



The art of medicine

Reframing surgical simulation: the textile body as metaphor

What we see is shaped by what we look for and what we expect to find. Surgeons come to the operating theatre after years of learning about anatomy and disease. From their perspective, surgery is about individual patients who come to the operating theatre with diseased or injured organs. Medical training starts with anatomy, physiology, and pathology and that's how we build up our understanding of the body. The physical skills of surgery are acquired gradually too, through apprenticeship as a member of a surgical team. Traditionally, it takes a long time before trainee surgeons are permitted to do much, and physical skills lag behind factual knowledge. Simulation aims to speed this process up by allowing learners to practise surgical procedures and techniques away from real patients. Whether based on physical models, dead animal tissue, or haptic computer systems, such simulation is also rooted within the worlds of anatomy, physiology, and pathology. It functions within a scientific frame.

As patients, we see things differently. If I have intermittent claudication, I'll be referred to a vascular surgeon. But I'm not interested in vascular surgery as a specialty. I want to be able to walk without pain. Fleur Oakes, lacemaker in residence in the vascular surgery unit at Imperial College London, has a third perspective. She's interested in surgery for its intersections with her worlds of fine art, fashion, and embroidery. Fleur has spent countless hours as artist-in-residence in consultant vascular surgeon Colin Bicknell's operating theatre, observing operations with the same intensity as when she's creating three-dimensional embroidery inspired by a spider's web

or a fallen leaf. As she watches the team at work, details of anatomy, procedures, techniques, and the names of instruments are irrelevant. Instead Fleur registers what many surgeons no longer notice—the subtle shades of living tissue, the textures of the body's layers, and the gentle decisiveness of experts as they work together in a complex, unconscious choreography. She sees how some patients have arteries as soft as butter, others hard as chalk, and she watches how surgeons adapt their techniques as each operation unfolds.

As an artist, Fleur's sense of texture, shade, and form is highly developed. When asked what it was like watching her first operation, Fleur described it as "a journey through colour". She has trained herself to look deeply at what she sees, to notice tiny detail, and to capture what all her senses reveal. She does not make assumptions about what she is looking at but scrutinises each structure as she finds it. This kind of looking is essential to surgeons too, especially in areas where anatomy is inconstant or hard to see—recognising the parathyroids as they come into view during a neck dissection, or distinguishing the pancreas from its surrounding fat.

To explain all this to her non-medical friends, Fleur has created the Textile Body using materials that are familiar, domestic, unthreatening. By stripping out the obvious connotations of surgery—guts, blood, sliminess—Fleur highlights the precision, teamwork, and respect for delicate structures upon which surgery depends. The Textile Body doesn't look like a human being but is a square wooden box. When you lift the lid you find a sheet of 19th-century lace—delicate, fragile, and papery. Inside are nine panels of sturdy linen, held together by tiny buttons that she undoes with a surgeon's precision. This uncovers a series of layers, each representing an anatomical plane. Coarse yellow knitting is the subcutaneous fat, filmy netting is the fascia, unsettling structures made from rubber bands represent the peritoneal cavity with its restless contents. And in the depths are tiny structures made from the finest silk, each unfolding to reveal minute embroidery stitches in vivid colours. These textiles not only look different from one another but each also behaves in a unique way when you manipulate it. This is not direct mimicry, as with surgical simulators and anatomical models that set out to represent the body as surgeons see it. No-one could mistake Fleur's structures for actual organs. Yet for all its strangeness, this is still simulation.

Traditional simulation develops skills that can be directly transferred from simulation centre to patients. It sets out to achieve authenticity while ensuring that no patient comes to harm. Simulators allow clinicians to work within a familiar context, learning to join structures that look like arteries or intestines. Despite its acknowledged value, such simulation



Fleur Oakes

can be deceptive, making things seem simpler than they are. It can conceal the difficulties of accessing remote parts of the body or working at the limits of what organs and tissues will tolerate. Other challenges include working with people you have not met, or recognising in good time those small errors that could turn into serious harm but can be halted and remedied if noticed early. All this traditional simulation takes place within a medical frame.

Fleur's Textile Body changes that frame. In it she captures an essence, a distillation of surgery without any of its usual cues. Yet experienced surgeons seem to understand and respond to her textiles instinctively. The process of getting down to a tiny delicate structure and placing a stitch inside the Textile Body remains profoundly surgical, even though the materials don't look human at all. While remaining faithful to the nature of surgical work, Fleur's simulation makes the familiar strange and the strange familiar. By stripping out the landmarks of anatomy and disease, Fleur forces clinicians to be attentive, to engage with what is in front of them and to notice what is there.

This is especially valuable for newcomers. Seasoned surgeons have developed a rich sensory library based on past experience. They know how different one person's femoral artery is from another's, how structures vary in appearance and feel. But trainees must learn to "see with their fingers", to develop a tactile intelligence. This kind of knowledge takes years to develop, is hard to articulate, and difficult to share. The world of textiles offers one solution.

Connections between textiles and surgery go back a long way. In the 18th century, the midwife Angélique du Coudray developed textile obstetric simulators for her teaching. In the 20th century, surgeon Alexis Carrel gained inspiration from Belgian lace-makers when developing his pioneering techniques for arterial anastomosis. Contemporary textile artists use knitting to explore health issues with patients and public, from dental decay to women's health. But as far as we are aware, Fleur's approach is unique.

Fleur's Textile Body is not an alternative to traditional simulation but an adjunct. We are using her insights at two levels. First, for surgeons in training, helping them to understand techniques that their specialty demands. Building on a recent pilot, Colin's programme for vascular surgeons will start with dissecting at depth, working around the constraints of a patient's body to expose delicate structures without causing damage. Then comes the placing of tiny stitches and the subtle control of tension on which a successful vascular anastomosis depends. Later it will include working with fragile materials where too much tension can split or tear a vital vessel. Surgeons must make observations, take decisions, perform actions, and deal with the consequences, based on each patient's unique body. They need to equally feel at home with arteries like chalk and arteries like butter. Fleur's expertise in restoring fragile vintage textiles echoes the challenges of handling diseased

blood vessels in frail older patients, where precise suture tension can make the difference between success and failure.

Second, Fleur's work provides a bridge for outsiders to experience the closed world of surgery. We've held events where young people considering a career in health care took part in "operations" on the Textile Body, joining a team of experienced surgeons. By holding retractors, manipulating instruments, and inserting stitches into delicate fabric, participants experienced the precision, team working, and jeopardy of surgery without needing scientific knowledge. These sessions have been followed by similar experiences for the general public.

Fleur has taken a world that we as surgeons thought we knew and showed us things we had forgotten or never noticed. Fleur's focus on layers, planes, subtleties of colour, relationships between structures, and the skills of teasing them apart reveals a different knowledge: the artistry that surgery conceals when it frames itself as a science. With neither a clinician's professional detachment nor a patient's personal involvement, Fleur brings a different way of seeing. Witnessing the art within surgery captured through her physical metaphor has shown how easy it is to ignore what is under our noses and made us think again about the nature of surgery and of simulation.

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Further reading

Kneebone RL. Simulation reframed. *Adv Simul* 2016; **1**: 27



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