

Institution: The University of Huddersfield
Unit of Assessment: 34 Art and Design: History, Practice and Theory
Title of case study: Design to Improve Life: Functionality and Infection in Healthcare
<p>1. Summary</p> <p>Research by the University of Huddersfield's School of Art, Design and Architecture has made a significant contribution towards ensuring that patient safety is a central feature of the rapidly expanding transfer of healthcare from hospitals to the home. By demonstrating that traditional nursing bags can be carriers of disease and creating a 21st-century successor that addresses this longstanding failing, Dr David Swann's pioneering work has generated international interest, influenced design practices and drawn much-needed attention to the dangers of exporting healthcare without hygiene in an age when rises in demand and costs are making non-hospital treatment one of the industry's fastest-growing sectors.</p>
<p>2. Underpinning research</p> <p>Health services are increasingly looking to cut costs by moving more treatments out of hospitals and into the community, but there are inherent perils in this approach. Research published in the <i>Journal of Infection</i> in 2009 reported a rise in the incidence of community-associated MRSA strains and highlighted the limitations of existing surveillance measures. The World Patient Safety Alliance says the chances of a patient contracting MRSA are 1 in 10 in a hospital setting and 1 in 4 in a non-hospital setting, with the rise in risk attributable to the contamination of medical devices and healthcare workers facilitating the spread of disease.</p> <p>Research by the University of Huddersfield's Dr David Swann (joined UoH in 1997; now Subject Area Leader, Product Design and Interior Design) set out to address the issue of ensuring hygiene is exported alongside healthcare. Much of Swann's work in this field has been carried out in conjunction with NHS at Home, a programme sponsored by NHS East Riding of Yorkshire (ERY) with a view to understanding the service challenges of delivering clinical procedures in patients' homes. Efforts to investigate the threat of infection posed by nursing bags used in practice have been key to the research, as has work to design a replacement for the traditional "Gladstone" bag that doctors and nurses have used for home visits for the past 150 years.</p> <p>In 2010 studies by Swann and ERY found a third of a sample of bags used by nurses in the community carried the MRSA bug. Some 55% of bags were never cleaned, and only 6% were cleaned once a week – even though diary analysis showed community nurses in the UK might visit up to 17 patients a day, mostly for wound care. To aid the design of a new bag Swann conducted workshops with nurses, healthcare professionals and service improvement managers, employing <i>Lego Serious Play</i> to enable participants to work through imaginary scenarios by using 3D Lego brick models to simulate daily practice [1].</p> <p>The bag was designed from non-permeable polypropylene white plastic to optimise the interrelationship between construction and cleansing techniques and featured easy-to-clean drawers and a hard surface that could be transformed into a hygienic treatment area. Polypropylene is a tough material that is highly resistant to corrosive chemicals making it suitable for hygienic applications. It also has an inherent hinge property that makes it resistant to fatigue from repeated flexing. The bag incorporates a flat-assembly modular drawer, which could be removed or replaced to accommodate patient-specific procedure packs. It is entirely free of zips, pockets, fasteners and folds, meaning it could be comprehensively cleaned to eradicate all bacteria. Ultraviolet-sensitive gel was applied to the surfaces to evaluate how various features inhibited or aided hand cleaning, and the design was tested through an iterative process of simulation cleaning scenarios while using UV analysis. Tests showed the new bag helped minimise contamination spread, while any areas missed could easily be identified with a UV torch [2].</p> <p>With the migration of hospital procedures into community settings becoming ubiquitous in the West in light of social, demographic and economic challenges, particularly financial austerity and aging</p>

populations, the research acknowledged a major shift in healthcare treatment. By focusing on infection control as well as functionality, Swann's work demonstrated that existing and long-established methods of delivering healthcare in a home setting might be not only be outdated but also innately dangerous [3]. In 2012 the bag was patented in Europe [4] and the US [5].

3. References to the research (view links using Google Chrome)

1. Swann, D (2011): 'NHS at Home: Using Lego Serious Play to Capture Service Narratives and Envision Future Healthcare Products', paper published in proceedings, *The Role of Inclusive Design in Making Social Innovation Happen*, Royal College of Art, London
<http://include11.kinetixevents.co.uk/4dcgi/prog?operation=author&id=1227>
2. Swann, D (2011): 'NHS at Home: A Co-Design Research Project to Develop a 21st-Century Nursing Bag', in *Institute of Ergonomics and Human Factors, Contemporary Ergonomics and Human Factors 2011*, 291-298
<http://www.crcpress.com/product/isbn/9780415675734>
3. Swann, D (2012): 'Demystifying 21st-Century Healthcare Design Practice', in *Design for Health*, Gower
<http://eprints.hud.ac.uk/13362/>
4. Swann, D (2012): medical bag, EU patent application number 11185488.1
5. Swann, D (2012): medical bag, US patent application number 13/253723

4. Details of the impact

University of Huddersfield research into the design challenges of modern-day healthcare trends, particularly the transfer of services from hospital to home, has resulted in a product that has attracted regional, national and international attention as providers seek new innovations and interventions to improve service quality, optimise productivity and enhance patient safety.

Swann's 21st-century Nursing Bag has earned widespread industry acclaim. The design, due for commercialisation in 2013, has been a finalist in a number of prestigious competitions, including the Design Research category of the 2010 Industrial Designers Society of America International Design Excellence Awards; the Medical Device category of the 2010 Medipex Yorkshire and Humber Innovation Showcase Awards; the Body category of the 2011 INDEX: Design to Improve Life Awards; the 2012 James Dyson Awards; the Infection Prevention and Control category of the 2012 *Nursing Times* Awards; and the Product Design category of the 2012 Institution for Engineering and Technology Innovation Awards. It won the 2011 Helen Hamlyn Award for Creativity and in the same year, in recognition of its ability to reduce MSSA/E-coli in health care communities by 30%, was the only product to receive an NHS Innovation Challenge Prize award, with the judging panel describing the design as "highly innovative" [a].

The bag has significantly raised awareness of user-centred healthcare design. The then Scientific and Technical Programme Manager for the Department of Health's Healthcare Associated Infections Technology Innovation Programme, which aims to accelerate the development and adoption of novel technologies and medical devices that can reduce HCAI, observed in 2011: "Currently the majority of medical devices we use are primarily designed for their function, with little consideration to cleaning or decontamination...with your bag it's the inverse." [b] The former Service Design Lead at the NHS Institute for Innovation and Improvement, Julia Schaeper, has remarked: "The design process and in particular the prototyping session with NHS staff was truly an inspirational example of how co-design and anthropological observation techniques can help tackle service as well as product challenges." [c] Lord Darzi, a leading surgeon and former Parliamentary Under-Secretary of State at the Department of Health, requested images of the bag for inclusion in his presentations on hospital-acquired infections.

Media coverage has also raised general awareness of the importance of ensuring healthcare and hygiene are transferred to non-hospital settings simultaneously. In August 2011 the design featured on *The Health Show*, a 26-part series screened by BBC World, which has the highest average weekday viewership of any international news channel [d], while Swann has also written related comment pieces for policymaker-facing publications such as *Public Servant* and *Govtoday* [e] (both August 2012).

With healthcare providers around the world facing rising demand and escalating costs, Swann's research techniques have also generated interest both nationally and internationally. In 2010 the use of *Lego Serious Play* with healthcare professionals and the iterative process of UV analysis contributed to the securing of funding from the NHS London Regional Innovation Fund for the Helen Hamlyn Centre for Design, based at the Royal College of Art, to build on an existing programme to redesign the extant Accident & Emergency ambulance. In October 2011, at Sheffield Hallam University, Swann discussed the use of *Lego Serious Play* in a healthcare context with members of User-Centred Healthcare Design, a research team that works within the NHS and with NHS partners to identify innovative design methods, and in November 2012 he was an invited speaker at Norrbotten County Council, Sweden, the country's largest region for financing and providing healthcare, on the subject of innovations supporting the delivery of nursing care in the community. Positive feedback from these and other events includes advocacy from 'on the ground' practitioners such as the members of the Bridlington NHS Neighbourhood Care Team, who took part in a *Lego Serious Play* workshop. North Yorkshire & Humber CSU states, 'Dr Swann's ethnographic research has highlighted to our clinical executive board the real challenges of delivery [of] a high quality patient experience in the patient's home. These findings, together with the microbiology data related to nursing bag cleanliness has prompted our healthcare commissioners, service improvement teams and community nurses to evaluate current behaviours in relation to infection control standard/bag practice, and the quality of the service experience provided by our flagship neighbourhood care team service.' [f].

Swann's work in the field of user-centred healthcare design has also been presented to users themselves via *Mobilising Healthcare*, one of a number of exhibitions at Huddersfield Art Gallery in the School of Art, Design and Architecture's ROTOR series of research-led exhibitions and events. The exhibition began on July 20 2013 and prompted visitor feedback such as "[It made me] proud to be a nurse" and "Such a simple idea but very practical... Let's save NHS money and improve what is a wonderful service". [g]

The research has also led to Swann applying similar principles to further products that focus on both function and infection, chief among them the ABC Syringe. Impregnated with red ink that is sensitive to carbon dioxide, the syringe turns red after its special seal is broken, alerting doctors and patients to the fact that it has been used and could therefore be contaminated. The design, already nominated for several awards, was conceived for use in developing nations such as India, where the re-use of contaminated syringes (particularly by illiterate users) is widespread. A joint venture to bring the syringe to market has been agreed between the University and Hindustan Syringe and Medical Devices, the largest manufacturer of syringes in Asia [h].

5. References to corroborate the impact or benefit (view links using Google Chrome)

a. NHS Innovation Challenge Prize 2011

<https://www.gov.uk/government/news/winners-of-the-second-round-of-innovation-challenges-announced>

b. Advocacy from Chris Gush, Head of Clinical Innovation and Research, RCGP, formerly Head of Clinical Innovation and Research at Royal College of General Practitioners

c. Advocacy from Julia Schaeper former Service Design Lead at the NHS Institute for Innovation and Improvement

d. 'New nursing bag to combat infection', BBC World News, August 22 2011

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<http://www.bbc.co.uk/news/world-radio-and-tv-14614670>

e. 'Home Improvements', *Govtoday*, August 29 2012

<http://www.govtoday.co.uk/infection/12427-home-improvements>

f. Advocacy from Jo Gaunt, Head of Service Delivery & Assurance, North Yorkshire & Humber CSU

g. Visitor transcripts and analysis from ROTOR exhibitions (scroll through document to see 'Mobilising Healthcare' ('MC') feedback and comments):

<https://drive.google.com/file/d/0B2-kBScAaLCYLXE1UDNMT0I3TIk/edit?usp=sharing>

h. 'Clever syringe warns you of prior use', Design to Improve Life Awards 2013

<http://designtoimprovelife.dk/abcs-a-behaviour-changing-syringe/>