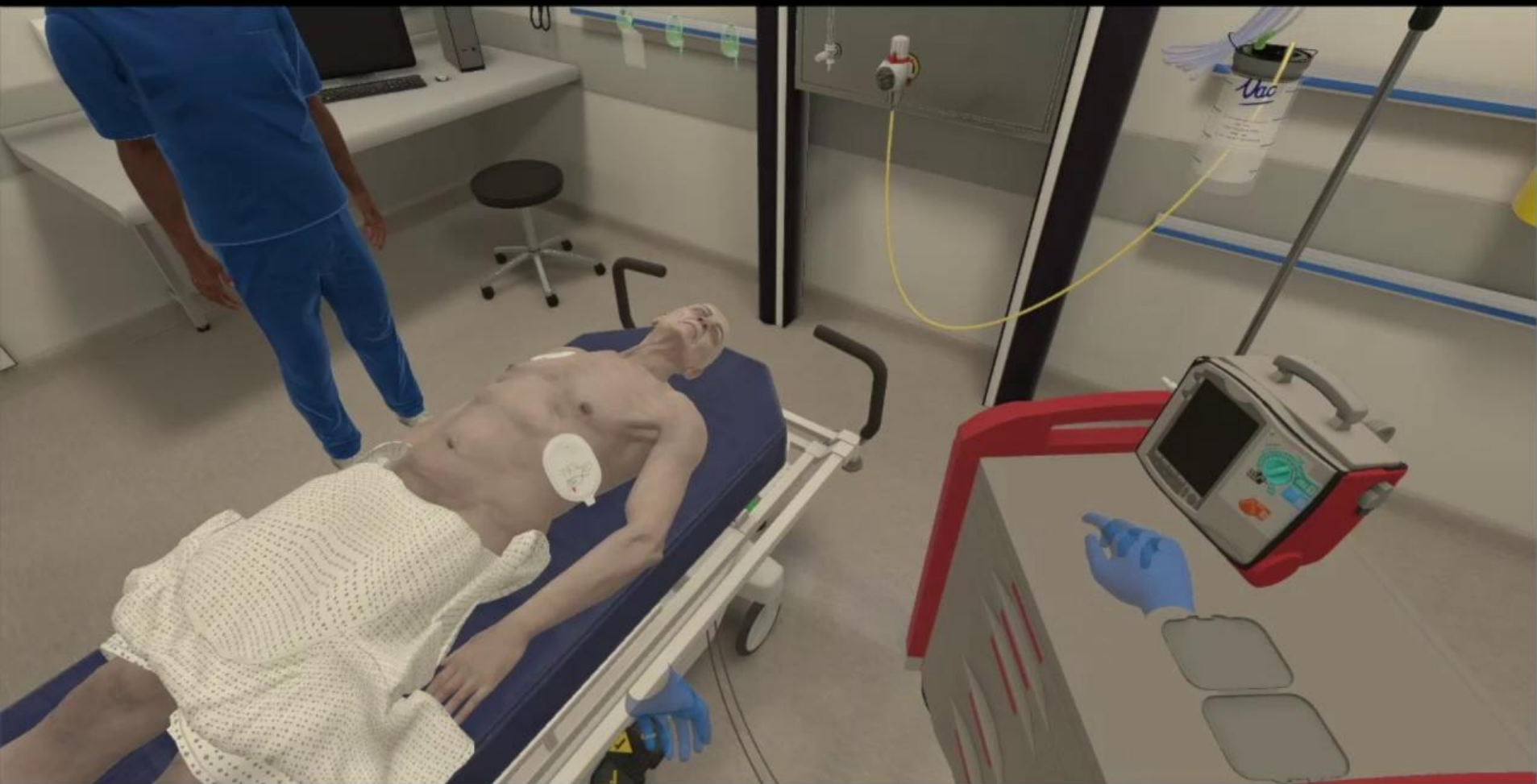SCENARIO TIMELINE

user 1
user 2

10:54

Vbg Results
Abg Results
Result 1
Result 2
Result 3

MANAGEMENT OF ANAPHYLAXIS IN ADULTS

Comparison:
Single player vs Multiplayer

Single player	Multiplayer
Learner-driven	Human factors focus
Simple scheduling	Interprofessional engagement
Psychological safety	In-scenario tuition and mentoring
100% objective and standardized	Remote teaching and learning
	Full team debrief
	Improve debriefing skills
	Faculty-driven scenarios

IMPLEMENTATION

University of Oxford

Integration

- 1. In combination with physical simulation
  - Flexible space in simulation center to increase throughput on sim days for students and foundation years
  - Rotation between VR/Physical
- 2. Stand-alone access with peer teaching
  - For ad hoc VR simulation around other commitments
  - Super users

Testimonials

- "Embedding OMS VR sim has enabled us to give a far greater number of learners access to simulation in a shorter space of time. It's encouraging to see how quickly our students have adopted the technology. I'm excited to see how they progress clinically as they use it more and more."

- "Simulation is a vital part of medical education and students just don't get to do it enough. The OMS virtual reality platform allows learners to enter simulation as often as they like to transfer their knowledge to practice."

Rosemary Warren, Center Manager

University of Northampton

Integration

- 1. Structured group teaching sessions
  - Four sets of hardware projected on screen, students in small groups with peer learning, debrief as a cohort
- 2. Distance learning

Testimonials

- "Nursing encompasses a range of competencies including people skills, soft skills and clinical skills - we needed to be able to train future nurses in a balanced way that caters to each of these skill sets. OMS is allowing us to do this in a safe and supportive learning environment, focusing on immediate feedback and the opportunity to repeat the scenarios and improve over time."

- "The OMS system allows us to integrate theory into practice in a really meaningful manner, allowing progression throughout their academic career."

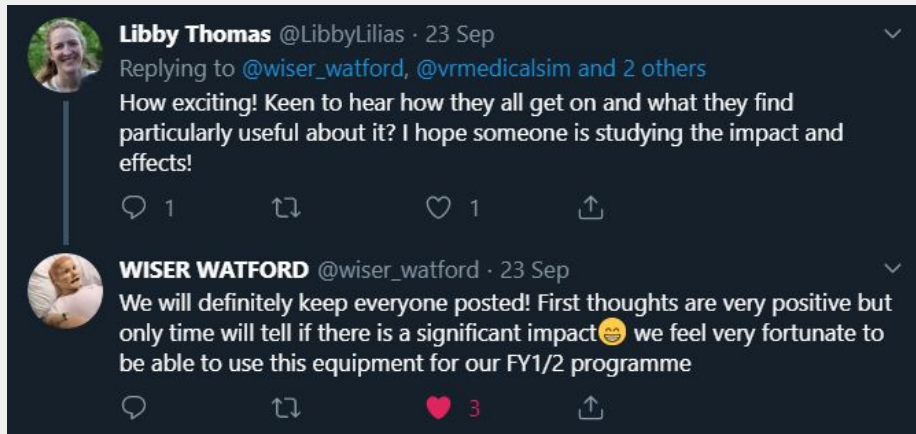 **Simulation Lead, University of Northampton Nursing School**

HEE East of England

Aims

- Scale sim delivery at reduced cost, ensure competence, standardize delivery, prove ROI, improve satisfaction

Integration

- Purchased across 18 trusts for foundations years from Aug
- Embedded next to physical simulation; mandated in part for foundation; open access in some trusts

Libby Thomas @LibbyLilias · 23 Sep
Replying to @wiser_watford, @vrmedicalsim and 2 others
How exciting! Keen to hear how they all get on and what they find particularly useful about it? I hope someone is studying the impact and effects!

💬 1   🔁   ♡ 1   ⬆️

WISER WATFORD @wiser_watford · 23 Sep
We will definitely keep everyone posted! First thoughts are very positive but only time will tell if there is a significant impact😄 we feel very fortunate to be able to use this equipment for our FY1/2 programme
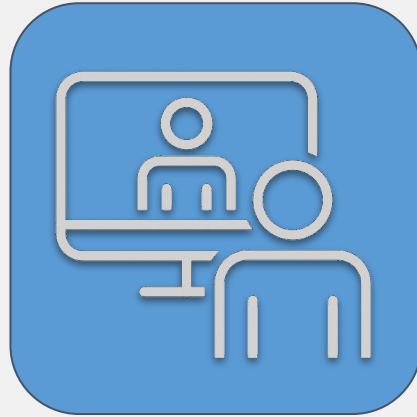
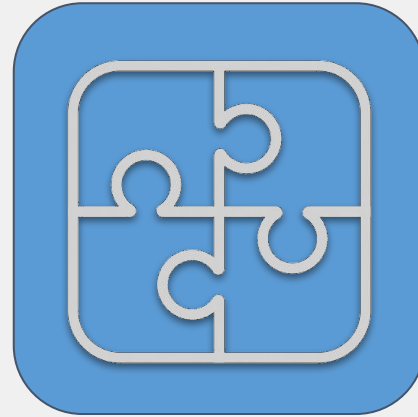💬   🔁   ❤️ 3   ⬆️

SUCCESS TIPS

Champion

Take OMS forward with an identified champion(s).

OMS Training

Support sessions provided to admins, faculty and learners. Faculty first approach provides the opportunity to familiarise platform use before including learners.

Solidify Integration

Embed OMS resources in internal platforms. Leverage OMS tools designed to familiarise faculty and learners with their new environment, ensuring successful integration.

Start Smart, Start Small

Implement in one module and ongoing evaluation. Build on the initial success for complete integration.

Assessments

Use for either formative or summative assessments. Drip feed scenarios or reserve specific scenarios for assessment purposes.

Multi Use Scenarios

Use the same scenario to achieve different learning outcomes. Focus on non-technical skills one week and clinical reasoning the next, all in the same scenario.

Increase Opportunities

Link to existing simulation sessions. Host simulations with manikin week one and revisit the same patient, with worsening symptoms in OMS the following week.

HARDWARE

Hardware Specifications

OMS software runs both in virtual reality and on flat screen

Virtual Reality Requirements

VR Headsets
- Oculus Rift S (Touch Controllers included as standard)
- Oculus Rift (Touch Controllers included as standard)
- Oculus Quest + Oculus Link
- Oculus Quest 2 + Oculus Link

Computers and Operating Systems
- Gaming/VR-ready desktop or laptop PC*
- Operating system
    - Windows 10
    - (Mac does not currently support VR capability)
- Minimum Specifications:
    - Graphics Card - NVIDIA GTX1080 or RTX2070 (RTX2080 recommended)
    - CPU - Intel i7 required (i9 recommended)
    - Memory - 16GB+ RAM required
    - Video Output for Rift S: Compatible miniDisplay Port
    - USB Ports for Rift S: 2 x USB 3.0 ports

*Most laptops or desktop computers meeting the Oculus requirements will be suitable - see https://www.oculus.com/rift-s/ for details.

Hardware Specifications

Without any VR equipment, OMS also runs on a regular computer screen (flat screen)

Flat Screen Requirements

General
- Desktop or laptop computers*
- PC and Mac compatible
- Web App access through latest versions of Chrome, Edge & Firefox

Computers and Operating Systems

- **PC**
  - Windows 10 OS
  - Intel i5 or above
  - 8GB RAM
  - Integrated graphics card
  - Storage: minimum 15 GB free space for installation and running

- **Mac**
  - Sierra OS and above
  - Intel i5 or above
  - 8GB RAM
  - Integrated graphics card
  - Storage: minimum 15 GB free space for installation and running

In practice this means OMS runs on essentially any desktop or laptop under 5 years old

*Mobile devices (i.e. tablets, phones) and Chromebooks are not supported

VR vs Screen
References

1. Krokos, E., Plaisant, C., & Varshney, A. (2019). **Virtual memory palaces: Immersion aids recall.** Virtual Reality, 23(1), 1-15.

2. Kyaw, B.M., Saxena, N., Posadzki, P., Vseteckova, J., Nikolaou, C.K., George, P.P., Divakar, U. ,Masiello, I., Kononowicz, A.A., Zary, N., & Car, L.T. (2019). **Virtual Reality for Health Professions Education: Systematic Review and Meta-Analysis by the Digital Health Education Collaboration.** Journal of Medical Internet Research, 21(1), 1-13

3. Repetto, C., Serino, S., Macedonia, M., & Riva, G. (2016). **Virtual Reality as an Embodied Tool to Enhance Episodic Memory in Elderly.** Frontiers in Psychology, (7)1839,1-4

4. Ragan, E.D., Sowndararajan, A., Kopper, R., & Bowman, D.A. (2009). **The Effects of Higher Levels of Immersion on Procedure Memorization Performance and Implications for Educational Virtual Environments.** Presence, (19)6, 527-543

5. Gutiérrez, F., Pierce, J., Vergara, V.M., Coulter, R., Saland, L., Caudell, T.P., Goldsmith, T.E., & Alverson, D.C. (2007). **The Effect of Degree of Immersion Upon Learning Performance in Virtual Reality Simulations for Medical Education. In Medicine Meets Virtual Reality**, J.D. Westwood et al. (Eds.)
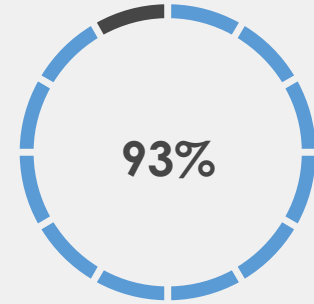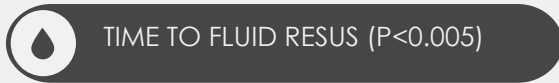
RESEARCH

TRIALS

96%
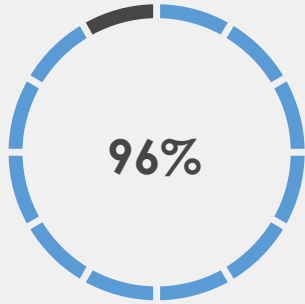
"This VR simulation is a **valuable** training resource"

97%
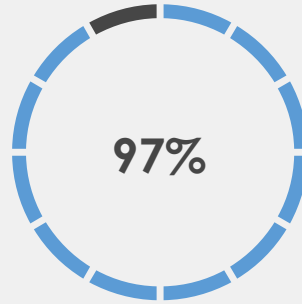
"I would **choose** this VR simulation as a method of learning in future"

93%

"This simulation is likely to **impact** on my clinical practice to the benefit of patient **care**"

⬤ TIME TO FLUID RESUS (P<0.005)

⬤ TIME TO ANTIBIOTICS (P=0.014)

⬤ OVERALL SCORE (P<0.005)

Selected Simulation References

Physical simulation overview

- Aggarwal et al (2010) Training and simulation for patient safety
- Zendejas et al (2013) Patient outcomes in simulation-based medical education: a systematic review

Physical simulation costs

- Abdulmohsen (2010) Simulation based teaching and learning
- Vazquez et al (2007) Cost-efficiency assessment of ALS courses
- McIntosh et al (2006) Simulation: what does it really cost?

VR simulation overview

- Kleinert (2015) 3D Immersive patient simulators and their impact on learning success: a thematic review
- Graafland et al (2013) Systematic review of serious games for medical education and surgical skills training

VR simulation efficacy

- Harrington et al (2017) VR in trauma decision-making
- Bric et al (2016) VR in robotic surgery training
- Maytin et al (2015) VR for physician removal of cardiac leads
- Karakus et al (2014) VR in emergency department and malpractice
- Creutzfeldt et al (2016) VR in resuscitation training

TESTIMONIALS

"It's **a brilliant simulation** for practicing how to interact with patients."

"Honestly, this is **the single most useful experience I've had so far in my medical training**."

"It's something I'd be happy to **spend some time on doing a session each day**."

"It felt really life-like. **Like it felt really, really real!**"

"I genuinely think if we used this it would **allow us to make better decisions in real life**."

OMS

OXFORD MEDICAL SIMULATION

For further information contact
info@oxfordmedicalsimulation.com