

# Using Fully Immersive 'In Situ' Simulation to Prepare New Foundation Doctors to Work in an Acute Setting

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## ABSTRACT

**Introduction:** Patient safety around the time of medical changeover day is of interest worldwide. Negative perceptions have now been supported by evidence that patients who are admitted on the first Wednesday in August in England with a medical primary diagnosis have a higher early death rate. Junior doctors are often the first to assess deteriorating patients. Delay in admission to intensive care due to suboptimal recognition and resuscitation of the acutely unwell patient increases morbidity and mortality.

**Methods:** Foundation Year One Doctors (FY1) at our institution were invited to participate during the start of their induction period. There were 34 participants in August 2014 and 27 in November 2014. The study was divided into 3 phases; (1) a fully immersive in-situ simulated scenario in an actual clinical area followed by an immediate video assisted debrief focusing on severe sepsis, acute kidney injury and non-technical skills, (2) a lecture outlining any latent errors discovered and also recapping the treatment of pneumonia, sepsis and acute kidney injury and then (3) a further simulation 3 months after starting their post. Post scenario questionnaires collected demographic data and information on confidence and views on simulation as an educational modality on a Likert scale.

**Results:** Data was collected around the management of the 'sepsis six' (oxygen therapy, fluid administration, blood cultures, antibiotics and lactate). Confidence in dealing with sepsis in August was rated as 3.41 and in November as 4.15. Key themes around environment, communication and technical skills were identified in the post scenario debrief.

**Discussion:** This study showed that many of Foundation Year One Doctors were unable to implement the Sepsis bundle, prescribe the correct antibiotic treatment or summon the Medical Emergency Team for a patient with severe sepsis during a fully immersive in-situ simulation at the start of their medical careers. This pilot study identified key deficits in knowledge and familiarity of the new working environment that impacted on best treatment for the patient in the scenario. Further research is required to aid provision of a tailored programme to enable new medical graduates to provide safe and timely treatment to patients in an environment they feel confident to work within.

## INTRODUCTION

Patient safety around the time of medical changeover day is of interest in both the United Kingdom [1,2] and also worldwide [3,4]. Negative perceptions have now been supported by evidence that patients who are admitted on the first Wednesday in August in England with a medical primary diagnosis have a higher early death rate [2]. These concerns are held by doctors [5] and increasingly the public alike since media headlines warn of a 'killing season' and 'Black Wednesday' [6]. The reasons for these findings require further investigation [6,7]. Despite substantive evidence, junior doctors appear to be the focus of such concern at this time. The lack of perceived preparedness by final year medical students about to embark on foundation training compounds the concerns which exist at changeover time [8]. Junior doctors are often the first to assess deteriorating patients. Delay in admission to intensive care due to suboptimal recognition and resuscitation of the acutely unwell patient increases morbidity and mortality [9]. Medical graduates feel particularly unprepared to deal with emergencies [10]. The General Medical Council [11] stipulate that final year medical students must undertake a period of shadowing which may play a positive role in improving perceived preparedness [5,8-12]. However, this does not always occur in the hospital in which they are due to work [13]. Even when given the opportunity to shadow during the induction process acute situations may not present themselves and the time available is limited. This means new doctors will invariably lack practical experience in dealing with unwell patients within their new work setting.

In-situ simulation is that occurs in the actual clinical environment providing the opportunity to acquire experience in that environment, the opportunity to rehearse using new equipment or to deliver a new treatment [14]. It can be utilised to identify latent errors and also learning needs which may impact on best treatment and subsequently patient safety [15]. Following local success with this educational modality [16] we provided new Foundation Year One doctors in our institution the opportunity to undertake a fully immersive in-situ simulation scenario. The aim of exercise was to improve confidence in dealing with patients with severe sepsis and ensure familiarity with our hospital standard operating procedures.

## METHODS

Aintree University Hospital is a large, complex organisation providing acute health care to a population of 330,000 in North Merseyside and surrounding areas and provides some specialist services to a wider population of around 1.5 million in Merseyside, Cheshire, South Lancashire and North Wales. The Trust handles over 76,500 episodes of inpatient and day case care per annum and more than 85,000 patients attend the Accident & Emergency Department. Typically, 50 new Foundation Year One Doctors are appointed each year with around half not having worked in the region previously. All receive a comprehensive induction process consisting of 3 days divided between lectures and workshops and 2 days of shadowing on their future ward. We invited all Foundation Year One Doctors to participate in this educational opportunity during the first two days of commencing their post. NHS Permission to conduct this study was granted by Aintree University Hospital Research and Development Department (R&D Ref 745/14). The project was explained to candidates during the start of their induction period and they were asked to sign a consent form. The inclusion criteria was all Foundation Year 1 Doctors (FY1) starting work in August 2014 at Aintree University Hospital.

The study was divided into 3 phases

- Phase 1 – 7-8th August 2014 each FY1 Doctor to undertake a fully immersive in-situ simulated scenario in an actual clinical area followed by an immediate video assisted debrief focusing on the clinical aspects of dealing with severe sepsis, acute kidney injury and non-technical skills.
- Phase 2 – Lecture on 13th August 2014 outlining any latent errors discovered and also recapping the treatment of pneumonia, sepsis and acute kidney injury.
- Phase 3 – 6-7th November 2014 each FY1 Doctor to undertake the same simulated scenario with the same parameters.

All scenarios took place on a non-acute ward in a side room in the hospital to reduce disruption and preserve the privacy of patients. A fully immersive in-situ simulation scenario was designed, concentrating on severe sepsis and acute kidney injury in a patient with a community acquired pneumonia. Key tasks were recorded, focusing on the recognition of an acutely

unwell patient who required prompt intervention and initial treatment implementation. This particularly related to the sepsis six bundle [17] and an acute kidney injury and appropriate involvement of the wider health care team. During the 10-minute scenario, the participants were able to access systems and support that they would have available normally and a nurse facilitator provided assistance. Physiological observations were predetermined and consistent for all scenarios.

Post scenario questionnaires collected demographic data and information on confidence and views on simulation as an educational modality on a Likert scale [18,19]. Each participant underwent a structured facilitated video assisted debrief allowing key issues and learning needs to be identified and subsequently analysed thematically. The videos for each scenario were reviewed with the occurrence and timings of key technical and non-technical tasks recorded.

**RESULTS**

Due to on call commitments and placement in other hospitals a proportion of FY1 doctors were unable to attend. A total of 34 of 50 FY1 doctors attended in August and 27 in November and their details are shown in (Table 1). The 3 participants in November who did not take part in the initial scenario in August were omitted from data analysis. Numbers were not significant to sub analyse this cohort. The clinical data collected in the scenario are shown in (Table 2) and additional data in (Table 3).

Table 1: Candidate details.		
	August	November
Number of participants	34/50	27/50
Previous simulation exposure (fidelity not specified)	22 (44%)	26 (96.3%)
Local medical school (University of Liverpool)	15 (44.1 %)	12 (44.4%)
Out of region medical school	19 (55.9%)	15 (55.6%)

Following the initial post scenario debrief the key themes were identified

- Environmental
- Communications skills
- Technical skills

**Environmental**

The hospital provides a multidisciplinary Medical Emergency Team (MET), which will respond when called to acutely unwell patient at any time. Participants were less likely to activate this team (deemed locally as the most appropriate source of help) in August when compared to November. They reported lack of knowledge about the team and uncertainty about the correct course of action as barriers in August. Knowledge of the practicalities and logistics of treating patients such as ordering a lactate which must be specifically asked for, utilising the antibiotic and acute kidney injury policies were reported as a difficulty by participants.

	August	November
Confidence in dealing with sepsis at Aintree University Hospital.	3.41	4.15
Benefit of August simulation		4.3
Usefulness of simulation to role		4.81

**Communication skills**

Difficulties were identified with aspects of communication between the FY1 doctor and both the patient and wider health team. There was a lack of appreciation for the importance of these skills and uncertainty about how to implement a structured handover particularly in August, as had been highlighted in their induction process but not their undergraduate training. The Trust recommends the use of the SBAR (Situation, Background, Assessment and Recommendations) handover technique [20] of which use improved in the November scenarios.

The acknowledgement of a ‘bleep’ was also noted to be a difficulty, inability to use the system, how to answer a call and when to do this. Participants reported having never used the system before commencing work and had not had this explained or appreciated the need to learn this.

**Technical skills**

Completion of the sepsis six bundle improved as did all components individually with the exception of fluid administration. Difficulty in recalling all components, the practicalities and incomplete knowledge of local guidelines caused problems. Ability to recognize that rapid administration

of the correct antibiotic according to local policy was implement local antibiotic policy was initially cited as the case. recognized as problematic. Lack of knowledge and how to The correct administration rate did not improve substantially in November. Here FY1 doctors reported seeing deviation from local policy in clinical practice and subsequently had not had use of this policy routinely reinforced in practice.

Table 2: Scenario data (MET: Medical Emergency Team, see text for details).		
	August	November
<b>Calling for help</b>		
A call for help was made by Foundation Year 1 Doctor	32/34 (94.12%)	23/24 (95.83%)
The average time to call for help (when call made) (seconds)	218.94	81.78
Who was called for help?		
Medical Emergency Team	17/32 (53.13%)	22/23 (95.65%)
Senior Doctor	14/32 (43.75%)	1/23 (4.35%)
Critical Care Doctor	1/32 (3.13%)	0
<b>Reason for calling for help?</b>		
Medical Emergency Warning Score (MEWS) triggered call	9/32 (28.13%)	15/24 (65.22%)
To assist with diagnosis	3/32 (9.38%)	2/24 (8.70%)
Not specified	17/32 (53.13%)	6/24 (26.09%)
To help manage patient	3/32 (9.38%)	0
<b>Oxygen Therapy</b>		
Oxygen was administered by Foundation Year 1 Doctor	33/34 (97.06%)	24/24 (100.00%)
Average time to apply oxygen (seconds)	45.75	45.33
<b>Fluid</b>		
Fluid challenge administered?	34/34 (100.00%)	24/24 (100.00%)
Volume of fluid specified?	26/34 (76.47%)	21/24
Type of fluid specified?	31/34 (91.18%)	24/24 (100.00%)
Average time to administer a fluid challenge (seconds)	156.38	109
<b>Blood Cultures</b>		
Blood cultures were requested?	26/34 (76.47%)	22/24 (91.67%)
Blood cultures taken before antibiotics?	22/26 (84.62%)	21/22 (95.45%)
<b>Antibiotics</b>		
Antibiotics requested?	30/34 (88.24%)	22/24 (91.67%)
Average time to request antibiotics (seconds)	271.7	221.68
Trust Pharmacy Card used?	26/30 (86.67%)	13/22 (54.17%)
Correct choice of antibiotics made? (Benzylpenicillin & Clarythromycin)	20/30 (66.67%)	15/22 (62.50%)
Dose specified?	11/30 (36.67%)	13/22 (54.17%)
Allergy checked?	14/30 (46.67%)	12/22 (50.00%)
<b>Arterial Blood Gas (ABG)/Lactate</b>		
ABG requested?	26/34 (76.47%)	21/24 (87.50%)
Lactate requested?	10/34 (29.41%)	14/24 (58.33%)
<b>Urine Output</b>		
Urine output monitoring requested?	19/34 (55.88%)	18/24 (75.00%)

Acute Kidney Injury acknowledged once blood results were given	14/34 (41.18%)	17/24 (70.83%)
<b>Communication</b>		
SBAR <sup>†</sup> handover tool used to communicate with senior doctor.	10/34 (29.41%)	14/24 (58.33%)
Declaration to nurse of diagnosis	22/34 (64.71%)	13/24 (54.17%)
Declared to patient of diagnosis	21/34 (61.76%)	11/24 (45.83%)
Diagnosis not discussed with either patient or nurse	7/34 (20.59%)	8/24 (33.33%)
Sepsis bundle mentioned during scenario?	13/34 (38.24%)	11/24 (45.83%)
<b>Sepsis Six</b>		
ABCDE <sup>#</sup> approach obvious during assessment	31/34 (91.18%)	23/24 (95.83%)
<b>Sepsis Six</b>		
No of Foundation Year 1 Doctors who completed all of Sepsis 6 bundle	6/34 (17.65%)	11/24 (45.83%)

\*SBAR = Situation, Background, Assessment and Recommendation.

#ABCDE = Airway, Breathing, Circulation, Disability and Exposure.

## DISCUSSION

This study showed that many of Foundation Year One Doctors were unable to implement the Sepsis bundle [17], prescribe the correct antibiotic treatment or summon the Medical Emergency Team for a patient with severe sepsis during a fully immersive in-situ simulation at the start of their medical careers. It was encouraging that there was an improvement particularly in the clinical aspects following a re-testing after 3 months. The reasons for this improvement cannot be defined in the context of this pilot study however participants may have recalled the original exercise, subsequent debriefing and teaching session, although their experiences following three months of clinical work as foundation doctors are highly likely to have contributed to this. Difficulties identified in this study in implementing best treatment were broadly identified into two categories: knowledge deficits in both a clinical and non-technical capacity and environmental difficulties. These included a lack of understanding of the help available and all aspects of the sepsis six bundle of care [17]. This correlates with previous findings [20,21]. Involvement in this study provided an opportunity to implement interventions on both accounts with structured, video assisted debriefing allowing reflection and highlighting learning needs. Knowledge deficits may be inevitable to some extent, yet it may demonstrate limited experience and focus at an undergraduate level. If graduates are expected to perform in line with several outcomes of Tomorrows Doctors [13] then exposure and intervention should be maximized and occur earlier with the necessary support given. With three months of experience and

a specific intervention, management was still evidently deficient in areas, particularly in the implementation of the full sepsis six

bundle [17]. As previously reported graduates perceived lack of preparedness to enter in foundation training appears to have correlated with the difficulties identified within this study [8,10,20]. Major differences exist in clinical, technological and administrative process between hospitals and regions. Even with a firm knowledge around a clinical diagnosis, any health professionals' capability to manage this may be impeded by a lack of experience around or inability to operate these systems. The induction and shadowing periods aim to facilitate this. Familiarity with the specific clinical environment and policies within the Trust impacted on the ability to manage this acutely unwell patient effectively and efficiently during a fully immersive in-situ simulation scenario. A three-day induction process followed by two days of shadowing did not appear to fully furnish participants with the ability to fully manage the patient during the scenario in line with Tomorrows Doctors [11] and Trust level expectations. Explicit knowledge around the medical emergency team, specifically requesting a lactate, antibiotic policy and basic trust protocol for managing an acute kidney injury were particular issues. Shadowing periods especially when short, may not elicit all necessary experiences, particularly emergency situations. The majority of participants in both the first and second exercises had not trained within the region and therefore had no opportunity to work within the trust during their medical school training. The chance of a medical student undertaking a placement within their future

place of work is also not guaranteed for logistical reasons and the timing of job offers. Our data suggests that there needs to be more access for undergraduates to experience emergencies within their actual future place of work prior to the August changeover period, when they begin independent and autonomous practice. A high frequency approach utilising in-situ simulation may also provide the opportunity to regularly assess learning needs for these doctors.

### LIMITATIONS

Due to the study design we were required to keep all pre and post exercise data anonymous so extrapolation of data to look at individual differences in undergraduate education, previous simulation experience and perceived confidence versus performance was not possible. Whilst confidence does not confer competence any major deviances were addressed in part during the video assisted debrief prior to the post exercise questionnaire. This study also focused on one intake of foundation doctors in one trust so further larger studies would be needed to assess the full impact of such an intervention. The 'simulation experience' and the perceived 'assessment' despite a pre-brief on the objectives of this study may have had a minimal impact. It was not possible to translate any intervention directly to patient outcome within the Trust.

### CONCLUSION

Foundation doctors are likely to come in to contact with and be expected to initially manage acutely unwell patients during the first few days of their medical careers. Severe sepsis is a common and important clinical presentation with morbidity and mortality rates increasing rapidly if effective treatment is delayed [17]. This pilot study identified key deficits in knowledge and familiarity of the new working environment that impacted on best treatment for the patient in the scenario. In-situ simulation provides a safe, reflective setting in which to acquire this experience and knowledge to improve preparation for work without potential harm to patients. Further research is required to aid provision of a tailored programme to enable new medical graduates to provide safe and timely treatment to patients in an environment they feel confident to work within. The performance in non-technical skills also suggests that there is room for further integration of human factors education into the undergraduate curriculum.

### REFERENCES

1. Aylin P, Majeed FA. (1994). The killing season—fact or fiction? *BMJ*.309: 1690.
2. Jen MH, Bottle A, Majeed A, Bell D, Aylin P. (2009). Early In-Hospital Mortality following Trainee Doctors' First Day at Work. *PLoS ONE*. 4: e7103.
3. Haller G, Myles PS, Taffe P, Perneger TV, Wu CL. (2009). Rate of undesirable events at beginning of academic year: retrospective cohort study *BMJ*. 339: b3974.
4. Young JQ, Ranji SR, Wachter RM, Lee CM, Niehaus B, et al. (2011). 'July effect': impact of the academic year-end changeover on patient outcomes: a systematic review. *Ann Intern Med*. 155: 309-315.
5. Vaughan L, McAlister G, Bell D. (2011). 'August is always a nightmare': results of the Royal College of Physicians of Edinburgh and Society of Acute Medicine August Transition Survey. *Clin Med*. 11: 322–326.
6. Sharma V, Proctor I, Winstanley A. (2013). Mortality in a teaching hospital during junior doctor changeover: a regional and national comparison. *Br J Hosp Med*. 74: 167-169.
7. Blakey JD, Fearn A, Shaw DE. (2013). What drives the 'August effect'? A observational study of the effect of junior doctor changeover on out of hours work. *J R Soc Med Sh Rep*. 4: 1-7.
8. Monrouxe L, Bullock A, Cole J, Lisa G, Mala M, et al. (2014). How Prepared are UK Medical Graduates for Practice? Final report from a programme of research commissioned by the General Medical Council. 7: e013656 .
9. McQuillan P, Pilkington S, Allan A, Bruce T, Giles M, et al. (1998). Confidential inquiry into quality of care before admission to intensive care. *BMJ*. 316: 1853.-1858.
10. Tallentire VR, Smith SE, Skinner J, Cameron HS. (2012). The preparedness of UK graduates in acute care: a systematic literature review. *Postgrad Med J*. 88: 365-371.
11. Tomorrow's Doctors. London. (2009). General Medical Council.
12. Maisonneuve JJ, Lambert TW, Goldacre MJ. (2010). Doctors' views about training and future careers expressed one year after graduation by UK-trained doctors:

- questionnaire surveys undertaken in 2009 and 2010. *BMC Med Ed.* 14: 270.
13. Cave J, Woolf K, Jones A, Dacre J. (2009). Easing the transition from student to doctor: how medical can schools help prepare their graduates for starting work? *Med Teach.* 31: 403–408.
  14. Bisschops MM, Holleman C, Huitink JM. (2010). Can sugammadex save a patient in a simulated 'cannot intubate, cannot ventilate' situation? *Anaesth.* 65: 936–941.
  15. Wheeler DS, Geis G, Mack EH, LeMaster T, Patterson MD. (2013). High-reliability emergency response teams in the hospital: improving quality and safety using in situ simulation training. *BMJ Quality & Safety.* 22: 507-514.
  16. Schofield L, Murphy M, Taylor-Jones V, Parr T, Goulding J. (2014). A Week of Errors: a 5 Day Multi-Disciplinary Ward Simulation Exercise. SEASAM Conference.
  17. Daniels R, Nutbeam T, McNamara G, Galvin C. (2011). The sepsis six and the severe sepsis resuscitation bundle: a prospective observational cohort study. *Emerg Med J.* 28: 507-512. 18. Likert R. (1932). "A technique for the measurement of attitudes." *Archives of psychology.*
  19. Leonard M, Graham S, Bonacum D. (2004). "The Human Factor: The Critical Importance of Effective Teamwork and Communication in Providing Safe Care." *QualSaf Health Care.* 13: 85-90.
  20. Tallentire VR, Smith SE, Wylde K, Cameron HS. (2011). Are medical graduates ready to face the challenges Foundation training? *Postgrad Med J.* 87: 590-595.
  21. Tallentire VR, Smith SE, Skinner J, Cameron HS. (2011). Understanding the behaviour of newly qualified doctors in acute care contexts. *Med Ed.* 45: 995-1005.