Abstract

Medical simulation has historically been studied in terms of the delivery of learning outcomes, or the social construction of knowledge. Consequently, simulation-based medical education has been researched primarily in terms of the transfer of skills, or the reproduction of professional communities of practice. We make a case for studying simulation-based medical education as a cultural practice, situating it within a history of gaming and simulation, and which, by virtue of distinctive aesthetics, does not simply teach skills or reproduce professional practices but rather transforms how medicine can be made sense of. Three concepts from the field of game studies – play, narrative and simulation – are deployed to interpret an ethnographic study of hospital-based simulation centres and describe under-reported phenomena, including the cooperative work involved in maintaining a fictional world, the narrative conventions by which medical intervention are portrayed, and the political consequences of simulating the division of labour.

Keywords: play, narrative, simulation, aesthetics, education, serious games

Games and simulations are widely used in healthcare education. In teaching hospitals, trainees are commonly involved in role-play to rehearse conversations with patients and colleagues, and in simulations to practise clinical skills, such as laparoscopy (Bradley, 2006). In healthcare provision, patients are provided with 'games for health', 'exergames' and instances of 'gamification' to manage medical conditions, from obesity to diabetes. The study of these practices has treated games and simulations instrumentally, as means to ends – as in the phrase 'games *for* health' (Ferrara, 2013; Bogost, 2007). This has led to a methodological concern with measuring outcomes, such as changes in skill levels or attitudes (Dieckmann et al, 2009). It has also lead to treating games and simulations as transparent interfaces what provide access to content and cognition (Pelletier, 2006). This methodological stance neglects the significance of games and simulations as forms of expression that shape *what* is learned by virtue of *how* it is learned (Bligh & Bleakley, 2006). For example, measuring changes in performance before and after usage of a laparoscopic simulator reveals something about how the simulator could be used to develop surgical skills (Larsen et al, 2009), but it doesn't identify the conditions under which the body is perceptible as 'simulatable', how representational conventions and programming capacity in 3D animation determine what surgery is shown to consist of, or whose version of reality is invoked (and whose is marginalised) when the simulator is called 'high-fidelity' (Johnson, 2008; Prentice, 2005; Waldby, 1997).

These aesthetic and ethical considerations characterise the study of games and simulations as cultural practices. Broadly speaking, one might identify research that examines games and simulations as cultural practices in terms of its concern with representational conventions and semiotic operations, game players/users' actions and interactions, and design/production as

socio-economic activities (we draw here on the distinction, in media studies, between the study of texts, audiences or institutions – Tudor, 1999). This varied body of research, which focuses on the significance of games and simulations as expressive forms, has had relatively little impact in healthcare, as demonstrated by journals such as *Simulation in Healthcare*, *Games for Health Journal*, and *Simulation and Gaming,* in which articles reference publications primarily in the related professional domain rather than in that of game, play or cultural studies. Our aim in this article is to demonstrate the benefit for the study and practice of medical simulation of paying greater attention to the medium, and not only the message: in other words, we aim to show what can be seen and done with medical simulation when it is treated as a cultural practice, and not simply a means of content or skill delivery.

This work treads close to an area of work referred to as 'serious games'. As Charsky (2010) and Ferrara (2013) define them in this journal, 'serious games' solve the pedagogic problems caused by simply disguising unappetising educational content in the sweet wrapping of simulation technologies by focusing on the experience of the player/user and the quality of the design; an approach which builds on, rather than neglects, an analysis of games and simulations as aesthetic experiences. Whilst highlighting the significance of the medium, 'serious games' research has concerned itself primarily with identifying good design principles, notably by developing and testing prototypes. One implication is that a 'serious game' is identified in terms of its intended outcomes, with seriousness then referring to what designers want to achieve. Medical simulation can, in this light, be categorized as a serious game: its intention is to train, according to a pedagogic model imported from aviation (CMO, 2008; Gaba, 2004). Issenberg et al (2005, p.23), for example, conclude their systematic review of medical simulation by defining it as an

"opportunity for learners to engage in focused, repetitive practice where the intent is skill improvement, *not idle play*" [our italics].

A problem with focusing on intents and their realization is that the unintended is overlooked as insignificant. So, although the serious games movement pays attention to the medium, it identifies this in terms of the manifestation of intentions, a move that neglects examining how a game is signified in context, in relation to the activities and practices of which it is a part. The methodological point here is that a concern with intentions and their measurement obscures perception of the ways in which a simulation assumes its form within an 'assemblage' of historical and cultural practices constitutive of the setting in which it is played or used, and within which it assumes meaning, 'serious' or not (Taylor, 2009). This is one way of understanding why the serious games literature has focused so much on outcomes measures, and so little on textual analysis, ethnographies, or non-controlled/experimental settings, which might undo the specificity of its object of study. The related pedagogical point is that the identifier 'serious', and the distinction between it and other forms of gaming/simulation, hides how a simulation *is* played, idly or not: for example, the way simulation-based education requires the participative establishment of a fictional reality. Acknowledging this, rather than rendering it invisible, opens up scope to explore how fictionalization and other play-related activities make educational practices possible, and, significantly, how they determine *what* is learned.

For example, in the cultural study of medicine and medical technology, a body of literature has examined 'serious games' and simulations as reifications of practices for acting on the body (e.g. McNaughton, 2012; Taylor, 2011; Lizama, 2009; Johnson 2008; Prentice, 2005; Thacker, 2001; Hayles, 1999; Waldby 1997). These studies identify the conventions according to which 'the

body' or 'the patient' is established, maintained and de-stabilised as a realistic entity, in software or in face-to-face role play. Teaching and learning with simulations appear, in this literature, to involve more than the realization of intended learning outcomes. McNaughton (2012, p246) highlights the loss of control over the delivery of formalized professional competences in medical simulation, with the simulation of patients suffering from mental disorders leading to what she describes as "learning envisioned as a process of becoming […], a liminal experience that involves mourning the loss of certainty and […] an affective and emotional undertaking". Lizama (2009, p134-135) also notes the tropes of horror and nostalgia that haunt anatomical simulations, including "the affect elicited by the complete decimation of the body's organic form and the re-ordering of its physicality in terms of geometric rather than organic principles", a form of visualization which removes the body's excessive, visceral fluidity. Lizama suggests that such simulations make the body knowable as information, rather than substance, a move which reiterates the desire to control bodily aberrance and disintegration.

Although cultural studies of medical technologies analyse simulations in terms of textual practices, approaches that escape attribution to any author's intentions, such research pays limited attention to gaming and simulation *per se*, as genres of activity. The relevant field within which simulation is seen to emerge is identified in terms of medical technologies and medical knowledge; limited attempt is made to contextualise medical simulation within a history of gaming and simulation, for example, by discussing it in terms of an aesthetics of simulation, histories of play-acting, fictional forms, or participative dramatisation, or indeed debates about serious games. This has several implications. Treating simulation-based medical education as a cultural practice within medicine, rather than within gaming and simulation, leads

methodologically to a concern with the social construction of reality, at the expense of seeing it as a practice of play-acting, pretending, and story-telling. It leads also to an interest in how novices participate in communities of experts, rather than in communities of players, modellers, and actors. Such perspectives determine how medical simulation is judged. For instance, in some of the studies cited above (e.g. Waldby, 1997; Thacker, 2001; Hayles, 1999), there is a tendency to treat medical simulation as an inherently impoverished version of authentic practice (Grace, 2003).

Maintaining a dichotomy between the real/the embodied and the virtual/the disembodied, overlooks simulation's productivity: the way in which it brings new realities into being. This is a primary concern, we would argue, in cultural studies of games and play, which focus on them as genres in their own right, rather than in relation to a presumed authenticity (Dormans, 2008; Bogost 2007). For this reason, games and play studies can make a valuable contribution to simulation-based medical education.

We endeavor to demonstrate this in two ways. First, by presenting an account of simulation-based medical education organized around concepts developed in relation to games as cultural practices. And second, by highlighting the sensibilities made possible by such concepts in contrast to methodological perspectives tracing intentions and their realizations. In other words, we illustrate what can be seen about medical simulation when it is treated as a representational and dramatic practice, and how this differs from how simulation is normally perceived in the clinical and 'serious games' literature. In identifying the expressive possibilities of simulation,

we also show how it is implicated in making medicine meaningful, rather than leading inevitably to its impoverishment in relation to an authentic form.

The concepts have been chosen for their scope in describing simulation as a genre rather than a technology. They are: play, narrative, and simulation, as defined by Brian Sutton-Smith, Janet Murray and Gonzalo Frasca respectively, whose work is central to video game studies but whose analyses extend to other media; this is important for us, since the kind of simulation-based medical education we have researched is not primarily software-based. Before we move on to the analysis, we will briefly describe our study, including what we mean by 'high-fidelity' and 'immersive' simulation.

High-fidelity, immersive medical simulation

Although simulation has always featured in medical education to teach specific tasks – for example, chicken meat has long been used to simulate human flesh in teaching suturing – it has more recently been conceived as a way of addressing the limitations of work-based learning, including reduced working hours, shorter in-patient stays in hospitals, and increased fears about patient safety (DoH, 2010; Ziv et al, 2003). This concern has prompted efforts to simulate the complexity of the clinical setting, including its social and emotional dimensions, rather than isolated tasks or body parts (Curran, 2010; Kneebone, 2005). Simulation that renders the setting, rather than the task, is often referred to as 'high-fidelity' or 'immersive' (CMO, 2008; Issenberg et al, 2005). It is most commonly practised in dedicated simulation centres within hospitals, which are constituted by simulated wards and operating theatres, and manikins (see image 1).

[insert image 1: a simulated ward, with a one way mirror, behind which educators observe trainees and control the manikin's physiological outputs]

One of the authors of this paper, Roger Kneebone (2010), has challenged many assumptions underpinning immersive simulation, for instance by showing that realism is a function of a practitioner's concern, rather than the detailed reproduction of a setting. In 2012, he dedicated part of a research programme funded by the London Deanery[i] to exploring how immersive simulation is practised routinely, in London's teaching hospitals, including how realism is

achieved in everyday teaching practice. This is the work that Caroline Pelletier – the other author of this paper - undertook, by means of an observational study of four simulation centres in London (UK).

Over a 10-month period (Jan-Oct 2012), Caroline sat in on 30 half or whole day high-fidelity, immersive simulation courses. The clinicians doing such courses were trainee doctors (from Foundation to Registrar level[ii]), sometimes also with nurses and other health professionals. The courses were usually attended by 6-12 trainees, and taught by 4-6 educators, consisting of senior nurses and doctors. Observations focused on courses about human factors, since this is how the contribution of high-fidelity simulation was described by educators; it was also the topic of most courses taught in the centres. Ethical approval was provided by Imperial College, London.

Courses had three parts. First, lectures about a course's purpose. Second, a sequence of scenarios (between 2 and 6), lasting approximately 15 minutes, and in which 1-2 trainees acted out a situation. For example, a trainee might be told 'Mrs Smith has been brought into A&E by her sister. She is complaining of stomach pain, and you are the first doctor to examine her', and then sent into the simulation room to respond to the various prompts given by educators from the control room and by 'plants' playing the role of nurse, consultant or relative. Third, and following each scenario, a 'de-briefing', lasting between 20 and 45 minutes, and in which educators and all the trainees discussed the scenario. Scenarios were observed by trainees in the de-briefing room via an audio-visual feed consisting of multiple camera angles. Caroline was often given this feed and the analysis below is based on this, as well as field notes.

It was during field note coding that we considered the analytic benefits of organising a write-up of this study using concepts associated with the field of game studies, since they allowed us to account for under-reported phenomena in the clinical and sociological literature. These included the narrative conventions by which scenarios unfold, the emotions consequent upon dramatising clinical practice, and the cooperative work involved in maintaining a pretense - active and ideological work which goes far beyond the passive 'suspension of disbelief' called for in accounts of simulation-based teaching (e.g. Gaba et al, 2001). The game studies literature offers resources for studying these aspects. In this respect, treating medical simulation as a game does not mean equating it with mere idleness, but rather allows it to be framed as an activity implicated in symbolising the world and, consequently, in experimenting with how it can be made sense of.

Play – or the phantasmagoria of medical simulation

Sutton-Smith's (1997) review of the play literature starts from the argument that the word is used to describe a vast range of phenomena. He imposes order by describing seven rhetorics that sustain the identification of play. These rhetorics are "cultural 'ways of thought'" (p8), drawn upon by researchers "to persuade us in innumerable ways that their choice and their direction of research or study is sound"[iii] (p.8); they function therefore as "ideological values" (p.8), which sustain the claim to knowing the difference between play and its other. In education, the most prominent rhetoric, according to Sutton-Smith, is that of 'play as progress', in which play is understood in terms of moral, social and cognitive growth. Play is valued and studied to the

extent that it will eventually be not-play (Mandiberg, 2011): dolls become babies, practice fighting becomes real fighting, playmates become co-workers.

This rhetoric is recognizable in claims about the educational benefits of simulation (Pelletier, 2009), including medical simulation. For example, Alinier (2010, 2008) refers to the props (glasses, hearing aids, etc.) and costumes (torn trousers, patient gowns, etc.) involved in simulation-based medical education, accounting for these in terms of the realization of learning outcomes. Since these outcomes pertain to skills relevant to the workplace, such props are treated as resources for the establishment of realism.

The significance of this point, and the rhetoric within which it is embedded, emerges by contrasting it with other rhetorical alternatives described by Sutton-Smith, and which do not align easily with a narrative about skill development. We will focus here on Sutton-Smith's characterization of the rhetoric of the imaginary, drawn on to describe a range of practices relating to mythology, deconstruction, pretense and enjoyment. Sutton-Smith describes the main claim of this rhetoric as follows:

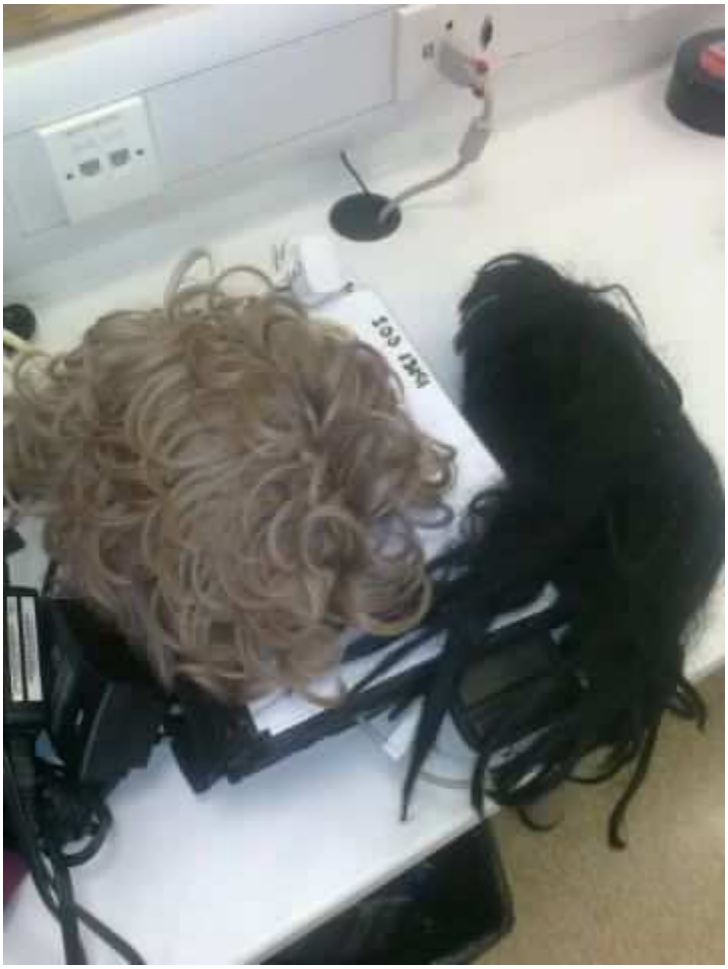
> We are eternally making over the world in our minds, and much of it is fantasy. The difference is that while children have toys, adults usually have images, words, music and daydreams, which perform the same function as toys. *Our fantasies are the microworlds of inner life that all of us manipulate in our own way to come to terms with feelings, conflicts, realities, and aspirations as they enter into our lives.* Children and adults may not really be so different in their

> use of fantasy play...*Play is not based primarily on a representation of everyday real events - as many prior investigators have supposed - so much as it is based on a fantasy of emotional events*. (p. 156 – our italics)

Within this rhetoric, play is understood to be motivated by feelings rather than images of reality. It appears as an emotionally vivid experience, which allows the limits imposed by normal or non-play reality to be transcended; mocked as much as mimicked. Rather than representing the world, play deconstructs it, taking it apart in order to suit players' emotional responses to events.

If we draw on this rhetoric to examine our field data, we see phenomena that are rarely commented upon in the literature on medical simulation. As Alinier notes, for instance, the representation of medical practice calls on educators to deploy wigs, make-up and costumes (see images 2, 3 and 4); but focusing on how this teaches skills by 'representing everyday real events' overlooks the function of this theatrical apparel in sustaining emotionally dramatic scenes. Educators did not simply 'represent' reality: they taught by pretending to be violent drunk patients, anxious and unreasoning relatives, and confused, demented old ladies. These parts were often played with relish: great pleasure appeared to be taken in acting outrageously at work, for instance, in a nurse's pretense of a drunk patient shouting expletives or a doctor's enactment of an irresponsibly dismissive attitude. Such enjoyment – absent from functional accounts of simulation-based medical education - might be understood as an instance of the carnivalesque (Bakhtin, 1984), in which the sobriety of normal life is overturned and social functions temporarily exchanged.

Acting was not restricted to simulating patients but also professions and grades, whose characteristic traits were exaggerated to signify the role symbolised: thus, consultants were played invariably as decisive and concise, and nurses, by contrast, as either friendly and approachable or stubbornly bureaucratic, attributes which arguably reflect feelings towards those professions rather than data on their 'real' behaviour.



[Insert image 2: wigs for use on the manikin

[Insert image 3: boxes of props and costumes]

[Insert image 4: manikin dressed up to be a woman. Bras and padding added to a manikin were, in all observed instances, large and plentiful, denoting the female form in a recognizably theatrical way]

This ‘emotionally vivid’ role playing – to use Sutton-Smith’s phrase - often provoked laughter in control rooms:

> In the control room, John answers the phone, playing the role of a consultant. In a strong Scottish accent he says: ‘Hamish McTaggart by name...’ The other educators in the control room laugh loudly. John then enters the simulation suite.

> Lindsey, the trainee, says to him ‘Hi John’. He responds in a heavy Australian accent: ‘I’m Shane’.
>
> [Field notes]

The parody of accents and professional traits was mirrored in the exaggeration of symptoms. Educators explained this in terms of the importance of teaching trainees how to manage clinical situations: it was imperative, then, that trainees recognize a situation as pertinent to clinical knowledge. A scenario was deemed a failure if a trainee did not identify the clinical condition, or if the scenario did not make it sufficiently visible. For example, the following field note was made during one scenario in which a trainee had failed to identify symptoms manifested by the manikin:

> John asks the technician to increase the settings on the manikin, so that the heart rate falls even more quickly. He then turns to me and says: “well, you have got to make it obvious what is going on, otherwise they just don't know”.
>
> [Field notes]

Symptoms and conditions therefore appeared heightened and exaggerated. This same phenomenon was evoked by trainees in terms of the speed with which time passed during a scenario, with patients apparently deteriorating much more quickly than in ‘real life’, making simulated clinical emergencies temporally, and also emotionally, highly urgent and dramatic.

This urgency, and the excitement and anxiety it generated, contrasts with how trainees represented their everyday work in discussions:

> During the coffee break, Susan, a trainee, says to another trainee standing next to her: 'In my hospital, there isn't a cannula on the whole ward. None of the equipment works. The seniors aren't at all interested in your situation. But I guess there would be no point in simulating this, as *what we want* to learn is the clinical stuff.
>
> [Field notes]

The italics here highlight the expression of desire - "what we want to learn is the clinical stuff" – which illustrates Sutton-Smith's point that play is performed "to come to terms with feelings, conflicts, realities, and aspirations as they enter into our lives". The purpose of a course, and the principle according to which aspects of reality were treated as 'simulatable', was – in Susan's words here – the expression of a wish: of learning 'clinical stuff'; of doing meaningful, satisfying, effective work. It follows that what was *not* simulated, or selected as significant for representation, were the dissatisfying, intractable, limiting aspects of life in hospital.

To give a final illustration of the way simulation can be seen to be "about [players'] feelings about reality and not about the direct representation of reality as such" (Sutton-Smith, 1997, p166), we cite below an extract from the de-briefing of a DNAR scenario (do not attempt resuscitation). This scenario was described by educators as teaching how to break bad news, specifically how to tell a relative that a 'DNAR order' has been issued on a patient. In hospitals,

such orders are issued when a resuscitation attempt is judged likely to be unsuccessful, for instance with very frail patients.

In all observed instances of this scenario, the person who had played the role of the relative was asked, in the de-briefing, to respond 'in character'. The extract below gives one example:

Faculty member [to Julian, who played the relative]	You were the son. Very good acting skills, I must say. As a son, getting the information from her, how did that make you feel?
Julian	*I was reassured*, that I was put in a space, that *I wasn't lied to*, at any point, *I was always given the right information* for that time […]because I was clearly anxious, you didn't say, we aren't going to resuscitate your mother. *You actually did it in a very skilled way* and so there wasn't anywhere where I could suddenly, you know, go *ballistic*, because this hadn't been discussed with me, and I thought *that was very well done* actually.

[Video transcript]

The educator's/son's response here illustrates an account of fantasy described by Zizek (1999), in which a situation is perceived from an 'impossible' perspective – or 'gaze', in Zizek's Lacanian terminology. It is impossible in that the educator/son perceives it from two perspectives simultaneously: as the son who is 'reassured' and not 'ballistic'; and as the educator who knows that he 'wasn't lied to', that he was 'always given the right information', and that the trainee's performance can be qualified as 'skilled'. Zizek's argument is that impossible gazes are evoked to declare how a situation should be felt, rather than simply how it *is* (this '*is*' is precisely impossible). Julian's response tells the trainee he did well in informing the relative of the DNAR order; but this telling is itself attributed to the relative. It is thus the relative's voice that speaks to the trainee, saying he did well in breaking the news that his mother was going to be allowed to die, an impossible, or fantasized, recognition of skill that avoids the potential of that distress being realized.

What does the treatment of simulation as the play of phantasmagoria add to an understanding of medical simulation?

Running high-fidelity simulation courses involves not only teaching skills, but also acting; pretending – and asking trainees to do the same. This phantasmagoric work is not reported on widely (but see Taylor, 2011; McNaughton, 2012). One consequence of rendering it invisible is that simulation appears to signify by virtue of its technological artifacts (e.g. manikins), rather than by virtue of the imaginative work of participants. This point has parallels with the critiques of graphical realism in the video-games industry (e.g. Salen & Zimmerman, 2003), when this is achieved at the expense of designing meaningful experiences. A second consequence is that such

imaginative work is treated as 'not real' - as detracting from the real business of transferring skills - rather than as what makes such skills sensible. Both of these points have resource implications: in the centres we observed, expenditure had been dedicated to purchasing technologies, with the resources available for other costs, including staffing, highly restricted. Since it is educators who sustain a course's imaginary work, there is a case to be made for revisiting this funding distribution.

If high-fidelity simulation is treated as phantasmagoria, which is meaningful *because* of its emotional vividness, its educational rationale is affected. It need no longer be accountable solely in terms of developing skills, and apologetic about its simplification of medical work. Rather, there is then scope to explore how it can sustain the deconstruction and analysis of medicine as an emotional practice. These contrasting rationales are not mutually exclusive. However, treating simulation as phantasmagoria is one response to "simulation deniers" (Turkle, 2009) who state that it can never be like real life; that it is trapped within its own magic circle, inherently separated from the real world (Caillois, 1967; Juul, 2005). This stance on medical simulation characterizes the clinical literature, including the arguments of those who advocate its use: Gaba (2004), for example, justifies simulation in medical education in terms of one day achieving something akin to Star Trek's holodeck, a claim which celebrates the achievements of current technologies whilst simultaneously deferring their full benefits to some point in the future. Others argue that simulation cannot replace work-based learning, but only supplement it (e.g. Issenberg et al, 2005; Ziv et al 2003). Both of these qualifications treat simulation as a form of illusion: a fake/unreal/inauthentic version of reality.

These arguments run parallel to those in the video games literature, in which games are treated as 'virtual environments', cut off from reality by the magic circle of play. As Calleja (2010) argues, such methodological treatment inherently makes games/simulations appear relatively trivial compared to what they are defined against: 'reality'. It also overlooks how the boundaries between reality and non-reality are anything but firm, but rather negotiated and shifting. Calleja's point is that defining simulation by virtue of its unreality/virtuality overlooks how "virtual worlds…are intimately woven into contemporary reality" (p340). Applying this to medical simulation, we can argue that treating it as a realistic space in which skills are gained for subsequent transfer overlooks how it makes medical work meaningful in distinctive ways, staging how belief in medicine is sustained, rather than simply representing it 'as is'. We can then also make a case for seeing medical simulation as a resource with which to explore and manipulate the pains and pleasures of work, its failures and frustrations, working through them to develop better responses to its tribulations. Rather than simulation acting only as an ante room to the hospital workplace, then, it can then also be imagined as a space in which the emotional experience of medical work is manipulable, and thus transformable in ways that go beyond the transfer of skills, to touch on the meaning of those skills for the experience and quality of work.

We develop this point further in the final part of this paper, since it also pertains to how we discuss Frasca's concept of simulation. For now, however, we will move on to the concept of narrative.

Narrative – or the drama of medical simulation

When simulation is treated as a realistic setting in which to rehearse skills, a scenario is defined as the domain of knowledge to be learned about. In the 'serious games' and clinical literature, Dieckmann et al (2012) and Alinier (2010) thus refer to a scenario as a patient 'case'. Gaba et al (2001, p.181) describe scenarios as "sets of underlying diseases and […] challenging problems to solve". Barach et al (2001) similarly define them as clinically defined and generalisable situations. In our research sites, a scenario was referred to in terms of the clinical condition to be taught: there was the anaphylaxis scenario, the upper GI bleeding scenario, the trauma scenario, and so on.

Treating scenarios as cases or diseases does not foreground their temporal dimension: the way they unfold in time to tell a story. Yet acting out a case means organizing a sequence of events narratively. For example, establishing a case on which a doctor can act to effect necessitates describing how it arose; which events it comprises – such as a falling blood pressure - and the order in which they take place; how long these events last; how they are linked causally. In our research sites, trainees were always given a background story before they entered the simulation room. The story indicated who they were in the scenario (e.g. a junior doctor on her/his first day in the hospital's emergency department), information about the prospective patient (e.g. Mr Bobby Plunger has come in with chest pain), and the chronology they were entering (e.g. the nurse has examined him and is calling you in to help). These elements – events organized into a causative chronology - are essential components of narrative (Ip, 2011). Our argument in this section is that a case's narrative organization is not simply a way of contextualizing the content to be taught, but more importantly, determines how that content can be understood and valued.

In game studies, narrative has proved a controversial concept. Without revisiting these debates, we can argue that interest in the narratives realized through games and simulations focus on the significance of their distinctive structure:

> Whereas novels allow us to explore character and drama allows us to explore action, simulation narrative can allow us to explore process. Because the computer is a procedural medium, it does not just describe or observe behavioural patterns, the way printed text or moving photography does; it embodies and executes them. And as a participatory medium, it allows us to collaborate in the performance. Using the computer, we can enact, modify, control and understand processes as we never could before (Murray, 1997, p181).

The simulations we observed were not computer-based and, in this respect, were more akin to drama than simulation, using Murray's definition here. And indeed, scenarios were only ever played once, rather than 'modified' to 'control and understand their processes' – suggesting that the pedagogic emphasis was on evaluating action rather than gaining procedural understanding (we return to this point in the next section). Murray's work on simulation narratives is only selectively applicable then, in our study, although its argument offers important insights. Before we present these, we will do a brief detour into relevant work on drama-based narratives, to identify the significance of the actions represented in the scenarios.

The work of Jacobs (2003) is helpful in understanding the genre of narrative with which scenario-based actions can be understood. Jacobs describes the rise of a genre of medical TV drama called 'body trauma', in which trauma is the primary plot device. Whereas previous medical dramas staged the power of medical science to cure the ills of society (*Dr Kildare, Medic*) or mapped the social anxieties of the baby boom generation onto the body (*MASH*, *Casualty*), more recent shows (*ER, Chicago Hope)* make the body's visceral injury the cause of a narrative's dramatic events.

This trait characterized the scenarios we observed, in which the cause of events was the body's sudden deterioration. Acute symptoms were thus the starting point of narrative development: a sudden fall in blood pressure, the lack of a pulse, the cessation of respiration. Death was invariably imminent, with medical intervention framed as an act that stabilized the body. The hospital thereby appeared as the front line in the fight against tragedy; a war zone, rather than a place of healing. Educators explained this emphasis on emergencies in terms of teaching the management of crises, with some adding that it also made for an exciting training day.

Jacobs quotes Michael Fitzpatrick (p. 12) on the ideological significance of body trauma: "once you give up on any prospect of achieving progress in society, your horizons are reduced to securing your own physical survival". The argument, here, is that dramatizations of medicine which focus almost exclusively on disease as a sudden contingency in the body detaches its appearance from the wider context of the patient's life. Doctors are positioned in particular ways, making highly visible the power of doctor-heroes over life and death (Gordon et al, 1998). This dramatisation of disease, and of the social function of doctors, has implications for understanding

the effectivity of clinical work: what it pertains to and what it does not, what a clinical case is and what it is not. This is effectively also what is taught on simulation-based courses; ideology, not simply skills.

We will now turn more specifically to the significance of interactivity in these narratives, which is Murray's central concern. She organizes her argument around aesthetic concepts, two of which we will focus on here: immersion and agency.

Immersion

Murray's argument on immersion echoes some of the points we made about play. She states that immersion is a function of fantasy: we create belief, rather than suspend disbelief. Fiction/play is immersive when intelligence is applied to reinforce rather than question the reality of the experience. Immersion does not pertain to losing sight of the real world, then, but rather to the creative and willing negotiation between the two: "sharing an unscripted fantasy environment with other people entails a constant negotiation of the story line and also of the boundary between the consensual hallucination and the actual world" (p.112).

This emphasis on negotiation highlights the importance of a practice we observed called 'meet the manikin'. It involved educators teaching trainees how to interpret the simulation environment:

> Geraldine takes the trainees into the simulation room and points out where equipment is stored, where the cameras and microphones are, and how the

> manikin works. She lifts its arm to show that it already has a cannula attached to it. She says this is because the manikin is too expensive to be replaced as a result of the wear and tear of frequent injections. She says 'if he's not meant to have a cannula in, I'll just cover his arm with his bedsheets. I'll tell you if he's sweaty or clammy. You can inject him and it goes into a bucket underneath, so don't kick the bucket'.
>
> [Field notes]

The 'meet the manikin' practice sets out the semiotic conventions specific to the simulation room: if the patient's arm is covered by bedsheets, this means he doesn't have a cannula in. Not only is the role of imagination highlighted again here; it also shows that the credibility of the simulated world results from acceptance of its distinctive semiotics.

This is significant because it means that immersion is undermined not so much by lack of realism (e.g a patient who arrives in hospital with a cannula) as by a rejection of its semiotics. This point can be illustrated in reference to a pattern identifiable in de-briefing transcripts: when the performance of a trainee was evaluated poorly (a judgment almost exclusively carried out by trainees on themselves), s/he also named differences between the 'real world' and the simulation. For example, one trainee explained his failure to treat anaphylaxis correctly as follows:

> I think in real life it would be more obvious if someone was having an anaphylactic reaction, so you could get a bit more certainty.
>
> [video transcript]

This pattern raises a question about the appropriateness of simulation to teach about error or individual poor performance. If doubt is raised about the semiotics of the simulation, so will be the recognition of error. Several researchers have already noted the difficulty of identifying errors on simulation courses (Dieckmann et al, 2012; Rudolph et al, 2007), and treat this as a problem of de-briefing technique; it may however be more effectively considered and then addressed by treating it as a function of simulation.

Agency

Proponents of medical simulation emphasize that it supports trainees' agency, enabling them to learn at their own pace, rather than that required by the clinical workplace (Ziv et al, 2003). Murray is similarly interested in how agency is granted in interactive texts. She identifies a generic plot device, resonant of detective stories, in which the player hero advances the narrative by evaluating the significance of available evidence.

This device characterized observed scenarios, in which trainees advanced events by reading patient notes given by the 'plant', and examining the manikin for further clues. It was this device therefore which sustained the demand to ascertain the cause of the symptoms. Trainees' identification of the guilty party, such as ectopic pregnancy or transfusion reaction, provoked signs of jubilation and relief among observers, who occasionally shouted 'bingo!', 'he's got it!', or screamed at the TV sets when a clue had been overlooked: 'check the name on the blood bag!'

Representing medicine as investigative, detective work portrays the clinician in a distinctive light. It makes investigative genius shine out against slavish adhesion to institutional procedure. Rapezzi et al (2005), for instance, use the figure of the detective clinician to highlight the importance of clinical acumen in the face of the uncritical application of protocols. Commitment to an aesthetics of agency may therefore illuminate why de-briefing talk focused on endorsing individual qualities, such as a trainee's communication skills, rather than on the examination of standardized protocols, which feature prominently in human factors literature (Dejours, 2008). Protocols prescribe action, and in this respect, restrict agency (this is Rapezzi et al's critique). The teaching of human factors, understood as justifying the prescription of action, was therefore at odds with an aesthetics of agentive action.

Murray's distinction between agency and authorship (p. 153) is helpful in clarifying the peculiar conditions for agency in simulation. She argues that although players exercise agency, authors determine the conditions for this exercise. The relevance of this point is brought out by Corliss (2010) who argues that simulations foreground decision-making whilst disciplining players towards a particular course of action, by determining what counts as a good decision. This argument makes visible the scope for agency: it isn't so much that trainees controlled their own learning, but rather that educators determined how and to what effect trainees encountered situations to be learned from.

What does the treatment of scenarios as narratives add to an understanding of medical simulation?

Narrative analyses account for the way in which representations of reality appear realistic. This problematises the treatment of realism as a quality of unmediated reality, and points instead to the role of cultural frameworks of interpretation/imagination, by means of which the real becomes sensible. Evolutions in the narratives of medical dramas highlight how 'realistic' representations of medicine transform over time, reflecting the changing meaning of medicine. Simulating medicine (or indeed anything) is not a question of objectivity therefore, as the term 'fidelity' implies; it is necessarily subjective and ideological. Bogost (2006, 2007), who has taken forward Murray's concern with procedural narrative, puts it so: "a simulation is a representation of a source system via a less complex system that informs the user's understanding of the source system in a subjective way" (Bogost 2006, p98). Simulation is made possible by the exercise of choice over how to represent/narrate the 'source system', and these choices reflect cultural values: "no simulation can escape some ideological context" (p99).

This argument was in fact widely accepted in practice (if not in theory) in our research settings, in which nurses and surgeons identified the way manikins represented/enacted the body from an anaesthetic perspective: as a site of anaesthetic action. In other words, the medical world simulated through the use of the manikin sustained stories of anesthetic action, marginalising the actions of other professions – as surgeons sometimes complained.

Treating simulation as ideological enables novel questions to be articulated: from whose perspective is a scenario represented/enacted? What/whose forms of action and agency does its narrative structure enable and disable? Who is made hero and who has the walk-on part? Discussing such questions explicitly with trainees might prevent de-briefing discussions

becoming mired in debates over the realism of a scenario (which we observed repeatedly, as noted above), and enable educators to focus instead on how medicine, and medical errors, are perceived from different perspectives. Such discussions seem important to articulating the attachments of different professions and grades to versions of medical realities and the scope for agentive action within these, and therefore to clarifying where and why such versions do not cohere. It also seems important to making explicit how medicine constructs the world to make it into its domain of action.

Simulation – or the participatory politics of enacting a variable system

In game studies, much intellectual effort has gone into identifying the aesthetic features specific to simulation, by contrast to play and narrative more generally. It seems ironic that the simulation-based courses we observed did not comply with many of these specific features, as identified by Frasca (2001, 2003, 2004), who describes them as follows: a simulation (unlike a narrative) is re-played repeatedly by virtue of its systemic variables (rather than read once); variables can be changed to see their effect; variables determine how a simulation operates rather than its objective. From this definition, Frasca identifies the educational value of simulation in terms of repetition and experimentation with variables. Most of the trainees in our study, however, attended simulation-based courses once or twice over a training period of several years; performed a scenario once on any one course; had no opportunity, during a scenario, to change the variables (e.g. start again and change the treatment); and the objective was invariably pre-determined by the curriculum. De-briefing discussions sustained a kind of repetition and experimentation, with alternative scenarios realized discursively (e.g. an educator asking trainees

to say what would have happened if X had been different), but this was never enacted. The reason for this was budgetary: removing trainees and educators from their work in order to train is expensive, as is re-organising the postgraduate curriculum.

The absence of repetition and experimentation with variables demonstrates how limited the scope has been, in practice, to exploit the aesthetic qualities of simulation in medicine. With respect to the serious games literature, this absence points to the difference between simulation performed in experimental settings or at the prototype stage, and simulation performed as an educational practice; indeed, nearly all the literature claiming to know the educational outcomes of clinical simulation is based on experiments involving repeated practice, rather than once every couple of years (e.g. Larsen et al, 2009). With respect to accounts of procedural rhetorics (Bogost, 2007), which have built on Frasca's work, this absence also points to the difference between the aesthetics of a simulation/game as a stand-alone entity and its aesthetics within an assemblage of social practices.

However, there was one exception to this one-off pattern of provision, which we will describe because it aligns more closely with Frasca's vision, and thus points to how immersive simulation might be done differently in medicine. It consisted of a course funded by a hospital's management body, which was intended to address a high rate of 'failure to rescue' incidents[iv] on one ward. The course involved all staff on that ward - by contrast to junior medical trainees only. It ran repeatedly over several months. On the day Caroline observed, several of the ward's nurses interrupted the introductory lecture on the importance of communication skills (which educators

intended to teach about) to interject that 'failure to rescue' incidents were not caused by a dearth of such skills, but rather by management's irresponsible cost-cutting exercises:

> So what are you going to do if you come round to my ward and I have seven patients to look after, two post-ops, and no HCA[v]. What are you going to say or do?
>
> [Field notes]

The presence of 'management', in the form of the deputy director of nursing, meant that this version of reality was counterposed by another: that the hospital's funding was being cut, with little prospect of future increases. The debate that followed set versions of the reality of work against each other. Nurses pointed to the fictional status of work 'systems' designed to identify deteriorating patients; 'management' disclaimed the power to resolve this. The exchanges – unintentionally - shaped what was treated as the object of the simulation: a scenario was not seen as indicative of an individual's capacity to respond to an emergency, but rather of working conditions, as this extract illustrates:

Tutor 1	The problem is, Sally, you didn't tell your team-mates you had the sickest patient. I was just interested in knowing - it's not a criticism - why you felt you had to cope on your own?
Nurse 1 (Sally)	That's what I do on the ward
Tutor 1	You might be stuck in a ward when you are trying to

	cope and you don't go and get help?
Nurse 1	I'm just re-living yesterday, it's constantly juggling. I find it heavy-going, but I don't want to seem I'm not coping with it
Nurse 2	We need to re-design the system so that nurse leaders don't get attached to particular beds and oversee the whole ward *[there follows an extended discussion about whether this system is in fact already in place but undermined by staff shortages.]*
Tutor 1	You need to think as a group how you want to deal with these situations. You need to have agreement on this, as a unit

[Field notes]

The exchange illustrates how the course became an occasion on which to critique and re-think how clinical work ('the system') was done and divided up; in other words, why its existing variables led to one kind of outcome, and how these could be altered to achieve a different effect. The scenarios were not treated/seen as simulating different clinical cases or diseases, but rather the same processes of work, repeatedly, at different points in their operation. De-briefing discussions gave rise to and debated the virtues of competing accounts of this 'system', as well as alternatives to it, with no pre-determined known and correct answer (see Tutor 1's last intervention, which demonstrates the skill she deployed in negotiating an emotionally charged situation). This meant that the perspectives used by the different parties to explain 'failure to

rescue' were challenged: that management were only concerned with financial targets; that nurses lacked communication skills. As a consequence, other explanations, previously unimagined and unimaginable, were generated.

Agreement was not reached on the day Caroline visited the hospital. However, a principle of ongoing collective review, instantiated in the course's iterative design, appeared to have gained support among both staff and 'management'.

The course illustrates Frasca's claim that simulations sustain explorations of how versions of reality are generated and maintained, and also how they can be de-stabilised. This vision of simulation does not necessarily lead to the kind of radical transformation evoked by Bogost (2007) in terms of an 'event' –in reference to Badiou - but it does demonstrate how training-oriented, 'serious' simulations give rise to aesthetic reconfigurations which make the world appear alterable. This has implications for imagining the ethics of medical simulation: simulation may not be ethical because it is safe, but precisely because it is dangerous. It puts versions of reality at stake.

What does the treatment of simulation as the enactment of a variable system add to an understanding of medical simulation?

Frasca's account of simulation is suggestive of the benefits of 'playing' with a modeled system, rather than modelling the system to secure its reproduction. This understanding of simulation

foregrounds pedagogic practices of debate, critique and invention, based on the enactment of different realities, rather than the transfer of what is already known.

Bogost's (2007, p57-8) account of 'persuasive games' has more recently elaborated on Frasca's notion of simulation, and defined 'persuasive games' in opposition to 'serious games', in that the former "facilitate dialectical interrogation of process-based claims about how real-world processes do, could or should work, [and…] speak past or against the fixed worldviews of institutions like governments and corporations, […interrogating] those institutions themselves, recommending correctives and alternatives". The course described above illustrates what this might look like empirically, and is suggestive of a different rationale for simulation-based medical education: one that focuses on organizational development, rather than the transfer of skills. Such a rationale is commonly articulated in the clinical literature (e.g. Gaba, 2004), but is treated as identical to the transfer of skills, rather than different from (and possibly antithetical to) this objective. Frasca's and Bogost's arguments are helpful in showing the difference between simulating to reproduce a practice versus transform it. Their arguments have affinities with accounts of work-based learning which endeavour to move away from defining learning as the transmission of what is already known, to the learning of "something that is not yet there" (Engestrom and Sannino, 2010); something that has not already been thought, but is worked out by participants to address the concrete and contextual challenges of their work. In tandem, both sets of arguments identify possibilities for considering and using simulation in medicine in ways that are under-explored.

Why study medical simulation as a cultural practice?

We wrote this paper to identify the benefits for simulation-based medical education of treating simulation as a cultural practice, and to broaden the analytic focus in the 'serious games' literature beyond the measurement of intended outcomes. We also hope to have shown the scope of concepts articulated in relation to game play, and to demonstrate the empirical reach of aesthetic analyses of games and simulations.

Studying medical simulation as a cultural practice demonstrates the significance of imagination and fantasy in maintaining the credibility of simulation. What turns a plastic manikin into a patient on the verge of death, or body trauma into a justification for medical intervention, is not fidelity to a hypothesized real, but rather fidelity to a set of values and cultural imaginaries. This has implications for educational practices, pointing to the value of moving away from concerns with technologies per se, and exploring instead practices for enhancing or disturbing belief, as well as their ethics and politics. One way of doing this is to focus on the affectivity of clinical practice, including how 'fidelity' to its sense of purpose is sustained and the disturbances caused to this, notably by the fear of medical error.

With respect to the game studies literature, the analysis shows novel empirical instantiations of common concepts. It confirms some of the critiques of the 'serious games' literature offered by those who treat all games seriously, in the sense of worthy topics of academic study, by highlighting some of the methodological limitations of focusing on designers' intentions. We also hope to have made a case for not leaving games and simulations in educational settings to the 'serious games' research lobby. This is what Bogost (2007, p57) does in his criticism of the

'serious game' initiative: "Educational games translate existing pedagogical goals into videogame form;…health games provide doctors and medical institutions with videogame-based tools to accomplish their existing needs". We would suggest that educational simulations, including ones in medicine, do not simply translate 'existing needs' into a new representational form, but rather that such needs and the aesthetics of the form emerge in tandem, re-shaping one another and thereby making original meanings possible.

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[i] The professional body responsible, at the time, for funding post-graduate medical education in London.

[ii] Doctors are classified as trainees when they are following a training programme subsequent to their medical degree. During this 'training period', they work as doctors, but also engage in structured and compulsory training.

[iii] Sutton-Smith's definition and analysis of play research rhetorics has many similarities with the meta-narrative method in clinical research, which reviews literature by uncovering its philosophical assumptions and methodological approaches, as seen for instance in Greenhalgh et al (2009).

[iv] 'Failure to rescue' is a category with the health service's taxonomy of errors, and refers to a failure to identify a rapidly deteriorating patient, who then goes on to die.

[v] HCA stands for healthcare assistant