

Visualising within healthcare practice and research

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Introduction

The act of sense making is a central practice of health humanities. Writing in their foundational text in 2015, Crawford et al draw on the work of Bruner (1990) and Stetler (2010) to advance the idea that meaning is dynamic and formed in situated action. Having worked as a nurse, health researcher and educator for almost 40 years, this idea resonates with my own experiences. As a novice nurse in practice, meaning for me came primarily from situated interaction with those in need of health care and their families/friends and other colleagues involved in providing that care. Consideration of particular contexts and actions through the lens of wider knowledge from a range of disciplines developed over time and helped build further understandings of what was going on for whom and why.

Thus the scholarship of others was and is vital in helping to create ongoing meaningful dialogue with practice experiences. This wider knowledge typically comes in the form of words and images, which can themselves influence ways of seeing, thinking and acting. This is important for healthcare provision because the three related practices of observation, imagination and identification remain as crucial to high quality nursing now as they were when highlighted by Florence Nightingale over 150 years ago (Macduff 2017). Writing of nursing in her seminal 1860 text *Notes on Nursing*, Nightingale declares “there is nothing in the world, except perhaps education, so much the reverse of prosaic – or which requires so much power of throwing yourself into others’ feelings which you have never felt...”. (Nightingale, 1860: 196). Good nursing requires not only observation and listening skills to try to apprehend at least some of what a person’s feelings may be, but also a prospective act of imagination to seek to understand some of what this may mean for that person in context. This sense making requires more than the five senses, and this is particularly the case when nurses and other healthcare professionals are dealing with aspects that are not necessarily directly visible or tangible (e.g. feelings of anxiety; the threat of invisible pathogens).

Accordingly, the role of imagination and what may influence it becomes a very relevant consideration for healthcare practice and provision, and thereby for health humanities. As a full exploration of this is beyond the scope of this chapter, my particular focus here will be on how visual aspects of imagination may be relevant to healthcare practice and research, within the broader domain of individual and collective visualisation processes.

Individual and collective visualising

According to Oxford English Dictionary, the term “imagination” stems from the Latin verb “*imaginare*”, to “picture to oneself”, a visualising aspect prominent in its formal definition as “the faculty or action of forming new ideas, or images or concepts of external objects not present to the senses” (Oxford English Dictionary 2018). In layman’s terms this aspect is known as the *mind’s eye* and Pearson et al’s (2013) psychology based review suggests that such image generation is built using the scaffolding of previous related memorized perceptual information. Applied to healthcare experiences, this raises the question of what influences the individual practitioner’s (or patient’s) mind’s eye when envisaging a phenomenon. In turn this raises the linked matter of the relevance of externalized visual representations of the phenomenon produced to inform collective understandings and actions.

Visualising the invisible

These questions have been a particular focus for my research in recent years. In my previous experiences as a nurse in clinical practice, I was usually aware at some level (conscious or liminally) of how relatively clean or dirty my hands were, even though no dirt might be visible. When later I was drawn into researching the efficacy of education to prevent and control healthcare associated infections (HAIs), I came to reflect on this in more depth. In discussions with other nursing colleagues it seemed that not everyone shared my *mind's eye* internal gauge; one particularly respected colleague declared that nurses don't wash their hands when they don't see the dirt, because "seeing is believing". In turn this led to curiosity about the extent to which practitioners actively envisage the invisible pathogens that cause HAIs. In time this became a foundational question within the AHRC/SFC funded Visualising the Invisible (Visinvis) research study (Macduff et al 2013).

While addressing this question through the lens of psychology may have been feasible, I was drawn more to the possibilities of combining health service research knowledge (nursing and microbiology) with approaches from the wider humanities, specifically art and design. In this way Sullivan's Dimensions of Visualisation Framework (from Art Practice as Research; Sullivan 2005) informed our methods of elicitation, and our adaptation of his framework is summarised in Figure 1 below.

Figure 1: Study Design Based on Dimensions of Visualisation (Adapted from Sullivan, 2005)

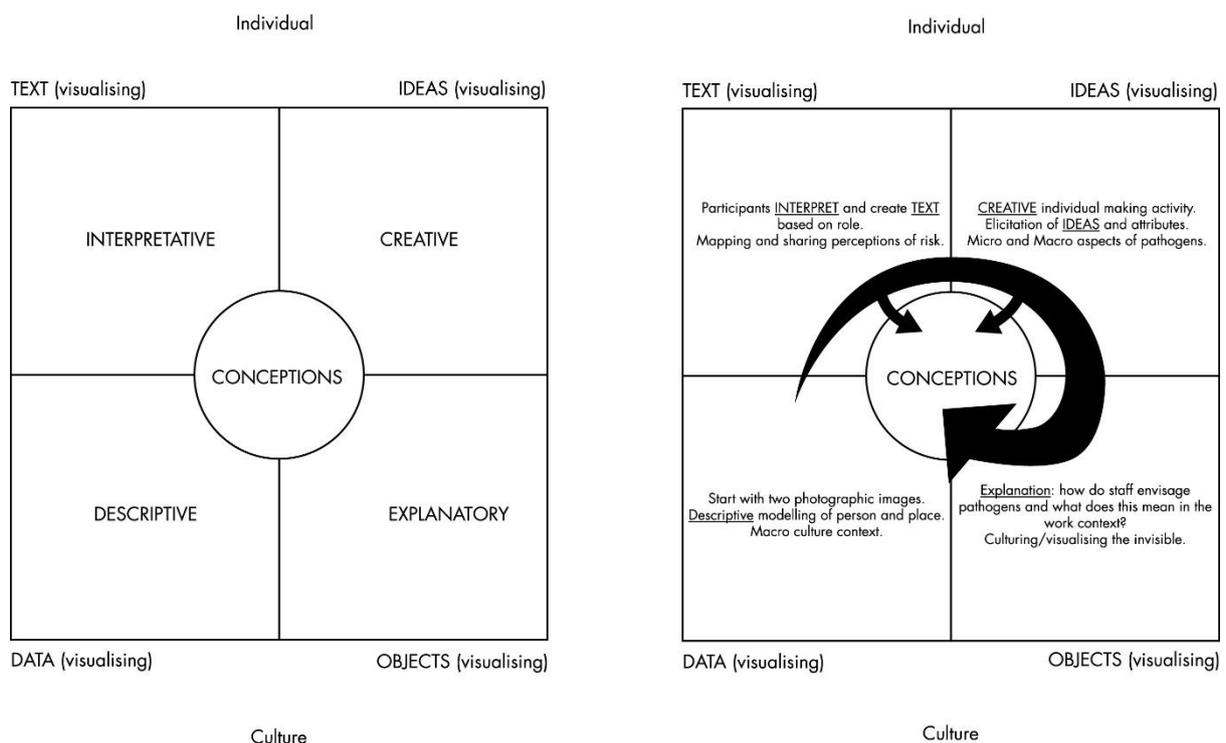


Figure 1. Study Design Based on Dimensions of Visualisation (Adapted from Sullivan, 2005)

Starting from the right hand panel, lower left quadrant, enlarged photographic images of a clinical setting were used to help us elicit 12 participants' perceptions of their role in context, pathogen risk points, and the extent to which pathogens were already envisioned in situ (left hand upper quadrant). Recorded dialogue continued during an activity where participants were asked to choose from a range of materials to create a representation of pathogens (right hand upper quadrant). This process built cumulative understandings of the conceptions of this mixed group (right hand lower quadrant) which comprised four nursing staff, five domestic services staff, two patient-focused public representatives and one construction design management coordinator.

Data analysis showed that few participants reported actively visualising pathogens in their mind's eye in clinical contexts. However the study elicited mental images of pathogens from all participants and all were able to create related models during the making activity. The attributes of these images and the models were manifold, covering aspects of dimension, colour, texture, smell, emotion, and movement. Key referents included small animals and microbiological depictions.

In this way some useful insights into individuals' envisagings, and what influenced these, were elicited. These findings, along with a related collaborative exploration of the meaningfulness of current ways of visually representing pathogens, then informed the design team members' development of a suite of three prototype digital visualisations, created to help healthcare workers to visualise pathogens more dynamically in medical and surgical ward settings.

This suite of prototype visuals was then shown at a national healthcare conference where they were reviewed and evaluated by almost 200 healthcare professionals from varied backgrounds. For each prototype feedback was obtained regarding what these visuals could be used for; where they could best be deployed, and who would find this most meaningful and appropriate. All prototypes were seen to have substantive common strengths, but some nuanced differentiation of purpose and application was also usefully elicited (e.g. in relation to use in clinical or classroom environments).

To our knowledge this was the first study to explore internal and external aspects of visualisation for HAIs in this way. However the importance of internal images, in the form of mental models, has more recently been posited by leaders in the infection prevention and control field (Sax and Clack 2015). Clearly there is need and scope for further research.

VisionOn

Our own follow-on work, VisionOn (see Macdonald et al 2017) has involved the development and evaluation of a prototype training tablet app for hospital staff, using interactive contextualised visuals rather than standard visualisation of data via graphs, charts and dashboards. To demonstrate different pathogen behaviour, dynamic visualisations of norovirus, *C. difficile*, and MRSA were developed in relation to location, survival and transmission within a virtual hospital ward model using evidence-based microbiological and staff behavioural data. The three-stage iterative co-design and evaluation process involved a mixed sample of UK National Health Service staff (doctors, nurses and domestic services staff, n = 150).

Participants reported improved awareness and understanding of the pathogens responsible for HAI. They also gave feedback on the types of information relevant for different staff cohorts, and on which aspects of the visualisations worked well or were prone to cause misunderstandings, and provided suggestions for further development and improvement. Overall the tool appeared to offer staff a new perspective on these invisible pathogens by being able to 'see' them newly contextualised in the virtual ward, thus making them seem more real.

As such the study suggests the possible value of a tool designed with active practitioner involvement to produce meaningful shared visualisations. In the process a number of conceptual and practical visualisation challenges were identified, such as the tension between "realistic" visual rendering and the need to minimise the "clutter" of a typical ward environment so as to foreground key information (Macdonald et al 2017). The VisionOn and Visinvis studies are also notable for including cleaning staff as key participants, crucial stakeholders that many studies, including those within health humanities (Crawford et al 2015), tend to neglect. As we have noted previously (Macduff et al 2013), the low status that society ascribes to domestic work makes cleaners almost as invisible as the pathogens that they work to control.

Other participatory approaches

Crawford et al (2015) argue that "one important role of the arts and humanities in healthcare is to dramatically expand the scope of the social negotiations and verbal and visual narratives available as we make sense of health and illness" (6). Within the two linked research studies outlined above it can be seen that combining arts and design approaches with those from nursing and microbiology can help to open up a topic. Importantly, this starts and continues by eliciting and incorporating the perspectives of health service workers themselves. One widely used approach which aspires to such inclusion is the value stream mapping aspect of Lean Kaizen quality improvement exercises, where a visual tool/template is typically used with staff to help generate collective visual representations of healthcare delivery systems and processes. However, in my own experiences of being asked to take part in such exercises within clinical practice, scope for creativity and questioning was very much limited by the over-riding corporate agenda of achieving efficiencies. As such, the effect was, for me, a brief opening up followed by a swift shutting down. Less subjectively, the overall evidence on staff satisfaction with this process (and its overall effectiveness for quality improvement) is at best mixed (Moraros, Lemstra and Nwanko 2016; Nowak, Pfaff and Karbach 2017; Holden et al 2015).

Within the context of collective visualisation for practice improvement in infection prevention and control, it is important to note the potential value of the video-reflexive ethnography approach as developed by Iedema and colleagues (Iedema, R; Mesman, J and Carroll, K 2013; Iedema et al 2014). This involves the consensual filming of health service staff and patients in clinical contexts. The dynamic medium of video film is then used by staff and patients as a basis for reflexive discussions around areas of practice that might be improved. Thus, rather than focusing on the imagination and invisible phenomena such as pathogens, this recording and reflecting approach seeks to capture the complexity of visible clinical situations and highlight practices that have become unconscious and habitual. Importantly, this "exnovation" approach is designed to be appreciative in nature and to foster innovation from within by foregrounding "the ordinary, moment-to-moment unfolding of clinical work" (Iedema R; Mesman, J and Carroll, K 2013: 83) . As such it seeks primarily to open up thinking and dialogue about practice and systems, an intention that seems compatible with health humanities perspectives on visualisation.

HAIVAIRN

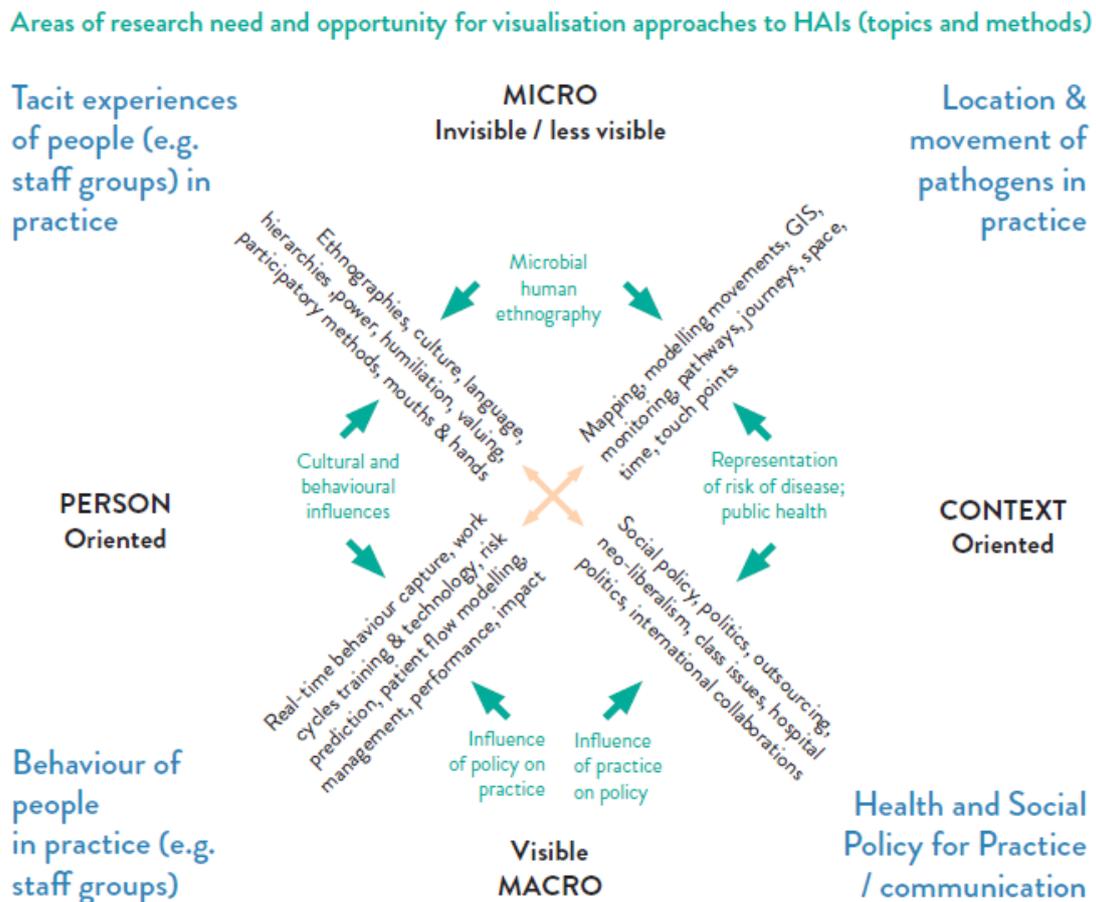
A final example of how arts and humanities can contribute to the field of infection prevention and control/HAls is manifest in the work of the Healthcare Associated Infection Visualisation and Ideation Research Network (HAIVAIRN). Through our experiences of developing the Visinvis and VisionOn studies as interdisciplinary projects, Professor Alastair Macdonald and I became ever more conscious of the need to further expand and integrate research in the field by involving perspectives from other disciplines. Fortunately, this thinking was very much in line with the UK Research Councils, whose collaborative funding programmes recognise that “wicked” issues such as Antimicrobial Resistance (AMR) require combined expertise from across the academic spectrum. Nevertheless, on mentioning “visualisation” and “healthcare associated infections” to members of the public and academic colleagues, we found that the default mind’s eye position tended to rest on the microscope’s eyepiece.

Accordingly the AHRC funded HAIVAIRN project sought to address the question: *how can we better address the problem of HAls through visualisation-related ideation and applications?* Again this was an attempt to expand conceptions and the scope of verbal and visual narratives. The objectives were:

- To coalesce a diverse range of national and international expertise around visualisation-related ideas to address the prevention and control of HAls, working from a foundation in arts and humanities
- Through a series of workshop events, to explore and identify areas of research need and opportunity, articulating possible cross-disciplinary contributions
- To create a set of visual mappings locating main priority themes for inquiry, promising sub-themes and related loci and foci for cross-disciplinary interactions
- To generate a range of relevant researchable questions from this basis
- To develop these as feasible cross-disciplinary proposals
- To disseminate network activities to increase visibility and connectivity in this field

The three workshop events brought together participants from design, nursing, health geography, human geography, microbiology, NHS domestic and support services management, psychology, health humanities, English literature, social policy, transport planning, anthropology, architecture and sociology. The final report (Macdonald and Macduff 2018: <http://radar.gsa.ac.uk/5642>) summarises the collaborative processes and outputs achieved. The visual mapping of areas of research need and opportunity (Figure 2) shows the diversity of topics and methods generated by participants, and their contingent nature within an integrated schema.

Figure 2: The nature, location and interrelationship of the main topics and methods that HAIVAIRN participants saw as research needs and opportunities



During the lifetime of the project several members of the network developed ideas into funding bids, resulting in three new interdisciplinary research studies focusing on the related problem of antimicrobial resistance in the indoor and built environment. All of these three studies have visualisation as a central element and are design-led.

Conclusion

This brief chapter has sought to explore some relevant examples of individual and collective visualising, ranging from internal imagined images to externalised representations. All seek to open up ways of seeing, thinking and making sense that may help collaboratively address challenges in health care practice. In this way the visual dimensions of health humanities can not only offer relevant processes, but also create designs, maps, windows, mirrors and other artefacts to complement the magic of the microscope. In turn these tools can help kindle the acts of imagination and breadth of vision that are needed for good quality care to flourish.

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