Design for Patient Safety: Creating significant professional, cultural and commercial impact through innovative design in a range of health care settings

1. Summary of the impact

Design research at the Royal College of Art (RCA) has pioneered projects and studies developing a design-led, systems-based approach to improve patient safety in hospital and mobile healthcare. It has led a multidisciplinary culture in which designers, clinicians, psychologists and business specialists collaborate in development projects. This new approach to Design for Patient Safety has had a profound impact on understanding public service provision, on practice and policy, and has realised commercial benefit.

2. Underpinning research

Research in Design for Patient Safety, carried out at the RCA by the Helen Hamlyn Centre for Design (HHCD) in partnership with the universities of Surrey and Cambridge, resulted in the publication of the Design for Patient Safety report in 2003 [s3.1]. Co-author of the report, Professor Roger Coleman, co-directed the HHCD. The authors criticised design management practices in the NHS and called for a system-wide, design-led approach to improve patient experience. The report advocated designers as having a central role to play in improving healthcare, and was endorsed in a foreword by the Chief Medical Officer, Sir Liam Donaldson [s3.1]. This endorsement enabled HHCD researchers Thea Swayne, Sally Halls and Sarah Gottlieb to undertake a series of projects with the National Patient Safety Agency (NPSA), from 2005–9.

Beginning in 2006 with A Guide to the Graphic Design of Medication Packaging [s3.2], the NPSA and HHCD produced guidance publications to assist designers, manufacturers and procurers in improving designs for the frontline of healthcare provision. Further publications in the series covered the graphic design of injectable medicines and packaging of single-use medical devices.

The methodologies were refined by HHCD researchers Grace Davey, Gianpaolo Fusari, Halls, Maja Kecman, Yusuf Muhammad and Karina Torlei during a series of patient safety projects with the Department of Health and the Design Council [s3.3]. Design Bugs Out (2009) resulted in designs that are easier to clean and less likely to trap bacteria. Design for Patient Dignity (2010) resulted in innovative products and systems to improve dignity in the patient experience. Reducing Violence and Aggression in A&E adopted design principles to reduce violence in the emergency departments.

Ed Matthews, Fusari and Jonathan West at HHCD built on these foundations through a dedicated Health & Patient Safety research lab, achieving genuine interdisciplinary collaboration, and helping major research projects achieve significant impact in two key areas: ambulances and mobile healthcare; and patient safety in the hospital environment.

The ambulance research began with the NPSA study Future Ambulances in 2006, which found a lack of consistency in equipment and vehicles, identifying nine problem areas for design intervention. This led to the Smart Pods project (EPSRC, 2007–9), which explored a new system of vehicles, equipment and operations management to reduce unnecessary A&E admissions. Matthews, Fusari, Muhammad and Rob Thompson redesigned the ambulance interior and built a mobile demonstrator unit [s3.4].

Patient safety in the hospital environment was addressed via research with the Sorrell Foundation to improve the patient experience in London hospitals (Critical Points 2004–5) and with Imperial College to improve the resuscitation trolley (2006–8) [s3.5]. This culminated in a landmark, three-year multidisciplinary project, Designing Out Medical Error (DOME) (EPSRC,

2008–2011), undertaken by Professor Jeremy Myerson (PI), Matthews, West and Davey, researching how design can reduce medical error on surgical wards [s3.6], leading to several design outputs already commercially available or undergoing clinical trials. The appointment of procurement, design, medical and risk managers to the DOME Advisory Board helped achieve greater impact by assisting the adoption of the project outputs in the NHS.

In 2013, the Health & Patient Safety research lab is one of three priority areas for the HHCD and forms the basis of the RCA's leadership of the HELIX Centre for Design in Healthcare (HEFCE Catalyst Fund 2013).

3. References to the research

The high quality of the cited research, including DOME, is evidenced by international awards for both research and design (Core77 Research & Strategy Award Pro Runner-Up, and International Design & Health Academy Award Winner, International Research Project category). The Redesigning the Emergency Ambulance: Improving Mobile Emergency Healthcare project won a Silver IDEA in the category of Research for the 2012 International Design Excellence Awards, run by the Industrial Designers Society of America, as well as Design of the Year (Transport category) 2012 at the UK Design Museum. Research in HHCD receives funding from RCUK, EU, charitable trust and other funders who undertake peer review and award on the strength of research excellence commensurate with 3* and 4* levels. All URLs last accessed: 22/11/13.

3.1) Buckle, P., Clarkson, P.J., Coleman, R., Lane, R., Stubbs, D., Ward, J., Jarrett, J. & Bound J. (2003), Design for Patient Safety (London: Department of Health).

3.2) Helen Hamlyn Research Centre and National Patient Safety Agency (2007), Design for Patient Safety: A Guide to the Graphic Design of Medication Packaging (Second edition), <http://www.hhc.rca.ac.uk/CMS/files/NPSA-Design-for-patient-safety-.pdf>

3.3) Design Council website detailing the Design Bugs Out, Design for Patient Dignity and Reducing Violence and Aggression in A&E projects: <http://www.designcouncil.org.uk/our-work/challenges/Health/>

3.4) Matthews, E. et al. (2011), 'Patient safety: Redesigning the emergency ambulance', World Health Design, Oct 2011: 46–50.

3.5) West J., Halls S., Coleman R., Lowe C. (2008), 'Resus:station – breathing life back into resuscitation', Conference Paper, Improving Patient Safety: <http://hhc.rca.ac.uk/cms/files/JwestResusStation.pdf>

3.6) West, J., Davey, G., Anderson, A., Matthews, E. and Myerson, J. (2012), 'Designing out medical error (DOME): Establishing an evidence base to design products and equipment that better support surgical wards', World Health Design, 5(4), 48–55.

4. Details of the impact

Building on the 2003 Design for Patient Safety report, a number of research projects at the RCA have had extensive impact on professional stakeholders and the wider public.

Understanding public service provision

It is estimated that one in ten hospital patients suffer some form of unintended harm, at huge cost to the NHS (WHO 2013). This situation is due in large part to traditional, discipline-specific approaches to design for patient safety. By researching and piloting a new multidisciplinary process through the EPSRC-funded DOME study and others, and by widely disseminating that

process, the RCA research as cited in Section 2 has contributed significantly to improving awareness and understanding the importance of the ways in which a key public service – healthcare – is provided.

The DOME project was widely disseminated to professional and public audiences via international symposia (including a 90-minute workshop at the world's largest patient safety conference, ISQua, 2010, and a keynote at The King's Fund annual conference 2011, London) and media coverage (including a feature on the BBC Health website <http://www.bbc.co.uk/news/health-16812134>). Five design innovations arising from the project were showcased in a touring exhibition funded by the European Commission, which visited the RCA Galleries, the Royal College of Surgeons Hunterian Museum, London and the Pontio Centre, University of Bangor, North Wales. Thought leaders and policymakers attended the private views and accompanying presentations. The impact on the awareness of the importance of design for patient safety is evident in an editorial article in the world-renowned journal The Lancet: 'The DOME project suggests a pragmatic approach to care that is efficient, patient-centred, safe and – in its own way – beautiful' [s5.1]. The Director of Museums and Archives at the Royal College of Surgeons confirmed that the exhibition engaged stakeholders and the public in future directions for surgery [s5.2].

A similar strategy was adopted for the redesign of the emergency ambulance, undertaken in collaboration with Imperial College, the University of the West of England, London Ambulance Service and NHS London. A full-size mobile demonstrator unit embodying research principles was selected and exhibited by the Design Museum as one of its Designs of the Year (2012). International media coverage for the project channelled vehicle manufacturer and healthcare provider interest to aid the translation into commercial reality. The BBC2 Culture Show (average 800,000 viewers) covered work at HHCD, using the project as an exemplar. There was also coverage on BBC London News and BBC World Health Show. This media coverage guaranteed public understanding of the importance of design for patient safety [s5.3].

The Design Bugs Out (2009), Design for Patient Dignity (2010), and Reducing Violence and Aggression in A&E (2011) projects have all affected various elements of public health service provision. They also received extensive media coverage, opened national debate about our health system and were widely adopted. The A&E violence solutions are currently being piloted by three UK health trusts [s5.4], and a design to improve the practice of regularly changing cannulae to reduce infections is widely available [s5.5].

Impact on practice and policy

A series of publications (from 2006 onwards) detailing best practice in the design of healthcare graphics, packaging and equipment was produced with the NPSA. These provided clear guidance to healthcare bodies including the Department of Health and primary care trusts, winning a Design Management Europe Award for 'best management of design in a public or non-profit organisation' [s5.6].

Beneficiaries include the design community (giving unambiguous and detailed guidance), procurement (articulating their requirements) and staff and patients (improving patient safety). An independent review of the NPSA's medication outputs (carried out by York Health Economics Consortium) stated that 'The design recommendations for packaging are attributed with having made a significant contribution to safer dispensing and administration' [s5.7].

Commercial benefit

The RCA's multidisciplinary approach to patient safety has sought to involve business and suppliers at the earliest stages of development. Research as cited in Section 2 has had

commercial impact, creating a revenue stream for manufacturers, eg a central design output of the DOME project is the CareCentre, a bedside design containing equipment needed to improve safety and hygiene. UK manufacturer Bristol Maid was involved in the latter stages of the research and now produces and sells the CareCentre, in use in UK hospitals [s5.8]. Clinical trials have shown that the design improves the quality and safety of care on the front line [s5.9]. Bristol Maid saw the value of opening up a new market and entered the design into the Building Better Healthcare Awards, receiving nominations in two categories.

Bristol Maid is also commercialising the HHCD's redesign of the hospital resuscitation trolley, the Resus:station. This has been through a clinical trial funded by the Wellcome Trust and has been proven to enhance clinical performance when attending a cardiac arrest [s5.10]. Manufacturers have also been closely involved with the Design Bugs Out and ambulance redesign projects – and the business of extracting economic value from the research continues.

5. Sources to corroborate the impact: Copies of all sources to corroborate the impact are available from the HEI upon request. All URLs last accessed: 22/11/13. All URLs last accessed: 22/11/13.

5.1) The Royal College of Surgeons Hunterian Museum exhibition and the article in The Lancet, Vol. 379 (18 February 2012): <http://download.thelancet.com/pdfs/journals/lancet/PIIS0140673612602554.pdf>.

5.2) Letter from the Director of Museums and Archives, The Royal College of Surgeons Hunterian Museum (28 February 2013).

5.3) Redesigning the Emergency Ambulance: media coverage (2012) included BBC Culture Show (9 March 2012); BBC World Health Show <http://vimeo.com/39057179>; and BBC London News <http://vimeo.com/39057178>.

5.4) Feedback from Newham Hospital on merits of the Reducing Violence and Aggression in A&E project.

5.5) <http://www.timestrip.com/peripheral_intravenous_cannula.php>.

5.6) Design Management Europe Award 2008: <http://www.dmeaward.com/portfolio/national-patient-safety-agency-winner-npo/; http://www.nrls.npsa.nhs.uk/resources/collections/design-for-patient-safety/> (and 2007 Honourable Mention: <http://www.dmeaward.com/portfolio/national-patient-safety-agency-hm-npo/>).

5.7) Lowson, K., Lanshear, A., Weingart, S. (2009), National Reporting and Learning Service – Review of the Outputs of the Safer Medication Team (York Health Economics Consortium), xiii, section 4.6.42.

5.8) DOME CareCentre: <http://www.bristolmaid.com/prodtype.asp?strParents=0,157&CAT_ID=357&numRecordPosition=1>

5.9) Anderson, O., Briggs, M., West, J., Vincent, C.A., Hanna, G.B. (2012), 'The CareCentre:™ A cluster-randomised crossover clinical trial', British Journal of Surgery, 99 (Suppl. 6), 52. Oral presentation to the Association of Surgeons of Great Britain and Ireland, Liverpool, UK, 11 May 2012.

5.10) Resus:station trolley trials: Paper has not yet been published, but the abstract is in three publications: Resuscitation (impact factor 4.29), Circulation (impact factor 10.89) and Anaesthesia (impact factor 3.01).