

# Conference Handbook

## Design4Health2013

This book of abstracts is produced as an aid for conference delegates; it is not a definitive publication of the conference proceedings.

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Art and Design Research Centre

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This conference is CPD certified.



## Welcome

## Design for life and for living

Welcome to the second Design4Health conference and exhibition, hosted by the Art & Design Research Centre and Lab4Living at Sheffield Hallam University.

This exciting interdisciplinary event presents another opportunity to reflect on how the disciplines of Design and Health might develop new ways of thinking and working, and how we might impact positively and sustainably on the social, economic and cultural factors within our communities and beyond.

After the success of Design4Health 2011 we are encouraged by the number of returning delegates for Design4Health 2013 and pleased to welcome for the first time academic researchers, policy makers and practitioners who will join us in challenging discussion and debate.

I would like to thank keynote speakers, delegates and organisers for their contribution to this event and sponsors for their generous support. I very much hope you enjoy your time in Sheffield during the conference, extending networks and inspiring you to extend this meaningful discourse.

Prof Paul Chamberlain

**Design Director - Lab4Living**  
**Head - Art & Design Research Centre**  
[www.shu.ac.uk/research/c3ri](http://www.shu.ac.uk/research/c3ri)

Lab4Living is an exciting collaboration between the Art and Design Research Centre and the Health and Social Care Research Centre at Sheffield Hallam University, users and consumers. Our aim is to develop environments and propose creative strategies for future living in which people of all ages and abilities 'not merely survive' but are enabled and empowered to live with dignity, independence and fulfillment. This creative partnership brings together research expertise spanning the fields of the fields of design, human factors, health, rehabilitation, engineering and ergonomics.

Further details can be found at [www.lab4living.co.uk](http://www.lab4living.co.uk)

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For more information on our themes or projects please go to [www.clahrc-sy.nihr.ac.uk](http://www.clahrc-sy.nihr.ac.uk).

  
**National Institute for  
Health Research**

**CLAHRC for  
South Yorkshire**

## User-centred Healthcare Design

## KT-EQUAL

UCHD stands for User-centred Healthcare Design. UCHD is a design process that works alongside service users and providers to understand their experiences and stories and, together, find ways to improve things. UCHD is also the name of the team of researchers, designers and healthcare professionals who use this technique. We work within the NHS, and with NHS partners to find more innovative design methods which the NHS can use as part of its ongoing practice. We're interested in how thinking about, and doing, design can help in three areas:

- Improving existing services
- Designing service innovations
- Designing strategic change

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KT-EQUAL is a national research consortium created in 2009 and funded until 2013 by the UK's Engineering and Physical Sciences Research Council. We set out to show how ageing and disability research can make a difference to people's lives.

We know that the challenges we face transcend traditional scientific boundaries. We also recognise that older and disabled people and their carers have knowledge and expertise which is crucial to developing solutions that improve quality of life.

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### Creating games that promote Physical Activity (PA)

*Keywords: Games, Physical Activity, Obesity, Engagement*

Obesity is a serious problem; young people do not reach daily levels of PA recommended by government, regardless of Physical Education (PE) lessons. There is “not enough strenuous activity in PE school (...) [and] teachers tend to talk too much in sessions (...). The government (...) will put competitive sport back at the heart of school life” reports Richardson (Richardson, 2013). What if the strenuous PA was to be done outside of PE? What if pupils had the choice to decide whether to do competitive sports, to be part of a group or not? What if PE lessons were actually focused on having fun and playing games?

This interdisciplinary Design led research aims to find a way to tackle the ‘intention-behaviour gap’ (Sheeran, 2002) within the Theory of Planned Behavior (Ajzen): even when people have intentions of changing behaviour, only 53% will actually implement these intentions. Theories enabled to find out what the motivational factors for behaviour change are, and the practice to understand how these can be manifested to engage young adolescents.

Using design methods enabled to embed this knowledge into a card and board games aiming to promote PA, specifically Moderate and Vigorous levels & Non-Sedentary behaviours (Start Active, Stay Active, 2011). The idea is that if players engage with the fun of the games they will do PA, core component of the games: according to the players’ PA levels different currencies are given, increasing the chances to win the games.

This paper reports a Design evaluation of the games, tested in a secondary school over 6 weeks, with 15 participants, as part of their PE lessons. It investigated the engagement level of the participants, their PA levels, and the poten-

tial of the concept. The games were less engaging than expected but the study also attempted to explain why and how engagement could be improved.

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## The Good ward: a support tool for better planning and decision making when healthcare facilities are being planned and built

*Keywords: ward design, healthcare design, hospital, planning tool*

“The good ward” is a web-based tool that has been developed in the project with the same name and initiated by the Program for Technical Standard (PTS) in collaboration with the Centre for Healthcare Architecture at Chalmers University of Technology in Gothenburg. PTS is a group of several Swedish county councils established shortly after health care decentralization and liquidation of the Central Standard for Healthcare Construction (SPRI). Program for Technical Standards (PTS) is aimed to effectively administer and continually improve delivery of efficient and sustainable healthcare buildings.

The purpose of this article is to describe a new practical tool that make it possible to reach both practical knowledge and current research results.

“The good ward” consists of knowledge based on research, good praxis and visualized proposals for the solutions to the design; they are merged together in an illustrative overall. The idea is that the tool is to be used as a general knowledge and inspiration basis for discussion in the collaboration process on each particular project. Visualizations show the consequences of different solutions and how research-based knowledge can be worked into. It is an open material where standard room and proposed organizational ward should be regarded as illustrative rather than complete solutions to copy directly.

The project “The good ward” has been developed in collaboration with several stakeholders - health care professionals, local planners, project managers, architects and researchers from different disciplines. We have worked cross-professional in dialogue form together to develop ideas and proposals for solutions for a good ward design. The consolidated material has been processed

and remitted to the PTS group and then discussed at a final seminar. Health care buildings are important and a long-term social investment, and should as far as possible be based on best available knowledge.

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### Task analysis and design concepts for improved crutches

*Keywords: crutches, walking aids, physiological measurements, assistive devices, mobility*

Crutches are walking aids used to counter mobility impairment or an injury that limit walking ability. While extensive effort is being aimed at developing assistive devices for disabilities, much less is directed at designing crutches for people with short-term needs, and crutches still lag behind in both design and technology. Our study focus at casual users, forced to use crutches after an injury (e.g. ski, car accident, falling) or operation.

#### Aims

- Analyse difficulties in using crutches by temporary users.
- Define solutions and build a prototype of improved forearm crutches
- Test experimentally the improved prototype using functional, s subjective and objective parameters.

#### Methods

- a. Anonymous questionnaires for assessment of problems in crutches use.
- b. Building crutches prototype based on questionnaire results.
- c. Prototype testing in experimental setup (N=20, healthy volunteers, female and male, 18-48 years); Endurance test of 2 minute walk with crutches and ascending and descending 12 stairs.

Measures: Walking speed, physiological measures of stress (EMG, GSR, Temperature,  $\Delta$  Heart rate), Pressure (Grip) and Vertical Acceleration measured with wireless miniature sensors attached to hand and crutches handle, and satisfaction and preferences questionnaire filled at the end of each experiment.

The tests were performed twice by each subject with regular and prototype forearm crutches at a random order. Data were subjected to repetitive ANOVA.

#### Results

Walking speed was significantly faster ( $P < 0.05$ ) with the prototype crutches, and no change on stairs. Physiological measures: EMG, GSR, and acceleration were significantly improved with prototype crutches. No significant differences were found in subjective measures between two crutches.

#### Discussion

Our interdisciplinary approach using objective and subjective measures was found to be useful and is suggested as a model for testing new designs of home accessories in the medical and Life Style products field.

## Moving myself: insights for future patient experience journeys in orthopaedics

*Keywords: industrial design research, patient experience, multiple case study, orthopaedics*

This paper reports aims, approach and results of an exploratory study into the patient experience in health of joints (e.g. hip replacement). Treatment is improving, yet as hospital stays get shorter specialist-patient communication is not optimal (e.g. Jimenez, Romero and Keyson, 2011). The study aims to innovate on the patients' pathway (Zander & Bower, 1987) and identify salient communication opportunities. The project is a research collaboration between a hospital orthopaedic department, an orthopaedic supplies manufacturer and a university industrial design faculty.

In a multiple case study approach (Runeson & Höst, 2009) various stages of patient experience journeys were addressed. 20 industrial design master students investigated different contexts related to joint health through qualitative interviewing, observational research and design prototyping research (eliciting people's responses to various possible interventions). Content analysis of the 20 cases revealed five main drivers for the development of future patient experience journeys in orthopaedics:

This paper describes the drivers that emerged and illustrates them with examples from the diverse contexts. In a further step of the project, these drivers will be used to define areas of intervention and design a future set of patient experience journeys.

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Driver	Implications for patient experience journey
<b>Experience of Time</b>	Detect and support critical points in patients' journey by probing their experience.
<b>Experience of Body</b>	Generate information patients can use to understand and adapt their body. E.g. direct feedback on muscle activity.
<b>Knowledge</b>	Forms of knowledge presentation are needed that help people adjust their behavior and also provide feedback to specialists.
<b>Behaviour</b>	Specialists can assess the effects of behavior change through metrics to monitor and adapt treatment. For example, biofeedback on posture.
<b>Context</b>	Social interaction is important in patients' behavior adaptation: it motivates, corrects, commits and helps. Treatment and advice options should probe for this.

Runeson, P & Höst M 2009, Guidelines for conducting and reporting case study research in software engineering, *Empir Software Eng*, no 14, pp 131–164.

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## What makes technology based start-ups or small medium enterprises (SMEs) grow in the area of health care?

*Keywords: Health care, Technology based start-ups, Small medium enterprises, Innovation, and Implementation*

Health care area is known as being 'unfriendly' to Small Medium Enterprises (SMEs) (Porter, 2006). An underlying reason is that innovation is often initiated and used in a distinctively complex environment (Porter 2004, Herzlinger 2006, Christensen 2009). 'Critical success factors (CSFs) are the things that must go well to ensure success for an organization' (Boynton and Zmud, 1984:17). The aim of this study is to determine the CSFs of technology based SMEs and provide guidance to project/design managers for successful implementation of their new products in the health care market.

Firstly, an overview of literature on success factors and innovation was drawn up. Subsequently, in-depth interviews were conducted with six representatives of techno-based SMEs and with two representatives of large-scale companies in order to identify relevant success factors for SMEs and to classify the industry related success factors. Moreover, for validation, the factors were cross-examined by informal talks with different stakeholders like doctors, venture capitalists etc.

A literature review of Van der Panne et al. is used as a basis for the results (Van der Panne et al., 2003). Critical discourse analysis of the interviews showed six critical success factors for SMEs in the health care sector; 'experience', 'R&D team', 'concentration of target market: market introduction', 'innovation strategy', 'the relative price' and 'timing'. The success factor 'compatibility of the product' was found as an important factor for adoption in the health care market and added under the product related factors.

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## Adorning Health

*Keywords: wearable health devices, adornment, contemporary jewellery*

This paper describes research being undertaken that aims, firstly, to investigate the role of co-design in the design of wearable medical devices, (specifically orthoses for upper limbs); and, secondly, to explore how contemporary jewellery design practice could influence such design. At present, upper limb orthoses (splints and supports) are designed and prescribed by orthotists, hand therapists, and occupational therapists with only the biology and pathology being taken into consideration. People wearing these devices can often feel stigmatised by wearing them. This leads to poor patient adherence, and can also impact on their psychological and social wellbeing.

The research intends to investigate whether involving the wearers of medical devices and wearers of contemporary jewellery in the design process could offer insights into how future devices could be designed that take into account the supra-functional needs of their wearers. Furthermore it is hoped that a new methodology is developed for wearable medical devices, through the use of both contemporary jewellery design and co-design methods and philosophies, thereby developing a new hybrid artefact: the people-centric health device.

The generative design research project (delivered within an Action Research framework) aims to recruit six participants, who have Hypermobility Syndrome, (a chronic connective tissue disorder, causing joint dislocations and chronic pain), and six contemporary jewellery wearers; and intends to recruit via social networking sites and informal social meetings. Through the use of social media; sensitising packs, group workshops and virtual meeting spaces,

data is then generated which will be used to inform and inspire future design work.

Analysis of the Data generated from the research outlined here will draw upon established methods such as the DIKW scheme and thematic analysis. Prototypes and finished artefacts are expected to be fabricated through CAD/AM tools.

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**Alzheimer's – What remains?**

*Keywords: Co-Design, User-centered design, Emotion, Dementia disease*

'What remains?' is a design research project contributing to a larger investigation into how game elements can be used as motivational triggers to stimulate Alzheimer patients.

The severe health condition caused by Alzheimer's disease wears away the ability to speak, move or even eat. The difficulties in communication and understanding between elderly Alzheimer patients, care givers and elderly relatives, provokes a deep state of anxiety and aggression in the elderly's everyday life. Furthermore, Alzheimer patients regress together with their memory, and past events become their present reality.

By instigating a collaboration with a social enterprise specialized in the field of dementia care, support has been created for a more in-depth cooperation between designers, patients, caregivers and elderly with Alzheimer's relatives.

The research has been conducted from the starting point of observing patients' daily life in care homes. This approach stimulated a necessity to investigate new methodologies capable of supporting a communication with patients. Interviews with caretakers, and especially with the elderly's relatives, worked as a base onto which the patients' life stories could be constructed, through pictures and other information.

The elderly's memories became the connection through which designers could communicate with the elderly in face-to-face dialogues. Personal pictures and photos of everyday objects were perceived by each patient as a translation of their thoughts. This approach was not only fundamental for

the designers, stimulating interaction with the patients, but it also provided caretakers and the relatives with a new understanding of the reasons behind specific behaviors of the patient.

As a result, this research approach has ended in a story telling game tool that helps caretakers and elderly's family members to constructively interact with this disease. This new tool can therefore be considered as an alphabet that generates images to support the work of caretakers and elderly relatives.

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## Participation in healthcare environment engineering... the story so far

*Keywords: healthcare environments, participatory design, wellbeing, design research*

Participation in Healthcare Environment Engineering (PHEE) is a major five-year EPSRC-funded research programme, launched in 2010. We aim to understand how design can improve people's experiences of healthcare environments, to positively affect health, wellbeing and healthcare-effectiveness. This builds upon the evidence base that the environment can affect health outcomes (Ulrich 1991) and that improving experiences of healthcare environments is a central research theme (e.g. Bate and Robert 2006; 2007) and focus for policy discussions (DH 2010). We use, develop and evaluate (digital and non-digital) methods for involving people in design and explore the relationship between design and its impact on people.

Our multi-disciplinary team includes design, environmental psychology, ergonomics, engineering, computer-science, business and health. We work directly with the NHS, health professionals, architects, and designers and we engage with policy-influencing bodies and research councils. To date we have tackled a range of projects involving diverse groups of users across a wide spectrum of healthcare environments. We have designed and evaluated a staff co-design process to improve restoration in an NHS Emergency Department, and worked collaboratively with the NHS and interior designers on a wellbeing centre in a major London hospital. We have interviewed healthcare architects about design quality, interviewed GPs about online patient feedback, investigated how to improve the soundscape of a cardio-thoracic ward, and conducted lab-based evaluations to uncover preferences for healthcare waiting room design. We have also examined the relationship between care home design and depression in residents and explored the role of the domestic home environment in supporting the adoption of telehealth.

Now halfway through our program, in this presentation we reflect on the shared learning emerging from across the different strands of our programme, and on the challenges of conducting design research with the NHS in its current state of change. Finally, we propose a roadmap for our future research direction.

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## A user-centred design approach to electronic mobility devices for the visually impaired

*Keywords: user-centred design, assistive technology, visual impairment, mobility*

With the rapid rate of advancements in navigational and object recognition technology, many types of electronic mobility device have been developed for the visually impaired (Roentgen et al., 2008). The devices can be categorised into three main categories: hand-held devices that are aimed at obstacle detection and orientation of obstacles, to ascertain a clear path (e.g. Ulrich & Borenstein, 2001); devices that are essentially navigational systems (e.g. Katz et al. 2012); other devices that are used to communicate direction, distance, and/or a 'map' of the surroundings (e.g. Molton et al., 1998; Filipe et al., 2012). However, most of these either remain in the prototype stage and fail to enter the market, or are unpopular with users, largely due to the design approach being technology-driven as opposed to user-centred. This study has investigated the effectiveness of such devices and the needs of visually impaired people via: a review of literature; conducting focus groups and interviews with users; and circulating questionnaires to relevant healthcare professionals. The study aimed to inform the development of a new device, that uses sensors and actuators attached to headwear (see Figure 1 - note this version was originally aimed at fire officers in smoke environments).

The findings recognised a requirement to detect and communicate physical barriers that visually impaired people face, particularly when outdoors. User needs varied, but commonly highlighted factors included reliability, simplicity of use and training, cost, confidence and not masking other senses. The healthcare professionals had a varying attitude to new technologies with many preferring traditional solutions. They also highlighted the need to tailor any solution to the needs of their clients. The functions, capabilities, and inherent advantages and disadvantages of different technologies have been scrutinised

with regard to user needs and the prototype will now be developed further, with these issues in mind.



Figure 1: Early prototype device to aid mobility for the visually impaired

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## The SCP model: A three dimensional methodology for understanding, profiling and evaluating mental healthcare architecture

*Keywords: mental health architecture, evaluation, normalization theory, SCP model*

### Purpose:

Architecture for community based facilities for acute mentally ill people predominantly borrowed vocabulary and methodologies from neighboring fields or relied to experimentation in order to accommodate the uneven and varied development of community psychiatry in the Western world. Mostly, the model used was normalization theory, a linear model of understanding, designing and evaluating healthcare facilities, originally developed for learning disabilities. This research supports that the domesticity-versus-institutional concept suffered from a number of limitations, especially since it was not originally constructed for acute mentally ill people.

### Methodology:

To develop a methodology that fits mental healthcare architecture, a three-dimensional, comprehensive theoretical model has been created. The methodology puts together the dialectics behind mental healthcare: the idea of dangerousness that includes the danger of harm and self-harm, the idea of disability as a result of the illness itself or as an effect of institutionalization and the idea of social reintegration as expressed by clients reclaiming their role in decision making.

### Findings:

The three parameters stated above are analogous to the three prevailing models of mental health care -- the jurisdictional, the medical and the psycho-social-- presenting an integrating three-dimensional grid of the various mental healthcare regimes and architecture. Those dimensions/parameters were safety and security, those of competence and of personalization and choice.

The model created was named SCP from the acronyms of the parameters. Due to this flexibility, the model can be used for evaluating and defining the therapeutic environment of the facilities when combined with evaluation tools such as checklists, to highlight any limitations regarding the domestic character of those environments.

**A Dual Verification Model for Designing Home Use Medical Devices**

*Keywords: home use medical devices, inclusive design, design process*

Increasingly, medical devices are being used by lay people outside the clinical environment (FDA, 2010; Gardner-Bonneau, 2011). These are frequently called home use medical devices (HUMD). A HUMD is defined as “a medical device intended for users in a non-clinical or transitory environment, is managed partly or wholly by the user, requires adequate labelling for the user, and may require training for the user by a licensed health care provider in order to be used safely and effectively” (FDA, 2010).

The process of designing a HUMD differs from consumer products, because although these devices are used by lay people, they are medical devices which are safety critical and subject to regulatory requirements (Gupta, 2007; FDA, 2012). On the other hand, as lay users differ significantly from professionals in terms of their needs and capabilities, the design process of HUMD requires a different approach than medical devices designed for professional use (Wiklund & Wilcox, 2005). Despite many generic design process models (e.g. Pugh, 1991; French, 1999; Stanton, 2004; Clarkson et al, 2007; Pahl et al, 2007) and guidance and models for medical device (e.g. FDA, 1997; Alexander, et al., 2001; Alexander & Clarkson, 2002), little information was identified regarding the design process for HUMD.

In order to support designers, a new model was developed which involves five stages, i.e. discovering the needs, task clarification, design, testing and final validation. The model highlights the importance of understanding regulatory requirements and lay user requirements, and also emphasises the validation and verification activities. It is called the “Dual Verification Model for Designing Home Use Medical Devices” (Figure 1).

This paper will discuss how the regulatory requirements and lay user requirements were captured, how the model was developed, and what potential value it might have to designers.

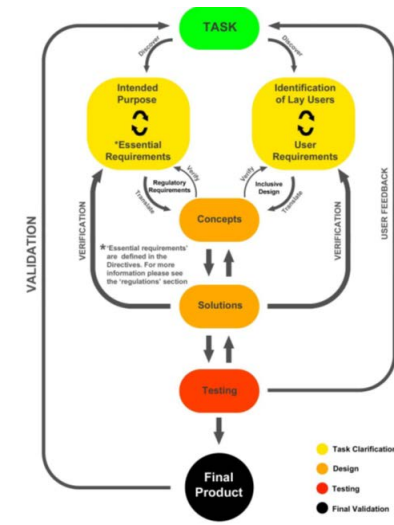


Figure 1: The ‘Dual Verification Model for Designing Home Use Medical Devices’

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## Towards better measurement of joint stiffness in people with Rheumatoid Arthritis

*Keywords: Range of Motion, hand evaluation, rheumatoid arthritis, goniometric measurement, data glove*

Rheumatoid Arthritis (RA) is characterised by synovial inflammation resulting in pain, stiffness, swelling and deformity of the affected joints. The Disease Activity Score (DAS) is commonly used to measure RA disease activity (Van der Heijde et al. 1993), but this only quantifies joints that are tender and swollen rather than measuring stiffness. The symptom of joint stiffness is 'the perception of difficulty in moving a joint'. Simply recording the duration of stiffness in the morning does not reflect its intensity or its impact on movement and function. Although goniometers can be used to measure the Range of Motion (ROM) in each joint, this is laborious to perform and rarely recorded in the clinic setting. Since joint stiffness is often linked with disability, awareness of this problem will help to focus treatment strategies.

Data gloves capable of measuring finger joint kinematics can provide objective and dynamic information on joint movement which has the potential to help measure joint stiffness in an objective and clinically relevant manner.

Our work initially focused on using commercially available virtual reality gloves - the 5DT (Fifth Dimension Technologies 2004) and X-IST (Inition 2013). We developed a simple visual interface for the patient and a more detailed view for the analyst. Although this improved the ease of calibration and reproducibility of the data it was still time-consuming due to the need for frequent calibration. We therefore developed a bespoke dataglove using multiple accelerometers, bend sensors and force sensors to eliminate the need for calibration and offer improved accessibility to users with arthritis. We will be using these gloves in a clinical trial to study joint stiffness and movement in patients who have RA.

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## Data glove design improvements for finger joint Range of Motion measurement

*Keywords: data glove design, Range of Motion, hand evaluation, rheumatoid arthritis*

Data gloves are capable of measuring finger joint kinematics and can provide objective Range of Motion (ROM) information useful for clinical hand assessment and rehabilitation. Our work focuses on an intelligent system to analyse ambulatory movement of patients with Rheumatoid Arthritis (RA) and particularly focuses on the measurement of joint stiffness. The Disease Activity Score (DAS) measures RA disease activity, but it quantifies pain rather than measuring stiffness (Van der Heijde et al. 1993). Goniometric measurement quantifies static ROM, but it is laborious to perform. This system has been developed using 5DT (Fifth Dimension Technologies 2004) and X-IST (Inition 2013) standard off-the-shelf virtual reality gloves. Both gloves are designed to fit specific hand sizes. However human hands are not identical, resulting in the need for calibration of the gloves for each user. Patients with RA can also have limited ROM. This affects the glove calibration process and angular accuracy.

Development of a new bespoke glove containing multiple accelerometers, bend sensors and force sensors eliminates the need for calibration and offers accessibility to users with limited ROM. This glove has been designed using flexible PCB technology. Implementation of a meander-type PCB design between each finger joint greatly increases overall PCB flexibility.

Figure 1 provides a comparison of commercially developed data gloves to our glove. Systems are examined for the number and type of sensors used and their placement. Immediately noticeable is the inclusion of accelerometers and bend sensors on each finger joint to improve angular accuracy.

Physical attributes of the glove structure have been amended to allow easier donning and doffing and to protect glove circuitry from unintentional stretching. Figure 2(a) and Figure 2(b) demonstrate design concepts to facilitate easy glove removal.

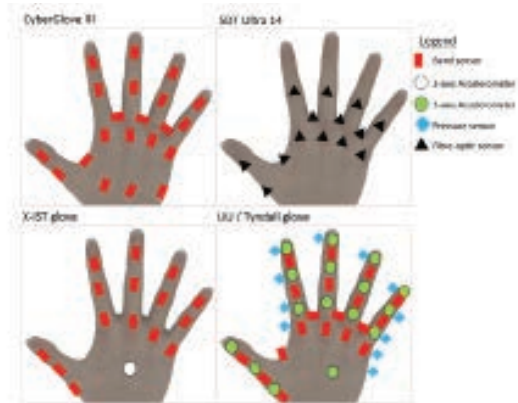


Figure 1: Graphical comparison of current state-of-the-art data gloves with the new glove. The glove contains bend sensors and accelerometers over each finger joint for dual movement determination. Additional force sensors demonstrate its suitability for rehabilitation.

Physical attributes of the glove structure have been amended to allow easier donning and doffing and to protect glove circuitry from unintentional stretching. Figure 2(a) and Figure 2(b) demonstrate design concepts to facilitate easy glove removal.

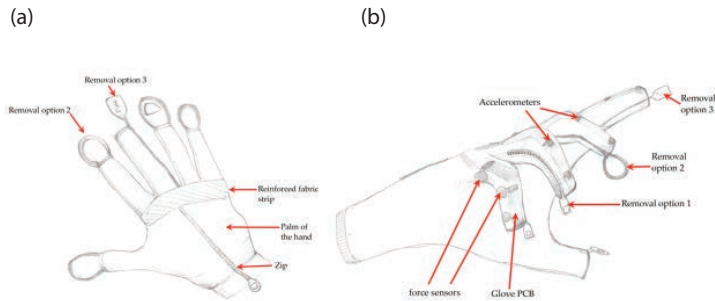


Figure 2(a): Sketch demonstrating design concepts implemented in the new glove design.

Figure 2(b): demonstrates the options considered to improve glove removal.

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## Designing for 'meaningful' patient experience using Xperience-based designing (XbD): A new twist on a familiar approach

*Keywords: Experience-based Designing, patient experience, hermeneutic phenomenology, meaning-filled design, SEEing process*

A major reform program has been instigated within the Danish Health system aimed at establishing Super-hospitals to replace smaller facilities (GE, 2013). This revolutionary change is expected to be achieved by reducing both the number and duration of patient stays in hospitals. Realising this goal requires heavy reliance on welfare technology solutions currently being developed that promote outpatient self-management and home-care. In the rush to accomplish these admirable goals the patient experience of existing and proposed services and products in most cases, has been largely overlooked. In this paper we present ways to address this gap with a number of new twists on established Experience based Design practices (EbD) that have gained popularity in the UK and other parts of the world (NHS, 2013; Cain, 1998).

At the Experience-based Designing Centre (XbDC) we are currently working within the larger Danish Patient@Home research and development project. We base our design perspective on deep phenomenal understanding of patient experience beyond what is said and immediately observed, working only with the meaning level in data. We utilise deep dive embodiments (always with an edge); standard observational/interview techniques (with a technological twist) and hermeneutic meaning analysis methods (The SEEing process - Coxon, 2008) that elevate the deep meaning structures within field data. Based on the understandings so produced, we 'design' a process for sharing insights (experiential dialogue) with various stakeholders (patients, therapists and technology manufacturers) so as to begin designing activities such as co-creation workshops.

Applying such methods has resulted in new and useful outcomes in projects investigating patient experiences such as disability and sexuality; home rehabilitation of paralysis patients; long-term patient monitoring; chronic

medication supply and use; living with visual impairment – these projects, the application of new methods and their outcomes are described in this paper. The information presented will be immediately helpful to practitioners who value the patient experience as an important aspect of designing-4-health in terms of products, services and systems.



Figure 1: 'Marias story' from Disability and Sexuality project, Design4Health 2011

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**Adaptive Daily Rhythm Atmospheres for Stroke Patients - A patient evaluation**

*Keywords: healing environments, stroke, patient room, user evaluation*

This paper addresses the evaluation in a lab setting with former stroke patients and their spouses of an in-patient environment that supports patients, family, nursing staff and medical specialists during the recovery process of neurology patients and especial patients recovering from a stroke (Daemen, et al., 2011). We describe the methods that were used to evaluate the Adaptive Daily Rhythm Atmospheres (ADRA) concept. ADRA supports the daily rhythm of the patient by generating dedicated multisensory atmospheres for different phases throughout the day (Flinsenberg, et al., 2012). Where needed, the atmosphere can adapt to specific interrupts and visits, for example, when a doctor is visiting (PhilipsResearch, 2011) (see Figure 1 ).

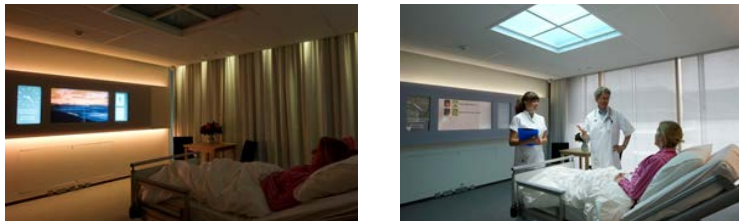


Figure 1 - Left: Going to bed Phase - Right Clinical Phase - doctors round

The goal of our patient evaluation was to gauge expectations against the different phases of the ADRA concept both qualitatively and quantitatively to determine if the different phases are useful, usable and desirable for the patient. Six former stroke patients, recruited through the national stroke center of the Netherlands, and their spouses were invited to the lab for a user evaluation of

1 hour where they experienced every phase of ADRA. Then we asked them for all the different phases of ADRA, if this phase would have helped them, during their stay in the hospital. They were asked to give a score on a 10 point Likert scale, especially designed for stroke patients (Daemen, et al., 2007)(see Figure 4). Next an interview took place with the patient and their spouse.

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Figure 2 - 10 point Likert scale designed for stroke patients

The results show that the patients believe that most of the different phases of the ADRA concept would have helped them while being in the hospital with the waking up phase as most positive (mean 8) (See Table 1 Results User studyTable 1).

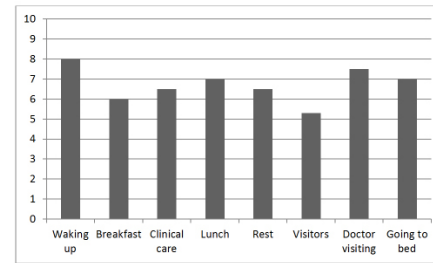


Table 1 Results User study



## Open Design and Cystic Fibrosis: Enabling Participation in the Design Process

*Keywords: open design, cystic fibrosis, participatory design, chronic disease*

This paper describes the results of a project to collaboratively design a medication dispenser using open design. This work explores the benefits of open design (open-source design) in the conception (and development) of medical products. Described here is the first attempt to tackle some of the issues facing the implementation of open design in the field of medical product design where a recognised move to 'open' working practices & innovation is needed (Barrett, 2010); as is the imperative to more fully include users in the development process (Karlsson et al., 2011; Martin & Barnett, 2012; Money et al., 2011; Owens et al., 2011; Shah, Robinson, & AlShawi, 2009). There are moral and pragmatic reasons to include people in the design process (Carroll & Rosson, 2007), especially true for medical products. Presented are the results of online collaborative design work with a geographically diffuse group of people with Cystic Fibrosis; the prototype, and the open design implementation developed and used.

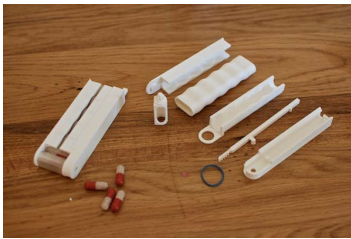


Figure 1: Medication dispenser; one of the open-source medical products developed

The project prototyped a wholly virtual meeting of people, empowering them to conceive and develop their own products based on their own lived experience of Cystic Fibrosis. The project involved the development of a community of people with Cystic Fibrosis, supported through tools and online workshops with a designer,

within an Action Research methodology. It is expected that open design has a positive contribution to make in the field of medical product design more widely, despite the very real questions surrounding its implementation. This research demonstrates the benefit open design can bring to (in particular) early stage concept generation, as well as continual evaluation and the fostering of innovation by leveraging the knowledge and action of lead users (Von Hippel, 1986). However, also included is an analysis of the regulatory, implementation, and economic factors that pose challenges.

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## The HIP-HOP Flooring Study: Helping Injury Prevention in Hospitalised Older People

*Keywords: falls, injuries, flooring, hospitals*

**Background:** Falls disproportionately affect older people, who are at increased risk of falls and injury (Cameron et al., 2012). This pilot study investigates shock-absorbing flooring for fall-related injuries in wards for older people.

**Methods:** We undertook an interdisciplinary, mixed methods study comprising: (1) A non-blinded cluster randomised trial in eight hospitals in England between April 2010 and August 2011. Each site allocated one bay as the 'Study Area', which was randomised via computer to intervention (8.3mm thick Tarkett Omnisports EXCEL) or control (2mm standard in situ flooring). The intervention period lasted one year. Anybody admitted to the Study Area was eligible. The primary outcome was fall-related injury rate. Secondary outcomes were injury severity, fall rate, and adverse events; (2) Interviews with patients, visitors, healthcare and domestic personnel across all sites; (3) Shock-absorbency and slipperiness assessments of the floors over time; (4) A cost-effectiveness analysis.

**Results:** During the intervention period, 226 participants were recruited to each group (219 and 223 were analysed in the intervention and control group respectively). Of 35 falls (31 fallers) in the intervention group, 22.9% were injurious, compared to 42.4% of 33 falls (22 fallers) in the control group (injury Incident Rate Ratio (IRR) = 0.58, 95% CI = 0.18 to 1.91). There were no moderate or major injuries in the intervention group and six in the control group. The fall IRR was 1.07 (95% CI = 0.64 to 1.81). The new flooring is potentially cost effective depending critically upon whether the flooring increases faller rates. Staff at intervention sites raised concerns about pushing equipment, documenting one pulled back.

**Conclusions:** Further research on the impact of flooring on faller rates is required and should assess flooring with better 'push/pull' properties. We estimate a fully powered trial will need 33,480 to 52,840 person bed-days in each study group.

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## Design of a safer Radiotherapy interface

*Keywords: interdisciplinary working, chronic/long term conditions, patient safety, evidence-based design, GUI*

100,000 people undergo radiotherapy in the UK annually (WHO 2008). Errors are estimated to occur in 40 out of 100,000 courses in the UK, and can be fatal (Donaldson 2007). Research indicates that there are a range of human factors issues affecting the safe delivery of radiotherapy, including the design of the linac machine interface (Chan et al. 2010).

Immediately prior to the delivery of a radiation dose, two radiotherapists working together check that the parameters displayed on the linac's graphical user interface (GUI) correspond with the patient's paper prescription to ensure that the dose is correct. Research indicates however, that not all errors are prevented, and that the checking process is error prone (Toft 2005).

This research aims to identify the causes of radiotherapy checking errors; of particular interest is the role of the GUI design. Semi-structured interviews were conducted with radiotherapy staff and students to understand the checking process, determine likely sources of errors, and identify design features of the current GUI which may impede effective checking.

Thematic analysis of the interviews indicated a number of usability issues with the current interface designs. There are 3 main software packages used in the UK which have similar issues in terms of dense presentation of information, and limited grouping or highlighting of key information. The interviewees also highlighted that the checking process can quickly become routine and automated leading to lapses of attention.

The findings have been translated into a design specification which makes recommendations regarding a simpler and more intuitive layout. It is suggested that the GUI design could invoke a more active checking process to increase operator attention and the likelihood of error detection, thereby increasing patient safety. The next stage of research will experimentally compare alternative interface designs to determine the optimum design for patient safety.

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## Invention, Adoption and Diffusion: Older People as Pioneers

*Keywords: older adults, technology, adoption, diffusion*

COBALT (Challenging Obstacles and Barriers to Assistive Living Technologies) is a multidisciplinary research project that is developing new ways of working with older adults, service providers and commissioners to encourage adoption and diffusion of Assisted Living Technologies (ALT's). COBALT's research goals are to work with end-users in all three groups to draw out their experiences and perceptions and feed these back to the ALT industry. The end-users are at the heart of the process and we have developed a range of approaches to working with them, including our 'Pioneer Group' programme.



Figure 1: St Andrews Pioneer Group introductory session

The 'Pioneer Groups' involved older participants in two research sites (St Andrews and Sheffield) taking part in a ten week programme of practical activities addressing a different part of the technology adoption and diffusion

process each week (Wang, et al., 2010). This included design, creating business models and identifying technology champions. The St Andrews 'Pioneer Group' 'invented' a novel ALT based on needs they identified. This took the form of specialised floor lighting to light their way to the bathroom in the night; thus preventing falls and injuries.



Figure 2: St Andrews 'Pioneer Group' design session

This 'product' was mocked-up and became the foundation upon which the other sessions were built. The Sheffield group re-designed an ALT created in another research project NANA (Novel Assessment of Nutrition in Ageing) (Astell, et al., 2010). NANA uses sensitively-designed touchscreen technology to identify individuals at risk of under-nourishment and improve targeting of interventions. This group also followed a ten session plan, with a focus on the process of getting NANA to market.



Figure 3: Sheffield 'Pioneer Group' Technology Champions session

The participants 'pioneered' these new techniques and helped steer the groups, making them central to the research process. COBALT has thus gained new insights into the behaviour of older adults around technologies which can help them to live more active, independent lives.

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## A usability study for an innovative dementia aid: using co-creation to engage participants in the design process

*Keywords: usability, co-creation, participant experience*

Previous studies have indicated that people with dementia can benefit from assistive devices which orient them to time of day and time-specific tasks (Topo et al., 2007). A usability study was carried out by HDTI at Coventry University to determine user needs for an innovative dementia product, a modified digital frame using video reminders (ReminderBot).

11 carers of people with dementia participated in a focus group with a prototype of the ReminderBot. The group were positive about the concept of the product and the co-creation tasks generated a number of suggestions as to how the product might best be developed, such as orienting sounds when an alert was about to play, an integrated camera, and the addition of time and date information. A number of methods were used to capture the data including flipcharts and worksheets. For one activity participants were given a blank frame to customise in a way which would fit their needs, which generated a good degree of consensus and a mix of qualitative and quantitative data by allowing tallies of suggested improvements to determine popularity, as well as the opportunity for less vocal participants to make notes or drawings during the task.

These techniques allowed a vast amount of data to be collected relative to a traditional focus group. The session was energetic and participant engagement was consistently high considering the emotional nature of the subject. In more traditional focus groups we have found that attention will drift over the course of the session, however this was not the case when using co-creation tools. The project provides strong evidence that co-creation techniques can be used effectively in usability studies in a way which is inclusive for a wider range of

participants than a traditional focus group, and to capture more data in the same time period.

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## Design Outreach: a design response to clinical needs and opportunities

*Keywords: clinicians, hospital, insights, prototyping, creativity, challenges*

There is recognition in the UK National Health Service (NHS) that new and innovative solutions to enduring health problems are required. Innovation, Health and Wealth (DoH 2011) describes the need for a radical change in response to how services are delivered and a design-led approach offers a potential way to facilitate this.

This paper will reflect on an innovative project to critically explore modes of interaction between designers, NHS staff and patients.

The design team was granted unprecedented access to the NHS through their involvement in User-centred Healthcare Design (UCHD), a National Institute for Health Research (NIHR) funded project. For six months between September 2012 and February 2013 the designers engaged with clinical staff to respond to and better understand their perceived clinical needs.

Engagement took the form of a series of case studies, which were initiated by clinical staff. These case studies ranged from evaluating walking frames with physiotherapists to the 'wicked' problem of increasing dietary and fluid intake on a ward for elderly patients. The designers followed a design research process and were able to demonstrate a wide range of alternative responses to the initial challenge and help staff move from a problem focused to a solutions focused approach.

The paper will present a selection of the case studies, the process and outputs from the engagement and reflections on this unique model of engagement. Initial reflections are that, unsurprisingly, the NHS is a challenging environ-

ment in which to effect change and that some clinicians had a preconception of design as a service to quickly solve complex problems, without an understanding of the creative thinking processes and reflection inherent in creative design practice. However once clinicians were exposed to the design process they could quickly understand the power of the approach and see how it might enhance their own practice.



Figure 1: Designers shadowing a Dietician on a ward for post-operative elderly patients, Sheffield Northern General Hospital

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## Dignified Spaces: deinstitutionalising spaces in the heart of the clinical environment

*Keywords: dignity, art and design, families and carers, conversations*

The Therapeutic Design and Art Strategy for the New South Glasgow Hospitals has a key focus on patient dignity and participation. This paper provides an action research based reflection exploring the process of creative practice and innovation within a major capital healthcare context focused on the project Dignified Spaces which addresses some 70 rooms variously labelled quiet, relatives or family rooms in the new hospital buildings.

The key research question is “What does dignity mean to users and how that inform the design process?”

The need for dignified spaces has emerged within hospital design and in NHS Greater Glasgow and Clyde (NHSGGC) this is the first generation of buildings in which these spaces are included at the stage of design. The importance of patient dignity and the need for appropriate environments is evidenced in NHSGGC’s Community Engagement programme reports (2006, 2009). These types of spaces have been created in older buildings as part of refurbishment programmes. These spaces are used for a range of purposes of which the most important are conversations between clinical, nursing or spiritual care staff and patients’ relatives and carers. They are also used by families and carers waiting to have conversations with healthcare professionals.

The potential for creating quality spaces is constrained within an acute hospital setting. Examples such as Maggie’s Centres and initiatives within the King’s Fund Enhancing the Healing Environment Programme demonstrate a range of possibilities.

The Dignified Spaces project takes key aspects of the learning from these other contexts and is working with a palette including lighting, wall colours and coverings, flooring, furniture and artworks. The project utilises creative engagement strategies to inform thinking about the idea of dignity and the development of innovative approaches to interiors.

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**Motion capture analysis of dexterity tests**

*Keywords: dexterity, motion capture, inclusive design, biomechanics, hand*

A person’s ability to manipulate objects is known as their dexterity; it can be broken down in a variety of ways into different subtypes e.g. macro-dexterity, and micro-dexterity. Most people will go through their daily lives unaware of their dexterity level but for those who are recovering from stroke or loss of dexterity there are a wide variety of dexterity tests available to health practitioners to assess that person’s ability and need for support. Tests such as the Purdue Pegboard and Moberg Pickup are used to do this assessment, however they do not always test the dexterity subtypes required for activities of daily living (ADL).

This work is to identify the dexterity subtypes assessed by common dexterity tests using video ethnography and motion capture. Parallel to this, using the same methods, five ADL were assessed for the dexterity subtypes required to complete them.



Figure 1: Motion Capture Laboratory and markers on one candidate’s hands

This investigation was based on 8 healthy participants between 24 and 40 years old carrying out a selection of 5 dexterity tests and 5 ADLs, with the main goal being the identification of the biomechanical factors that account for dexterity. Additional assessment was carried out to relate the subtypes of dexterity to the performance levels achieved.

Dexterity Tests	Activities of Daily Living
Purdue Pegboard Right Hand	Pouring from a bottle to a glass
Purdue Pegboard Left Hand	Open an envelope
Purdue Pegboard Assembly	Eating with a spoon
Dexterity Types Test	Open bottle of soft drink
Moberg Pickup Test	Open box of cereal

Table 1: Dexterity Tests and ADLs assessed

It has been shown that in order to accurately measure hand function it is essential to take into account the dynamics, perception of movement and speed of manipulation as well as the relationship between all these factors and functional tasks. Establishing links between dexterity tests, ADLs and dexterity subtypes will aid health practitioners in their understanding of the assessment results. It will also help in the development of accurate, repeatable and inclusive methods for the measurement of dexterity, truly assessing a person’s ability to carry out ADLs and thus their capability to maintain their independence.

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## A Survey of Designers' Perspectives on Home Use Medical Device Users

*Keywords: Medical Device Design, Design Practice, User Involvement, Usability.*

It is widely acknowledged that the use of medical devices in the home is on the rise (FDA, 2010). Increasingly, devices previously designed for use by trained professionals are migrating into the hands of lay or inexperienced users (Bogner, 1999; Cifter, 2011; Gupta, 2007). The design of such devices therefore must accommodate this change in paradigm and the shift towards the commercialisation of medical devices for the home environment.

An exploratory online survey of the design community (n=46), predominantly micro enterprises (54%), reveals a lack of consistent and standardised process towards home use medical device development. Approximately 45% of designers reportedly adopt a user centred design process, however the involvement of users typically occurred after a product had been developed during product testing or post launch. Furthermore, the designer's perception of the user for home use medical devices varied considerably.

If the design community fail to identify their users correctly or follow a consistent approach to design then the deliverable will always be compromised. Consequently, the end users who are often vulnerable are left with a poorly designed medical device that is potentially neither safe nor usable.

With increasing usability guidance now available to designers, this study suggests that one of three incidents is occurring. Either designers are; (1) Aware of the approaches to capture end user requirements and are not applying them, (2) Not aware of the approaches and so cannot apply them at all, or (3) Apply such approaches but do so sub-optimally.

If improvements to design in this sector are to be made it is imperative to explore which incident is occurring and why. Only then can research address how to consistently deliver improved usability and safety for device users in the home.

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## Comic strips help children understand medical research: Tailoring the informed consent procedure to children's needs

*Keywords: comic design, informed consent, children, participatory research*

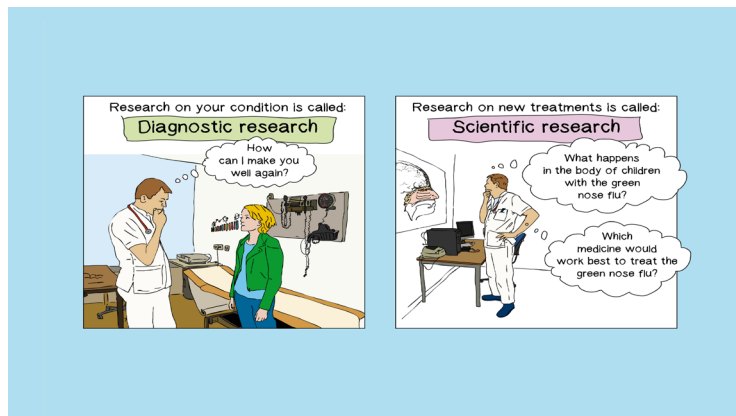


Figure 1: Panel from the comic strip © 2013 Irene Cécile

### Background

Children who are about to participate in a clinical trial need to indicate their informed consent. However, research has shown that disclosure on trial information to children is seldom sufficient, due to language that is too technical and too complicated. As a result, children are left uninformed or even unaware of their participation in medical research. In order to improve the informed consent process, we have developed a comic strip for and with children explaining medical research.

### Methods

The first version of the comic strip was developed by a science communicator and a professional designer in collaboration with pediatricians. The top-down approach ensured inclusion of all essential aspects of informed consent. A pretest was designed based on the results of a pilot pretest among five children in a clinical trial. In the pretest, feedback on the comic strip was collected from two school classes. The comic was adapted accordingly and retested in two other classes. Feedback was collected through structured observations, a survey and qualitative interviews.

### Results

Children in the pilot pretest were positive about the format of a comic strip. They enjoyed the storyline, but indicated that there were too many pages. Also in the first round of the pretest, children appreciated the comic strip, but confirmed that it was too long. Detailed feedback on the storyline, wording and layout was collected and the comic strip was shortened, restructured and altered. Children in the second round found it easier to read and more interesting compared to children in the first round. They provided feedback on the lay-out and parts they found were hard to understand.

### Conclusion

A comic strip was developed for and with children to improve the informed consent process. Hearing children is a useful and enriching step in developing information material that optimally appeals to them.



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## Excising Wrong-Site Surgery with Human Factors Systems Design

*Keywords: wrong-site surgery prevention, cognitive design, cognitive engagement, human factors systems design, implementation, error reduction*

Based on a review of the National Practitioner Data Bank and closed claims databases, Seiden and Barach estimated that wrong-site, wrong-procedure, and wrong-patient events could occur between 1,300 and 2,700 times per year (Seiden and Barach 2006), while Kwaan et al (2006) estimated that non-spine wrong-site surgeries occur at a rate of approximately one in 113,000 procedures. To address the continued problem, in 2007 human factors systems designers from a major research university in the USA were engaged by the State of Minnesota's Department of Health and a major medical center to investigate the problem of wrong-site surgery.

The human factors systems analysis involved (1) information gathering, using direct observation of 56 surgical operations (varying in duration, complexity, and laterality) to assess the effectiveness of the final verification process to confirm correct patient, procedure, and site, focus groups and interviews; (2) analyzing and synthesizing the collected information; (3) identifying potential weaknesses in the processes and their execution, and determining how they can be addressed; and (4) generating detailed recommendations aimed at improving the rigor and reliability of the processes, enhancing performance, and increasing patient safety, and (5) implementation to foster sustained safe practice. During the information gathering phase, a number of critical problems that diminished process effectiveness were identified. Human factors systems designer analysis of information gathered by direct observation in the OR and from focus groups was used to design a more robust and rigorous safe surgery process. The Safe Surgery Process, implemented at the major medical center in January 2009, has produced impressive declines in wrong-site surgery. It is undergoing implementation in the majority of Minnesota's hospitals as well as

other hospitals in the United States and is leading to a reduction in wrong-site, wrong-procedure, and wrong-patient surgeries. The study's findings, recommendations, and implementation journey leading to sustained success will be presented.

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## Designing a patient centred environment for older people in acute care: recognising and reconciling tensions identified from a systematic review of the literature

*Keywords: built environment, acute care, older people, systematic review*

As numbers of emergency admissions for older people increase, acute hospitals face an imperative to develop facilities to meet the needs of frail older in-patients with complex health problems. Evidence-based design is increasingly recognised as a method for achieving a safe and effective hospital environment. This research aims to improve the processes, quality and outcomes of acute services for older in-patients.

A comprehensive review of the design and healthcare literature on the physical environment for older in-patients in acute care was undertaken across 7 database sources (health, architecture and general science) supplemented by following up citations, examining related articles and project chasing. Data were extracted into a standardised form and, for 20 design topics, were combined using tabular presentation and narrative synthesis.

868 studies were initially identified from the per protocol search. 60 related specifically to the frail, aged and those with dementia with 808 studies considering issues judged relevant to a wider general hospital population. Single elements such as safety and noise were well covered by the literature, whilst other considerations (e.g. dignity, privacy, and spatial layout) were comparatively poorly covered. A key finding from the systematic review was an identification of themes indicating tensions or 'trade-offs' between elements often examined separately (e.g. carpeted floors are associated with reduced fractures from falls, but increase concern about infection and allergies; need for freedom and autonomy juxtaposed with the need for observation and safety; design should stimulate withdrawn/depressed patients but not over stimulate

those who are manic/agitated).

Such tensions argue for a holistic consideration of the evidence base, in contrast to unilateral approaches typically harnessed in individual research studies. Although systematic reviews are criticised for requiring that problems are first clearly defined and hence "tamed" in advance, this review demonstrates how deconstruction, and subsequent reconstruction of a complex design scenario can lead to enhanced understanding of real world 'wicked problems' to inform the search for innovative design responses.

## Can a design intervention using creative prompts promote the quality of life of patients with the long term condition Type 1 diabetes in the UK National Health Service?

*Keywords: Creative prompts; Long term conditions; Type 1 diabetes; Quality of life; Patient experience; Care commissioning; Patient-centred design*

The structure and ethos of the National Health Service (NHS) is changing in response to the complex challenges of caring for an ever-growing number of individuals living with one or more long-term conditions (LTCs) (Naylor et al, 2012). Being diagnosed with a LTC, specifically Type 1 diabetes mellitus (T1DM) is a life-changing event, which can affect an individual's quality of life and emotional wellbeing. The NHS Mandate (Great Britain. Department of Health, 2012) identified enhancing the quality of life for individuals with LTCs as a key area for improvement alongside patient experience. Determining why improvements are needed and what will remedy them requires a deep understanding of the realities of living with a LTC and what really matters to individuals. Creating engaging ways of capturing and using this type of information to benefit patients and medical practitioners is crucial. Many individuals suffer from a silent misdiagnosis (Mulley et al, 2012) as a consequence of poor articulation and communication of personal preferences.



Figure 1. Collection of creative prompts

This paper reports on the design and development of Creative Prompts as a mechanism for improving the quality of life for patients with T1DM.

Creative Prompts are a variation on design probes, (Gaver et al, (2004), Mattel-

maki et al, (2002), Wallace et al, (2012), sharing their guise as designed artefacts. They act as vehicles for exploration by supporting patients to self-reflect and articulate their thoughts, feelings and experiences of T1DM. The Prompts help to identify unmet needs and ways in which quality of life could be improved. They empower patients to think about what is important to them. Initial findings reported in this paper indicate that Creative Prompts have influenced a patient's ability to self-reflect and communicate their needs and preferences. Patients have re-engaged and become actively involved in their own health-care. The tentative conclusion is that the quality of patient-medical practitioner interaction has improved.

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## Barriers to patient service innovation in the UK National Health Service (NHS): A case study of seeking permission to conduct service design research for long term conditions, specifically Type 1 diabetes

*Keywords: Design innovation; NHS culture; Creative prompts; Ethics process; Patient experience*

National Health Services in the UK are in a state of transition due to recent healthcare reforms (Great Britain. Department of Health, 2010). Their implementation has led to large-scale change in the way care is delivered and in organisational ethos. The National Health Service (NHS) must do more with less; improve the quality of care and patient experience while adhering to strict financial constraints. Innovation has been identified as having a crucial role to play in achieving this transition and in improving services and patient wellbeing (Great Britain. Department of Health, a) 2011 b) 2012).

This paper describes encounters with the barriers to innovation within the NHS, following a programme to gain approval to investigate whether a service design intervention can improve the interaction between individuals' with Type 1 diabetes mellitus (T1DM) and medical practitioners.

The intervention draws on a probes-based approach,(Gaver et al, (2004), Mattelmaki et al, (2002), Wallace et al, (2012) and takes the form of 'Creative Prompts'. Creative Prompts act as vehicles for exploration and support patients to self-reflect and articulate their thoughts, experiences and emotions in relation to T1DM.

The paper reports, from the perspective of a design practitioner/researcher, on the key junctures in the service design innovation process from the challenges of establishing a design-led research study within the NHS to the design of the Creative Prompts and the negotiation of the complex ethical approval process. This process is compared with that of other disciplines seeking ethical approval.

Consequently, the difficulties in gaining acceptance and adoption of this specific design method and in attaining ethical approval are described and reflected upon. This study is hosted by Newcastle Diabetes Centre. The findings of this reflective research are concluded in the paper to highlight the gap between NHS policy rhetoric and reality, hence the dysfunction between healthcare policy and clinical practice regarding the innovation of patient-centred healthcare.

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**A research project to explore how Participatory Research Methods can develop capacity with articulate individuals with autism to enable effective skills as co-researchers and skills as peer advocates for people with profound and multiple needs and autism**

*Keywords: autism, participatory research, stress sensor, ethics, advocacy*

Autism is a condition which affects people in different ways. Some are able to live relatively 'everyday' lives; others need a lifetime of specialist support. Yet, the right support at the right time can make an enormous difference to people's lives and help them to lead the life they choose (Bancroft et al., 2012). Aylott (2010) argues that an alternative way of understanding autism is through the 'social model of disability', where a person is disabled by barriers in their environment as opposed to disabled by the limitations and restrictions of their impairment.

This presentation will explore ways to engage with people with a diagnosis of autism through Participatory Research Methodologies. In the first instance this will be to facilitate their participation in a research project to measure and account for their own stress using simple wrist sensors that can identify when stress levels are rising.



Figure 1: The Stress Sensor

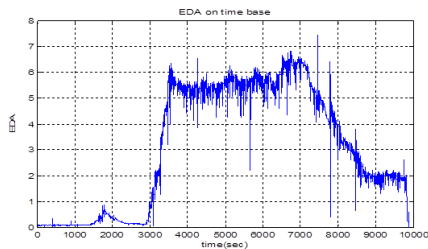


Figure 2: EDA on Time Base

This is carried out with the collection of personal diary records to correlate with the stress sensor data. This talk will demonstrate how the feedback from collected data about their own stress can make a difference to their lives and if they change or control their environments in light of this new knowledge.

Activity experience and mood diary					Researcher name: [redacted]
Date	Time activity happened	What were you doing when this happened?	What happened and how did this make you feel?	Who-time did you complete this form?	How did you cope?
10/1/2	9:00	Spoke with a 'Buck' group	A member of the group approached me and said 'Gosh, it's a shame about [redacted]'	[redacted]	None in the afternoon
10/1/2	19:00	W/1:1	Over 'buck' event '2' group (in support of 'Buck' 2012) and 'Buck' group	[redacted]	2. 'Difference' 'Technically' 10:30
10/1/2	19:00	Spoke up	W/1:1 'Buck' group	[redacted]	10:30 'Difference' 'Technically' 10:30

Figure 3: Mood Diary Record Sheet

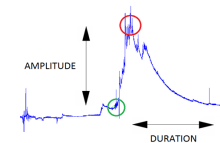


Figure 4: Signal Characteristic

This talk will argue that a level of engagement will enable the development of skills and knowledge of stress, measure what difference engagement with the project has made to them in terms of contributing to the self-monitoring of stress for self-management. This research aims to examine how it can inform and generate a greater understanding of the needs of people with autism who do not have verbal communication and explores how this new knowledge generate new theories in engaging people with autism in research- with people who have verbal communication and those who do not and contribute to the theory of advocacy particularly 'peer advocacy'.

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## Multi-Sensory Environments (MSE) in dementia care: the role of design

*Keywords: dementia, multi sensory experience and environment, inclusive design, evidenced-based design, health care environment*

Interdisciplinary research has evolved from a broad consideration in respect to the rising number of people with dementia, rapid growth of an ageing population, over-prescribed use of antipsychotic medication and the need for cost-effective interventions supporting dementia care. Within this context this research aims to explore the quality of multi-sensory stimulation offered in homes for residents living with dementia, focusing on Multi-Sensory Environments (MSEs) in particular, and whether design can improve such experiences and maximise therapeutic benefits.



Figure 1:  
Example of MSE in  
dementia care

MSEs are widely used in dementia care as a meaningful leisure activity and a therapeutic intervention. However, evidence suggests that they often fail to address the specific needs of people with dementia due to inadequate design and poor facilitation (Cruz et al., 2011; Dalke et al., 2011). Also, little research

has considered the impact of MSE design on engagement and well-being (Collier et al., 2010; Anderson et al., 2011).

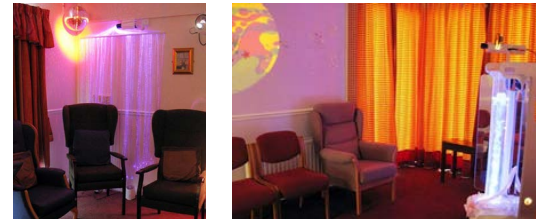


Figure 2: Examples of existing MSE facilities

This study investigates the aesthetic and functional qualities of MSE currently provided such as material/colour/imagery applied, spatial set-up, usability, accessibility, with the aim to establish reasons for success and failure. Fifteen

care-homes with MSE will be visited to record how they use MSEs. Data will be collected using ethnographic methods incorporating structured interviews with care staff familiar with the MSE and observations of residents and carers. All residents with dementia who currently use the MSE will be invited to participate. Data will be analysed using thematic and content analysis. The results will inform the design development of MSE for people with dementia and how benefits for residents and their carers can be maximised through improved design providing a person-centred experience.

The paper presents preliminary findings and methods from this research project, a collaboration between researchers from design and occupational therapy, funded by AHRC and supported by Care UK.  
<http://fada.kingston.ac.uk/de/projects/>

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## Spinal Injury Design Rehabilitation Workshops

*Keywords: design thinking, spinal cord injury, rehabilitation*

This project relates to Design & Rehabilitation (Campbell, 2011), an RSA initiative which began in 2009, to teach design to people with spinal cord injuries (SCI) as a route to independence, resourcefulness and greater control over their lives (Campbell, 2009). It began with an initial pilot, a 3 day workshop in London supported by the Back-up Trust. The success of this led to support from The Sylvia Adams Charitable Trust in 2011, allowing the Royal Society for the encouragement of Arts, Manufactures and Commerce (RSA) to commission a series of design workshops with three pairs of national partners, one of which was Sheffield Hallam University's Lab4Living team working with the Princess Royal Spinal Injury Unit at Sheffield Teaching Hospitals Trust. As far as could be established through literature reviews, the concept of teaching design thinking to patients as a means of improving self-reliability as part of a rehabilitation programme is an entirely novel one.

The project took the form of five 3 hour workshops introducing the concept of design as a way of thinking, interwoven with practical actions to resolve problems that anyone could face in everyday life.

Findings from the workshops and different groups were discussed at an RSA seminar. These included practical considerations such as recruitment, endurance, scheduling with other rehabilitation sessions, light intensity from a projector and patients with oxygen masks. Participant and healthcare staff response was very positive, particularly in having something to focus on that was unrelated to medical considerations. A minority of patients admitted initially to attending as a change to break boredom but staying through interest. Others mentioned increased confidence to request, ask or dictate rather than

being told what to do or passively receiving.

Follow on funding from the Health Foundation is enabling work to continue to assess the impact of this type of intervention and facilitate its future direction. This work will close in December 2013.

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## I've never told anyone that before: a story of Buckaroo and other tools of engagement

*Keywords: dementia, non-professional carers, older people, Alzheimer's disease, engagement, narrative*

There are currently 800,000 people living with dementia in the UK. This number is set to double over the next 40 years (Alzheimer's Society; 2012). The recent Support. Stay. Save. report (Alzheimer's Society; 2011) and the Department of Health's Draft Care & Support Bill (2012) acknowledge the social and financial benefits of enabling people to live independently in their own homes for as long as possible. This will require the commitment and dedication of professional carers and support services and will also be heavily reliant on non-professional carers, the family, close friends even distant relatives, whose significant contributions are often overlooked.

Literature relating to dementia that is available to carers generally places the emphasis on the communication difficulties faced by the individual requiring the care. Little attention is paid to how carers articulate their own experiences. Working as a cross-disciplinary team of healthcare professional and a range of designers, this short piece of work aimed to use creative methods to enable the carers to articulate their experiences and expectations with a view to contributing to the improvement of both.



Figure 1: workshop materials

Our approach was inclusive, using visual and physical metaphors, readings

(Shenk; 2003) and games in a group setting. The carers were given an opportunity to speak in a secure and supportive environment. Appropriate prompts, props and questions guided the discussion in each workshop but we were conscious of not disrupting dialogue or being overly directive. The sessions were videoed which enabled us to capture many of the rich narratives and insights that would otherwise have been lost as conversations moved with increasing momentum from person to person and topic to topic. Accounts of misdiagnosis, violent behaviour, worry, distress and a loss of self were punctuated with instances of joy and delight. The potential of what we were doing became clear when a participant declared that she had never told anyone the story she had just recounted.

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## Developing lab equipment with healthcare researchers: a participatory design analysis

*Keywords: healthcare research, lab equipment, participatory design*

In this paper, we explore how participatory design (Margolin, 1997) can be applied to scientific research in the field of healthcare and medicine. Though user-centred practices are already employed to support patient-side healthcare activities (Driver et al, 2011), not as much has been done to investigate how different design methodologies can engage researchers, being a crucial workforce for medicine (De Covreur et al, 2011). We compare case studies taken from design history (Maldonado, 1993, Margolin, 1992, Papanek, 2005, Roozenburg et al, 1995) with an experiment of our own, concerning the design of an Oscillating Perfusion Bioreactor, a bio-medical device now being used as a research platform for tissue engineering and regeneration. Taking autologous cells, the OPB performs 18 parallel cell culture threads, in a multi-array of confined chambers.

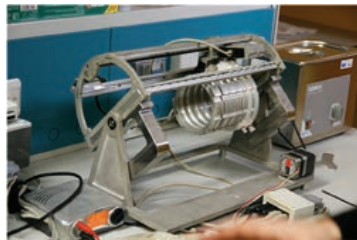


Figure 1: OPB: early model, Milan 2011

Our design intervention started from the perfusion patent and an early prototype of the machine (fig. 1), presenting issues in weight, scalability, kinemat-

ics and affordance. How can designers intervene into research to evolve its equipment? How can industrial design get involved as a structured discipline into the development of science? What can designers improve in the performance of the final product? How can design research support research in science? Our research methodology concerns a step-by-step analysis of both the evolving research environment and healthcare researchers, evaluating their habits, expectancies, behavioural and cultural schemes (Papanek, 2005, Whiteley, 1993), providing clues for engaging better design practices, both in terms of final product qualities and time-effectiveness. The findings provide an answer to these questions, with a detailed theoretical position concerning the disciplinary code of industrial design (McDonough et al 2002) and practical indications for taking better policies when dealing with users (Boztepe, 2007) and applying design management to healthcare research.

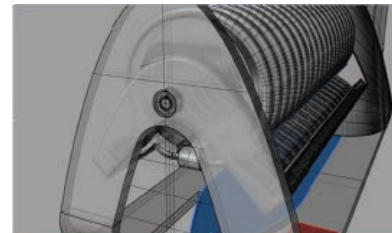


Figure 2:  
CAD model under development, Milan 2011



Figure 3: Engaging users in design, OPB:  
Milan 2011

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(a)

(b)

Figure 2: (a) Prototype visualisation displaying pathogens in the ward setting as perceived by domestic staff (b) Prototype displaying quantitative data on hand touch sites as an augmented reality overlay.

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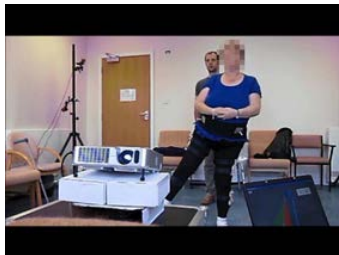


## Evaluating the effectiveness of visualising patients' motion data during stroke rehabilitation

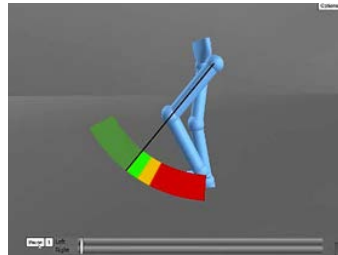
*Keywords: visualisation, stroke rehabilitation, qualitative methods*

Rehabilitation after stroke can be long and difficult, and maintaining a sense of progress made through the process a major challenge (Wartman et al., 1983), (Rosewilliam et al., 2011). This paper describes research which aims to use visualisation software to enhance communication between patients and therapists about how to perform the rehabilitation exercises correctly, and to enable the patient's progress to be measured and shown throughout the rehabilitation programme.

To achieve this, custom visualisation software was created which presents 3D visualisations of the patient's own motion capture data in real-time during the rehabilitation session with the therapist (Figure 1(a)). The visualisation tool as an intervention in stroke rehabilitation is being evaluated using quantitative patient outcome measures in three randomised controlled trials (Medical Research Council, 2000): lower limb rehabilitation (Figure 1(b)); upper limb rehabilitation (Figure 1(c)); and ankle foot orthosis tuning (Figure 1(d)).



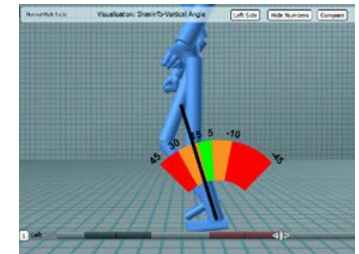
(a)



(b)



(a)



(b)

Figure 1: (a) Patient using the visualisation software with a physiotherapist in clinical trials (b) Knee lift exercise visualisation in lower limb rehabilitation following stroke (c) Reach and grasp visualisation in upper limb rehabilitation following stroke (d) Shank angle visualisation for Ankle Foot Orthosis tuning after stroke

This paper describes the qualitative user-centred design and evaluation process with patients and health professionals, which ran throughout the research, closely integrated with the quantitative trials process (Lewin et al., 2009). The paper reflects on the process as an example of designing and evaluating an intervention in healthcare including: the pre-trial design stage; interviews/questionnaires before the trials to record the expectations of patients and health professionals; through to the post-trial stage, including post-trial interviews and participant workshops with patients and therapists who had used the visualisation software.

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## Design's potential agency in changing roles and responsibilities in SCI rehabilitation

*Keywords: design approaches, rehabilitation, resourcefulness, changing responsibilities*

**Question:** Can design approaches be used to help increase resourcefulness and resilience, and reduce dependency in spinal cord injury (SCI) patients during their rehabilitation and on their return to the community?

**Method:** Literature reviews were conducted of: 1) prior work; 2) patient-voiced issues; 3) SCI patient pathways and rehabilitation management models; 4) design literature discussing structured design thinking, skills, methods, and approaches (Kimbell and Miller 1999; Kimbell 2011) to provide a framework for the analysis of tacit skills to be observed in SCI patients. A design workshop comprising a set of separate but related activities was used to observe and record tacit skills used by SCI patients in addressing a daily living challenge identified through discussion with the spinal unit, using the framework for analysis derived from the literature in 4 above.

**Discussion:** Design research has recently been exploring the application of design thinking and methods in new fields such as service design, and in healthcare (Campbell 2012). There is a small but growing body of literature on the application of design approaches used in these types of context. Healthcare service delivery is facing complex challenges in developing patient-centred 'social model' approaches which can complement or enhance clinical 'medical model' approaches and which allow patients to take more ownership of their recovery. The work described here opens up the discussion about potential opportunities to enhance the rehabilitation pathway and to improve self-management for SCI survivors, how management is conceptualised, and how this affects the relationships between and responsibilities of all concerned.

**Result:** While this pilot research demonstrated that SCI survivors are able to demonstrate the use of innate 'design' skills (Macdonald 2013), the question remains about the conditions required for these to be practiced, autonomously, in everyday situations.

Figure 1: Spinal Injury Unit staff viewing and discussing SCI survivors' issues and comments from one of the workshop activities. Still from film, 'Design and Rehabilitation', Dir. Claire Levy © 2012

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## A hospital ward soundscape: It's about perception not level

*Keywords: hospital, sound, perception, emotion*

Sound in hospital spaces is generally assessed in terms of sound level and how measured levels relate to guidelines of 30-40dB(A) (Berglund et al. 2000; DoH, 2008). Yet, as sound levels have persistently risen since the 1960s (Bush-Vishniac et al. 2005) and often exceed these figures, perhaps mitigation is the wrong way to look at the problem. It has been shown that there is no clear relationship between reduced levels and physiological improvement (Drahota et al. 2012) and as the absence of sound does not necessarily create a positive environment (Truax, 1984), understanding the perception of these sounds offers a way to improve the effect of them.

This paper details a research project which aimed to understand how to improve the perception of a hospital ward soundscape (the sound environment). A mixed method approach of interviews with cardiothoracic ward patients, laboratory listening evaluations, and a questionnaire study formed (i) a conceptual model of perception, (ii) notions of coping methods, and (iii) understood and measured how perception might be improved through physical and cognitive soundscape interventions. These related to the introduction of positive sound and the view that facilitating understanding of sound appeared to influence patients' perception of the soundscape.

In testing these, listening evaluations showed the addition of natural sound to hospital ward soundscape clips produced a significant ( $p=.001$ ) 10% positive change in subjective 'Relaxation' with the addition of 'Sound Source Information' (SSI) producing a significant ( $p=.001$ ) 5% change. Finally, SSI was tested with patients and although not found to affect patient perception of 'Relaxation' it did significantly alter their 'Interest & Understanding' in the soundscape by

26-32% ( $p<.05$ ). It is concluded, that with more testing, giving patients information about the soundscape may offer a way to potentially improve patient reported outcomes in relation to a hospital ward soundscape.

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How can communication design add value in the context of Alzheimer's disease?

Keywords: communication design, Alzheimer's disease

This paper describes a practice-based study that investigated different ways in which communication design can be applied in the context of Alzheimer's disease, a disease that is affecting millions worldwide (Prince & Jackson, 2009). In an iterative process between practice and research, visual outcomes were created specifically aimed to raise awareness and understanding of the disease and to facilitate interaction between people with Alzheimer's disease and their carers and families. Using first-hand experience with people with Alzheimer's disease, the study used generative research through observational methods and participatory activities, which were constantly redesigned to fit the practice and the needs of the users. The paper describes this process and the produced outcomes, which are divided in three groups: information visualisations about dementia (fig.1); reflection and discussion through graphic interpretations of symptoms, thus creating empathy for a deeper understanding of the disease (fig.2); and support tools to promote interaction between people with Alzheimer's disease and their families, with attention to layout and typographic details (fig. 3, 4, 5).



Figure 1: Map of dementia causes and symptoms.

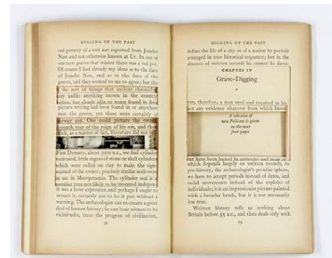


Figure 2: Digging up the Past. The book was modified to reflect on how memory is affected by Alzheimer's disease



Figure 3: Memory Card Game. Personalised set of visual and written cues to trigger memories in a playful way, allowing different ways and levels of interaction



Figure 4: Tablecloth with silhouettes of crockery and cutlery to enable laying the table. User-testing with first iteration of the product

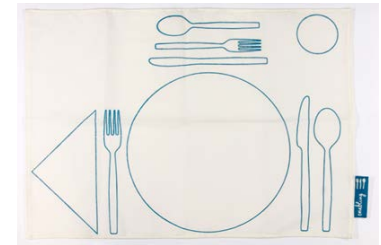


Figure 5: Laying the Table mats. Final outcome

Drawing on design approaches for dementia in other fields such as product, interior and service design (Design Council, 2012; Pullin, 2009; Tan & Szebeko, 2009; Timlin & Rysenbry, 2010), this paper discusses the value of communication design for Alzheimer's disease and the considerations to be taken into account when designing in this context. To conclude, this study is a starting point for further investigation in this field, extending the understanding of the disease, providing practical tools for the Alzheimer's sufferer support and suggesting possible graphic design guidelines for communicating directly with people with Alzheimer's disease.

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## Opportunities and barriers to the design of a self-management resource for young cancer survivors

*Keywords: Web-based self-management, young cancer survivors, design of online support*

Improvements to diagnosis and treatment mean that most British teenagers and young adults (TYA) with cancer now survive (Birch et al. 2002). With a growing population of survivors there is a need for alternative mechanisms to support the transition from treatment to survivorship (Zebrack 2011, Evan and Zeltzer 2006). The popularity of social networking sites, online forums and smartphones amongst young people potentially make the internet an ideal platform for self-management, e-learning and support following cancer treatment (Hulme 2010, Elwell et al. 2011).

This paper considers the needs of young people, and the feasibility of developing a web-based self-management resource. It considers the priorities and perspectives of a range of stakeholders and captures potential barriers to innovation.

A mixed methods approach included a rapid review of the literature, an online survey of young cancer survivors (n=24), focus groups and interviews with TYA patients, (n=7) and their parents (n=6) and interviews with information technology, medical, nursing and social work professionals (n=11).

All stakeholders were generally supportive of providing reliable and credible web-based self-management resources to augment face-to-face support. The teenagers and young adults indicated that they would like an on-line resource to provide clinical, informational and social support features. A number of governance issues emerged regarding whether all these functions could be provided by an NHS Trust IT system. There were some ethical and confidentiality issues, for example in the desire amongst young people for online contact

with health professionals and for accessing medical test results.

The research has led to design recommendations for a structured self-management resource to support the transition from treatment to survivorship. This would require close working between design, information technology and clinical staff to meet user, provider and governance needs. Computer use amongst this group is commonplace, and therefore it is an expectation that self-management needs will be met at least partially in this way in the future.

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## Understanding Patient Experience through Interventional Acts

*Keywords: design interventions, patient experience, research through design, reflection in action*

This paper presents design interventions as a research through design approach to researching the patient emotional experience within healthcare. Working with cancer patients undergoing radiotherapy, this research focuses upon situational patient anxiety triggered by medical technologies. Anxiety is a complex emotion, with a wide variety of causes and is highly context and person-specific (Stiefel & Razavi, 1994), and in order to properly address this complexity, one must look at patient experience from different perspectives to create knowledge that is synergistic, comprehensive, and integrative.

Previous research – conducted via ethnographic fieldwork, patient questionnaires, and design probe kits – found that the fixation devices used in radiotherapy can act as a source of anxiety in patients (Mullaney et al, 2011; Mullaney et al, 2012). Furthermore, these findings suggest that this anxiety can be attributed to the passive role patients assume while in fixation (Mullaney et al, 2012). This paper suggests that the creation of tangible designs can provide insights into patient anxiety that are unique from those provided through traditional research methods, and through the production of possible alternatives to the current reality, we can generate new awareness of the patient and their emotional experience.

In order to further elucidate the relationship between the fixation device and patient anxiety, we created two design interventions. The first intervention, implemented clinically, focuses upon providing self-selecting visual and auditory stimuli to the patient during treatment to distract them from their anxiety, something directly requested by patients to improve their experience.

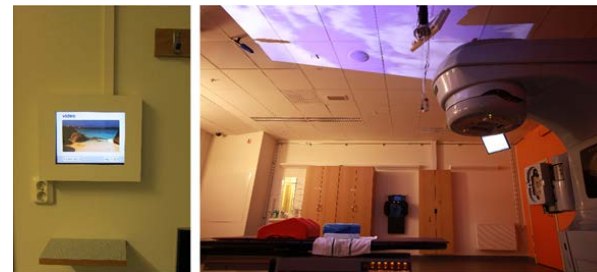


Figure 1: Projection Intervention

The second intervention, implemented non-clinically in workshops and exhibitions, challenges the need for a fixation device at all, by enabling individuals to self-position themselves.

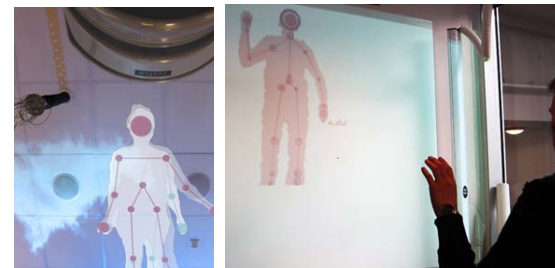


Figure 2: Self-positioning Intervention





## When a patient goes home: Meaningful lessons in designing for the patient experience of Cervical Radiculopathy and Stroke paralysis

*Keywords: Experience-based Design, Home Rehabilitation, Understanding Patient Experiences*

Presented in this paper are remarkable learning experiences from two different researchers in two separate studies; one dealing with the experience of patients suffering paralysis from stroke or brain haemorrhage and the other studying patients with Cervical Radiculopathy. Both cases originate in Denmark where recent measures have been initiated aimed at increasing rehabilitation of patients in their homes, but with a strong technology solution focus (P@H, 2013). The aims of the projects were similar; to explore the complex lived experience of patients so as to improve the experience (and efficacy) of home rehabilitation for people with these conditions. In this paper we share our practical experiences and lessons learned in pushing the boundaries of researching human experience but also how it deeply affected us as researchers in achieving the illusive, 'experience of understanding'.



Figure 1 : One day empathic Embodiment

In the projects described above, a hermeneutic phenomenological approach (Van Manen, 1997) was adopted but applied differently as each case required.

Both incorporated methods such as extreme researcher embodiment (experience prototyping), immersive field data gathering (utilising new digital technologies), unstructured in-situ conversations as well as observations during treatment processes. Data analysis was conducted through an intricate nine step process (Coxon, 2008) - interpreting patient's experiences, particularly the explication of deeper meaning structures hidden within their various communications.

This paper is primarily about sharing our stories of research highs, lows and lessons arising therefrom. We share insights gained in a process which shows the ineffectual nature of and opportunities lost in many normalised approaches to treatment. We also share some of the heartbreaking moments that arose as a result of techniques we applied that caught us unprepared, but which produced insights so moving, unexpectedly candid and profound. This paper is really about how to deeply understand patients in almost any sphere of health – to appreciate their viewpoint - to design ways to help to bring the two worlds of treatment and treated together – harmoniously and productively.

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## The Effect of Hospital Layout on Caregiver-Patient Communication Patterns

*Keywords: evidence-based design, hospital layout, communication patterns, Space Syntax*

Evidence-based design (EBD) takes into account information from credible research and case evaluations for design-related decisions (Hamilton, 2006). Environmental factors are of great interest for EBD in healthcare buildings (Ulrich, R et al. 2004). However, previous research also indicates that building layout can influence the way people interact in hospital wards (Lu, Y et al. 2009; Cai, H & Zimring, C, 2012).

The main research question focuses on types of interface (Hanson, J & Hillier, B, 1984) created between hospital users in outpatient clinics, i.e.: 1) among different categories of caregivers, and 2) between caregivers and patients. This is important, since the spatial layout and the interface between users have implications for communication patterns, and communication is crucial for good healthcare provision (Donchin, Y et al. 1995; Baggs, JD et al. 1999).

Two hospitals with major differences in the spatial layout were analysed. While in Hospital A back- and front-of-house are strictly separated resulting in a clearly defined large and shared area for professionals, in Hospital B caregivers and patients use a common corridor system leading directly to exam rooms and small common areas for staff. Therefore, in Hospital A caregivers are brought together and are separated from patients, while in Hospital B caregivers are separated, but brought together with patients (fig. 1). Five clinics in each of the two hospitals were chosen for analysis.

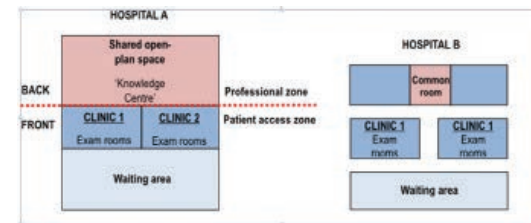


Figure 1: Diagrammatic layout of clinics with open-plan space and front- and back-of-house separated (Hospital A) versus clinics with no clear separation between front- and back-of-house (Hospital B).

The two spatial layouts were compared using 'Space Syntax' as a methodology; this was brought together with findings from a staff survey identifying communication networks and direct observations on everyday activities of caregivers. Results indicated strong differences between the two settings.

The paper provides insights for architects into the impact of hospital layouts and therefore inspires them to improve the design of healthcare buildings in order to support communication. Reflections on the practice of EBD were made based on findings.

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## How should a wellbeing centre look and feel?

*Keywords: wellbeing, environment, collaborative, environment design*

This research is a collaborative project between academia, the NHS, and professional designers. The Royal Free Hospital in London is developing an innovative new service provision to help patients, visitors, and staff address lifestyle related health issues, such as smoking, harmful alcohol consumption, and unhealthy weight. This service will be delivered from a self-contained space within the hospital's main entrance foyer. Existing research has determined the effect of environmental features on users' perceptions, outcomes, and experiences of healthcare environments (Devlin and Arneill, 2003, Phiri, 2006, Ulrich et al., 2008). However, being the first service of its kind to be launched within a busy acute care setting, specific design guidelines for the service provision of wellbeing centres did not exist. Furthermore, the physical design elements that would be important for this particular setting and population were unknown. Therefore research was required to establish "how should a wellbeing centre look and feel?" The academic research team designed and conducted a co-design process involving 53 Royal Free Trust members in focus group workshops. A range of activities including questionnaires, group discussions, and drawing and modelling ideas for the centre's layout allowed important design considerations to emerge. The data from the workshops was analysed using descriptive statistics, content and thematic analysis.

Six important design themes emerged from the research: Atmosphere; Initial points of contact; Waiting Experience; Health Assessment Areas; Spatial layout, size, structure; and Service. On average, privacy was very important (69%, n=16). Results from each of the themes were supplemented by existing evidence-based research (e.g. Dalke et al., 2004, Phiri, 2006) to produce design recommendations for the Wellbeing Centre. The professional designers interpreted

this research to produce user-led concept designs for the centre (Figure 1 and 2) which are now undergoing further user testing.



Figure 1: Proposed designs: Looking into the Centre from the Hospital foyer.

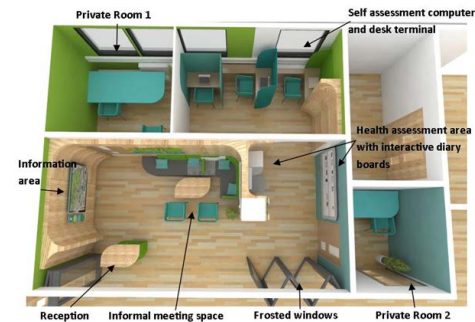


Figure 2: Proposed designs: Overhead plan of the Centre.

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## Architecture and Psychiatric Disease - Rethinking places of care

*Keywords: psychiatric facilities, supportive healing environment, interdisciplinary working*

The interaction between patient and healthcare environment influences well-being and course of treatment (Douglas 2005). This influence is even stronger for users as sensitive as psychiatric patients and leads to research specific issues and approaches (Thiels, 1993; Golembiewski, 2010) to support the design of mental health facilities.

The presented work aims to investigate the relationship between psychiatric patients and places of care and the environmental aspects that can improve patient experiences and enhance the healing process.

In an exploratory phase, the multidisciplinary research team (psychology, architecture, ergonomics and design) built a common base of knowledge through informal discussions, sharing of data, focus groups with patients and medical staff.

Then the research was focused on “non-hospital residential services” and carried out through a field study in two phases: 1. exploratory visits and informal interviews with staff and patients of three residences, matched with issues from literature, to identify key issues to be investigated (e.g. privacy, safety); 2. semi-structured interviews with patients and direct observation (fig. 1) of the usage of the environment by patients and staff.

With the help of the Experimental Center of Cinematography, the work availed itself of an additional tool: three short films (fig.2) that explore, from different points of view, the relationship between patients and spaces.

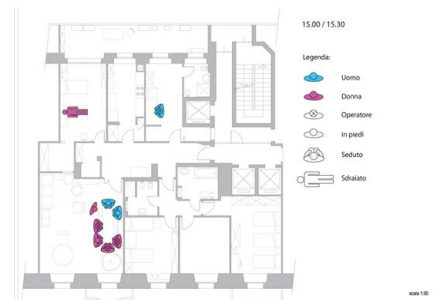


Figure 1: Example of “Space occupation” card, by FareSpazio, 2011.



Figure 2: From “The metamorphosis of space”, by Rita Maralla, CSC, 2011

The findings were formulated in 3 principles (e.g. “awareness about the importance of space by staff and users”) and 10 criteria (e.g. “non-medical environments, with no memories of hospital”, “integration and openness to the inhabited territory”) aimed at inspiring the design of psychiatric healing environments. These criteria will be the starting point for further processing of technical design requirements.

The field study and the multidisciplinary composition of the team were essential for understanding of patient’s needs. The adoption of an interdisciplinary and collaborative approach has allowed the team to develop shared criteria.

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## Does the Physical Environment Predict Depressive Symptoms in Older People Living in Care Homes?

*Keywords: built environment, depression, care homes*

40 % of residents living in care homes in the United Kingdom have significant depressive symptoms, compared with 9% living in the community (Mann, Graham, & Ashby, 1984, McDougall et al 2007). Care homes can appear to be depressing places, but whether the physical environment of homes directly affects depression in care home residents is unknown.

An observational approach was used to explore the longitudinal association between the physical environment and depressive symptoms of older people living in care homes. The physical environments of 50 care homes were assessed using The Sheffield Care Environment Assessment Matrix (SCEAM). The instrument assessed over 300 discrete items of the physical environment of care homes representing ten domains: privacy, personalisation, choice and control, community, safety, comfort, support for physical frailty, support for cognitive frailty, awareness and normalness. Depressive symptoms were measured using the Geriatric Depression Score (GDS-15) for 510 residents living in the care homes at baseline, six months and one year.

Multi-level modelling was used to analyse the data. Participant level covariates included: age, gender, length of time in home, cognition (MMSE), dependency (Barthel Index), and social engagement (Index of Social Engagement). Home level covariates included: size, type (nursing/residential) and ownership.

Overall the features of the physical environment of care homes were not associated with depressive symptoms. Controlling for dependency, social engagement and home type, 'access to outdoor space' was the only environmental variable significantly associated with depressive symptoms. That the physical

environment inside care homes does not play a part in depressive symptoms is perhaps surprising but also to some extent reassuring. Many care homes have outdoor spaces but access is often compromised. Overcoming barriers, such as locked doors, lack of paths, inadequate seating, steep steps and needing permission or assistance of staff to go outdoors may contribute to the poor mental health of older people living in care homes.

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## Tutorial: Co-production of assisted living technologies and services

### Overview

Despite the promised potential of assisted living technologies to enable people to 'age in place' (that is, avoid or defer institutional care in later life and remain active participants in society), the benefits achieved to date have been modest. Hence, there is a risk that much of the current and planned investment in assisted living programmes will be wasted.

Our work in the ATHENE project demonstrates that this problem cannot be resolved without a richer understanding of the complex and diverse living experiences and care needs of older people. More than that, however, it suggests that if the needs of older people are to be met, then industry, health and social care providers must evolve ways to work with older people to 'co-produce' useful and useable assisted living technology designs.

### Objectives

In this tutorial, we develop and expand on themes concerning the challenges of understanding the assisted living needs of older people in domestic settings, and methods to support their involvement in the co-production of assisted living technologies and services. It has the overall objective of developing an understanding and appreciation of the benefits and the various practical issues of following a co-production or 'bricolage' approach.

The tutorial will include comprehensive slides and a website where other relevant material will be hosted. It will build on our experiences and understanding gained from following a co-production approach with older people in the ATHENE project and will maintain a strong practical focus with an

emphasis on active participation. The duration is 90 minutes.

Web-based Resources: [www.atheneproject.org](http://www.atheneproject.org)

### Target audience

The tutorial will be of use to people involved in the design and development of assisted living technologies, healthcare professionals involved in the planning, management and delivery of assisted living services, Social Science researchers, including those in health and social care, and commercial researchers and consultants working in the field.

### About the presenters

The presenters, from Queen Mary University of London, Warwick and Lancaster Universities are members of the ATHENE (Assisted Technologies for Healthy Living in Elders: Needs Assessment by Ethnography) project funded by the Technology Strategy Board under its Assisted Living Innovation (ALIP) programme. They are particularly associated with developments in methodologies for the ethnographic study of domestic environments and practices associated with the participative design and co-production of technologies.

## How to create an internal innovation team using Service Design Thinking

*Keywords: innovation, service design, organisational change, healthcare*

How do we innovate with a health care organisation of 4,000 employees and 50,000 clients? That question was answered in a six month project by taking a Service Design Thinking (SDT) approach (Stickdorn and Schneider, 2010). SDT was implemented to guide future innovation projects. It was also used during the development of the first ever innovation team of the organisation, including co-creation of the goals, profile and practices of the new team. This offered a distinct shift from previous approaches that were more technology-led and often not successful.

Four methods were used in parallel to conduct the design research. Employees of the organisation were interviewed on their innovation projects. A literature study grounded the SDT approach in a wider body of innovation knowledge (e.g. Brown (2009) and NHS (n.d.)). In-depth interviews with external innovation experts further explored initial themes and insights. Finally, workshops with employees from the organisation were held three times during the entire process.

Key aspects of SDT such as empathy with all stakeholders and the expression of co-created synthesis through visualisations were applied in the innovation culture and process. SDT made it possible, for instance, to leverage the strong empathy of employees with clients, and give it a central role in innovation projects.

The process was facilitated by external service innovation agency STBY and resulted in 40 advices for internal innovation teams in healthcare.

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**Biophilic Design as a medium towards psychosocially-supportive design of the outpatient-clinics settings**

*Keywords: Psychosocially-Supportive Design, Biophilic design, Outpatient-Clinic, Staff wellbeing*

An outpatient-clinical department is deliberated to provide primary-care services to outpatients, through the extensive work of physicians and other staff members. By definition, all outpatient departments are alike in having no overnight patients (Haron et al., 2012). Therefore, caregivers are the most users, exposed to and, affected by the physical environment of the outpatient-clinical scenery.

Much of the environmental-psychology's research and theories are concerned with the adaptation and comfort of people within their working scenes. Yet the healthcare setting is viewed as one of the most stressful working environments; the increasing complications of the system impact staff as much as they influence patients (Berwick, 2002). The history of healthcare reveals that Ancient Cultures considered healthcare settings as of therapeutic value, not merely of purely functional designation (Verderber, 2010). Biophilic design is the attempt to translate an understanding of the congenital human development (known as Biophilia) into the built environment design. While, the Psychosocially-Supportive Design model aims to augment users' wellness and wellbeing by attracting their attention, remove/reduce their anxieties, challenge their minds to construct stimulation, creativity, satisfaction, enjoyment and admiration (Dilani, 2001). Therefore, it is believed that the two theories are congruent; there is a great opportunity to use Biophilic Design research to inform the Psychosocially-Supportive Design model to promote users' wellness.

The paper reports on research aiming to enhance the psychosocially-supportive design of the outpatients' clinics by exploring the biophilic design con-

notations and by defining and extracting elements/parameters that could be employed within the clinical settings, to strengthen the caregivers' wellbeing. The first stage of the research involves literature review exploring the biophilic design concept and the core ideas grounding the salutogenic designs. The final outputs will include design recommendations and attributes of biophilic design that will be employed to enhance the design outcomes in the outpatient clinical zone.

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**Optimising pen gripping in children to reduce muscle strain**

*Keywords: optimal writing grip, writing instrument, compensatory grip, muscle strain*

50% - 70% of children learning to write finish the development process using a dynamic grip style (Henderson & Pehoski, 2006). The rest learn non-optimal grips, known as compensatory grips. These occur due to weakness in the wrist and shoulder muscles (OT Mom Learning Activities, 2012). Long term effects caused by these grips include rapid fatigue and muscle strain occurring due to the user grasping the pencil tightly (Tseng & Cermak, 1993).

This project aimed to encourage children to use the optimal writing grips. The idea was to provide feedback about their finger positioning, allowing improvements to be made. By detecting unsuitable grips earlier in the development process they could be actively addressed, avoiding the negative health implications.

The research included understanding the theory behind children's grip development and hand positioning. A focus group was run testing 4 key types of writing instruments aimed at improving grip. Children were asked to complete a standard writing task using the different instruments and the grips observed were matched against standard grip classifications, shown in Figure 1.



Figure 1: Child's grasp with the 4 key types of writing instrument for improving grip

It was found that symmetrical integrated grip solutions were most suitable, producing the best versions of the children's grip style. The symmetrical form allows the instruments to be used in the initial orientation, maintaining the optimal linear wrist position (Pheasant, 1996). By using Jones' methods of fitting trials within focus groups, it was possible to calculate optimal ranges for width, length and lead thickness for the writing instrument.

The suitable width range found was relatively large compared to a standard pencil. The added thickness will help reduce the occurrence of compensatory grips by aiding the development of finger strength, decreasing muscle load and strain (Oehler et al., 2000; Goonetilleke et al., 2008). A new pencil design was proposed and prototyped to achieve optimal gripping.

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**Architecture as a Medicinal Instrument. The therapeutic role of healthcare spaces in their mission of cure and care**

*Keywords: Healthcare architecture, Therapeutic environments, Evidence based design, Maggie's Cancer Caring Centres*

The environments in which healthcare is performed play an important role in the healing process. Evidence-based design in healthcare is a developing field of study that holds great promise for benefiting key stakeholders: patients, families, physicians, and nurses, as well as other healthcare staff and organizations.

The aim of this paper is to explore the role of architecture as a therapeutic environment, understood as the stage of treatment that stimulates the healing process by creating a physical and social environment which reduces stress and promotes a sense of wellbeing, encouraging a positive attitude by their various users: patients, families, caregivers and healthcare professionals.

Firstly, through a literature review, the concept of therapeutic environment is justified, considering its historical evolution and identifying the current domain of evidence-based design in healthcare.

A second step of this investigation covers the study and evaluation of two recently built Maggie's Cancer Caring Centres using Space Syntax methodology in order to analyse and assess design strategies related with the previously identified parameters of the built environment. From this study, a set of guidelines is assembled for the design of therapeutic environments, highlighting those supported by evidence, from those simply based on theoretical assumptions or empirical knowledge.

In the field of Evidence-based design, this test enabled to frame a cluster of design hypotheses to meet the instances of a particular context and the

needs of a specific population of patients and caregivers. Therefore, it allowed highlighting the instrumental status of architecture in the design of healthcare spaces. Alluding to the Vitruvian Triad – FIRMITAS, UTILITAS & VENUSTAS – the instrumentality of the architecture of healthcare spaces presents itself as a necessary and essential condition to ensure its value and excellence.



Figure 1: Maggie's Centre Edinburgh, Jencks (2010)

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**Evidence based design of a Burnout Rehab Centre. Bridging the gap between research and design of therapeutic environments**

*Keywords: Healthcare architecture, Therapeutic environments, Evidence based design, Burnout Syndrome*

The environments in which healthcare is performed play an important role in the healing process. Evidence-based design in healthcare is a developing field of study that holds great promise for benefiting key stakeholders: patients, families, physicians, and nurses, as well as other healthcare staff and organizations.

Which principles should the architecture of healthcare spaces adopt to establish itself as a medicinal instrument, i.e. a device that enhances both the therapeutic support and the best medical practices?

How can architecture improve health and the physical/psychological comfort of the patient, considering the duality of contemporary healthcare spaces, i.e. cure and care, and the increasing number of chronic patients (e.g. autoimmune and degenerative diseases, oncological diseases, AIDS, etc..) who will live permanently with these conditions?

This paper aims to explore the role of architecture as a therapeutic environment, understood as the stage of treatment that stimulates the healing process by creating a physical and social environment which reduces stress and promotes a sense of wellbeing, encouraging a positive attitude by their various users.

Firstly, through a literature review, the concept of therapeutic environment is justified, considering its historical evolution and identifying the current domain of evidence-based design in healthcare.

Through a project report, the design principles for therapeutic environments are implemented to the architectural design of a Burnout Rehabilitation Centre in Austria.

In the field of Evidence-based design, this design project enabled to frame a cluster of design hypotheses to meet the instances of a particular context

and the needs of a specific population of patients and caregivers. Therefore, it allowed highlighting the instrumental status of architecture in healthcare design. Alluding to the Vitruvian Triad – FIRMITAS, UTILITAS & VENUSTAS – the instrumentality of the architecture of healthcare spaces presents itself as a necessary and essential condition to ensure its value and excellence.

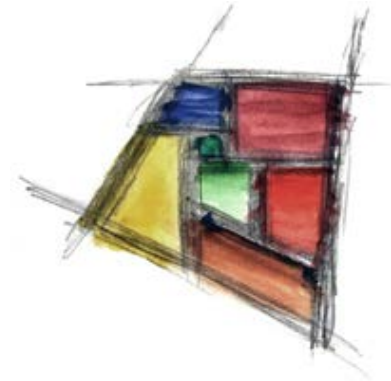


Figure 1: Conceptual drawing for the plan of the Burnout Centre in Seewinkel, REGO (2012)





Figure 2: Visual rendering of the interior patio of the Burnout Centre in Seewinkel, REGO (2012)

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### **Cutlery, Composition and Canter: A method for investigating the stigmatising effect of assistive cutlery design**

*Keywords: assistive cutlery, industrial design, stigma, room-effect method, arthritis*

This paper considers the impact industrial design has on assistive cutlery. Literature on designing for the elderly and “other abled” suggests users are embarrassed and often socially stigmatized by using the “assistive” cutlery on the market. Research suggests that the uptake is low due to the appearance of ergonomic products, leading to social isolation. How others perceive the users of such devices and the associated styling of assistive cutlery — not the functionality of the cutlery — appears to be the problem.

To test this hypothesis, a modification of the method used in Canter (1977) — the “Room Interference Protocol” was used. Stimuli were generated using stock images and Adobe Photoshop to ensure consistency and a survey was conducted based upon the “Big Five” personality traits. A pilot survey was undertaken using a convenience sample of first-year students within the Faculty of Design. A second, internet-based international survey was then conducted. The resultant data from the survey indicate that the arthritic and disabled cutlery attributed negative connotations to the users, and that a significant gender effect is also demonstrated.

In the context of health and wellbeing, this method allows for a large, internationally distributed sample size with the ability to modify the stimuli rapidly. The key benefits identified with this method highlight the ability to measure the perception of an assistive cutlery user within a social environment. Disabled users require products that enhance their social identity and do not detract from it. The style and aesthetics of such products requires greater attention than they have so far received.

This paper forms part of a doctoral research project from Swinburne University

of Technology, Melbourne, Australia.

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## Drawing Memories: An empowering and enjoyable aged care activity promoting confidence, independence and engagement

*Keywords: creative expression, emotion, aged care, dementia, drawing, well being, non-pharmacological intervention, communication, visual language, materials & media*

This paper presents the outcomes from the Drawing Memories program, developed and implemented with the aim of promoting quality of life indicators for elderly people with diverse physical and cognitive abilities.

Drawing is a way of thinking, communicating, and understanding. Drawing expresses our experience of the world (Ramm 2005 p.63). It is a fundamental human activity, a universal language of early childhood, yet often discouraged, even discarded as we grow up. This is particularly evident in our senior population, many of whom being denied the opportunity to explore drawing and creativity beyond their childhood years.

It is well documented in the health sciences, psychotherapy and art therapy fields that active participation in stimulating, creative activities improves quality of life and clinical outcomes across many health care sectors (Cohen, 2006; Gottlieb-Tanaka, 2011; Kaplin, 2000; McNiff, 1992; Rusted et al., 2006). With the population growth in aged care services, particularly in dementia care, there is an increased demand for research into the health benefits of non-pharmacological interventions such as creative expression activities. Moon (2010) argues materials and media play a central role in these activities. The role of drawing material and media choices, acting as an intermediary between thought, communication and the physical experience of creating, was a key aspect of the study.

This paper reports the outcomes of sixteen people who participated across two residential and community aged care services. To accommodate the multi-disciplinary nature of the study, a heuristic inquiry into the useability, practicalities and therapeutic potential of drawing media, was used in conjunction with

evaluation instruments and clinical assessment tests to analyse the results.

The observed responses to a variety of tools, activities and media will be discussed. An interesting outcome was the Apple iPad rating highly in useability and enjoyment. It was found that participants' confidence, independence and engagement improved while undertaking the drawing activities.

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## Interdependence between healthcare design and stakeholders: A designers' view

*Keywords: design quality, stakeholder management, healthcare environments*

The concept of 'design quality' during the design, construction and occupancy phases of healthcare environments is complex. There are multiple stakeholder groups (e.g. architects, contractors, the NHS, patients) with potentially conflicting requirements interacting with each other during the project lifecycle. There is a growing body of evidence demonstrating the impact of design elements on medical and non-medical outcomes for stakeholder groups (Huisman, 2012; Macmillan 2006) and as a result, the need for the healthcare construction industry to focus on design quality (Walker et al., 2009). This research looks at this issue from the perspective of 'stakeholder management': a field which can be used to analyse the attributes and interactions of stakeholder groups.

A series of semi-structured interviews was conducted with eleven healthcare designers and architects in the UK to explore their perceptions and experiences of interactions with other stakeholders, and their opinions of design quality within the healthcare design process. Based on the 'stakeholder' definition (Freeman, 1984), a novel matrix exercise was used with the participants to examine the two-way relationship between design quality and stakeholders during and after project delivery. 'Framework' method (Ritchie and Lewis, 2005) was used to thematically analyse the qualitative data. A conceptual framework was then developed, which defined the design/stakeholder interdependence as well as 'procurement system', 'building type', and 'project lifecycle stage' as variables affecting this relationship. Significantly, the findings showed the critical role of effective stakeholder interactions in order to compensate for the unequal distribution of power on design quality decisions. The ongoing research continues to validate the framework via a large-sample survey of

industry practitioners.

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## Making encounters work: How can Service Design support a more collaborative healthcare commissioning process?

*Keywords: Design for Service, co-design, healthcare commissioning*

Healthcare in UK is going through what has been defined as the biggest and most ambitious change management in its history (Delamothe and Godlee, 2011; Gregory et al., 2012). Key players in this change programme are the Clinical Commissioning Groups (CCGs) who are groups of practices responsible for planning and buying healthcare for their patients, working in partnerships with local communities and local authorities. With the new approved Health and Social Care Bill (2012) by April 2013 CCGs are responsible for 60% of the commissioning budget. They are urged to de-commission old models of care in favour of more preventative and integrated solutions designed around the needs of patients (Blunt and Leadbeater, 2012).

This presentation will be based on an ongoing research into healthcare commissioning and Service Design in UK; it will reflect on outcomes from an exploratory research workshop, interviews with four CCGs and four designers, and a short ongoing project collaboration with a CCG exploring the use co-design tools to make commissioning encounters work better. Previous research into Practice Based Commissioning has highlighted how “most of the difficulties for effective GP commissioning are related to structures, mechanisms and professional practices that resist and conflict with collaborative and integrated modes of commissioning and delivering services” (Sangiorgi et al., 2010: 40).

As part of the authorisation process, CCGs need to be able to demonstrate to have “a strong clinical and multi-professional focus” by actively engaging other clinicians (secondary, community and mental health care, public health experts, people working with citizens with learning disabilities and social care), and to carry out a “meaningful engagement with patients, carers and their communities” (NHS Commissioning Board, 2012: 7).

The presentation will summarise insights from the exploratory workshop and interviews, with a special focus on barriers for collaboration and patient engagement; it will then reflect on how co-design can work as an approach and a framework to help the convergence and enhancement of collaboration within potentially conflicting commissioning encounters.

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## Please resuscitate! How to share a project concerning self-management in diabetes to enable participants to elaborate on it after project completion?

*Keywords: diabetes, self-management, documentation, participation, fabrication lab*

This paper concerns the project “Bespoke Design” that deals with the development of self-management tools for people with diabetes. More specifically it focuses on sharing this development process within the context of an open fabrication laboratory (FabLab), which aims to trigger future continuation of a project by other people or organisations. Since self-management of diabetes is a complex matter, participation is central within this project. However, this paper especially explores the potential of enabling participation after the project is finished (Fisher et al, 2004; Ehn, 2008). The potential of sharing Bespoke Design lies in triggering participants (designers, developers, people with diabetes, etcetera) to explore and elaborate on the project, e.g. rework or alter the self-management tools for new contexts. In this way, the project is prevented from fading out, knowledge is shared and other (existing or new) stakeholders are empowered to elaborate on developed ideas, insights and tools.

While the sharing of a project is essential to enable participation after a project is finished, the question is what should be shared and how. The functionalities of a design can be shared via source codes or blueprints. However, this sharing seems rather limited for complex design matters in which, often, contrasting viewpoints and meanings are at stake (Kanstrup, 2008). Research shows that viewpoints concerning diabetes (e.g. of the participant with diabetes, his/her family, the designers, the caretaker) aren't always compatible (Storni, 2011). Moreover, Van Osch & Avital (2009) and Kanstrup (2012) value negotiations of viewpoints as a way of triggering people to participate after a project is finished. We developed a participatory game to explore, document and share viewpoints of stakeholders concerning self-management in diabetes. We use this in the development of self-management tools and explore how to share

these viewpoints in order to enable participation after the project is finished.



Figure 1: Exploring viewpoints of participants

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**The potential of touch-screen computer technology in facilitating social and leisure activities for people living with dementia**

*Keywords: touch-screen technology, dementia, video, participant observations, social and leisure activities*

One of the most frequently identified unmet needs for the person with dementia is something enjoyable to do during the day (Wherton & Monk, 2008). It is increasingly suggested that enabling technologies may contribute by positively influencing the dementia experience (Topo, 2008). Researchers have recognised the potential of developing technologies that assist people living with dementia to navigate their day successfully. Few however, have recognised the potential of using existing technologies as an intervention to support social interactions and leisure activities. This explorative study is focussed on the potential of touch screen computer technology as a facilitator of enjoyable activity thus enhancing wellbeing for people living with dementia. Participants in the moderate to later stages of the condition attending a day centre consented to take part in sessions using touch screen technology. Wednesday group involved four members, each being provided with their own touch screen. Friday group involved ten members, each touch screen being shared between two or three participants.

This multidisciplinary project takes an Ethnomethodological approach (Garfinkel, 1984) with data collection methods by means of video-based participant observations. The method of data analysis is interactional multimodal analysis (Norris, 2004) enabling both the audible and visual aspects of interaction to be explored. Deeper understanding of the data has been gained by drawing on theoretical perspectives from sociology, psychology and science and technology studies. The main findings indicate that touch-screen computer technology can facilitate social interaction through participation in leisure activities. However, differences exist in the nature of the interactions depending on whether



Figure 1: Friday group



Figure 2: Wednesday group

participants' are interacting solely with the technology or sharing a device within a small group. These findings will inform a subsequent study pertaining to the earlier stages of the condition.

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## Can a multi-sensory product enhance quality of life for people living with dementia and be used as a tool in the evaluation of an individual's needs? completion?

*Keywords: dementia, design, emotion, graphic design, haptic, textile, touch, tactile, movement, sensory, interaction, wellbeing*

The purpose of this study was to identify ways in which design could enhance quality of life for people with dementia. Using inclusive design principles our project aims to develop an innovative multisensory product (Fidget Widget) that can help sustain experiences of personhood, positive moments of interaction with carers, reduce agitation and restlessness, and encourage positive, physical activity by people living with dementia. The product is also proposed as a resource in the management of dementia symptoms, for use as an education/training tool, and to assess quality of life, an area that is lacking in accurate indicators (Warner, Milne and Peet, 2012).

Currently, many therapeutic sensory objects and materials used in dementia care have been adapted from other uses and contexts, often made for children, which can cause confusion and distress for patients and carers. It is our objective that Fidget Widgets will be neither childlike nor medical in their aesthetic.

A qualitative approach was used, starting with a collection of information (literature review) and objects (Sensory Store). The literature review evidenced the value of multi-sensory stimulation in the care of people living with dementia (Kitwood, 1997), and that positive relationships and social interaction are also important in the reinforcing of personhood for people living with dementia (Hammer and Orrell, 2008). The Sensory Store is being used in a series of participatory workshops in order that the researchers can observe sensory responses and gather verbal descriptions of the haptic experiences stimulated.

At present the Store is housed in the Alzheimer's Society, Central Lancashire for the benefit of carers and people living with dementia. Our paper will reflect on

findings to date and present initial design proposals for the next stage of the development process Fidget Widget.

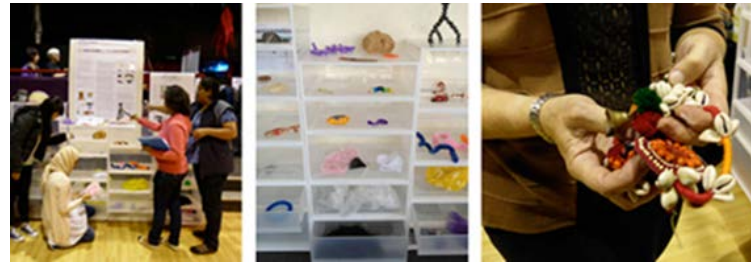


Figure 1 Sensory Store exhibit, World Mental Health Day, University of Central Lancashire, 10 October 2012.

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**Affective information design for patients**

*Keywords: graphic design, emotion, information design, patient information*

This is a position paper that discusses information design for patients in terms of potential emotional impact. The academic and practical focus of information design for patients has previously oriented towards legibility and comprehension of information (Houts et al, 2007; Dixon Woods, 2001). This paper argues the need for an additional focus - that of positive affect. Given the often emotionally-sensitive subject matter of the information and the existing emotions experienced by the patient, the issue of positive affect is a complex one. How do we help designers to acknowledge and design for positive affect? Currently there is little guidance produced regarding positive information design for patients and little published academic discussion into its use, despite a plethora of material designed for patients.

This paper critically examines current models of affective design for products (Desmet,2003; Desmet, 2012; Norman, 2004) and analyses how usefully these models can be applied to the field of information design for patients. Case studies are discussed, including examples of designs developed by the author and others, highlighting key concerns in designing affectively, as well as effectively. Designs discussed include the recent Design Council project, reducing aggression in NHS A&E departments and graphic designs to combat feelings of helplessness in chronic pain patients. Conclusions suggest that new models are required and that certain triggers of positive affect in existing models such as attachment and social belonging are particularly challenging in an information design context. The paper also concludes that cognitive, not only affective processes of patients still need to be a fundamental focus when designing for positive affect and that in order to achieve this we need to focus on content choice, order, and level of detail as well as positive visual appeal.

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*Keywords: self-care, chronic disease, ignorance, lay expertise, design*

This work explores self-care practices in type 1 diabetes and reflects on the design of a journaling platform supporting the personalization of self-monitoring practices. Chronic self-care in clinically uncontrolled settings is complex and gets entangled in a myriad of events in everyday life. In spite of the enormous clinical advancements in diabetes, what worked yesterday might not work today; what worked in the hospital might not work in a domestic environment; and what worked for the patient might not work for the doctor, and vice-versa. To deal with this complexity, patients need to rely on a series of resources and forms of knowledge that go beyond the clinical perspective. They develop a series of lay expertise that are key to ground medical knowledge in everyday life but that seem to be neglected by most design in the area (Storni, 2013a, 2013b; Orel, 1996). Available technology supporting diabetes self-management seems to rely on fixed and universal clinical that fall short in addressing everyday practicalities. Through the discussion of the proposed platform – called Tag-it-Yourself (Fig. 1) – it is shown that what each individual needs to learn is impossible to foresee at the time of design, and it should not be reduced to universal categories or normative approaches.

Drawing on Science and Technology Studies investigating the interplay between ignorance and knowledge (Gross 2007, 2010; Callon et al. 2009), I argue that designs uncritically relying on what is universally known today, risk transforming our ignorance (things we do not know yet) into non-knowledge (things we cannot longer know). Accordingly, I argue that design in chronic self-care should recognize and appreciate different forms of knowledge as well as our ignorance at the time of design, and that opening up the design to users, enabling appropriation (Storni, 2011), has the potential to better fit chronic self-care practices (Storni, 2013c).



Figure 1: The TiY Tags editor and a personalized self-monitoring page

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**About Us And Our Ideas: Young People (With Diabetes) Experiences Working With Designers**

*Keywords: young people, co-design, diabetes type 1*

Young people can be engaged in the design process: as informants (Katterfeldt, et.al., 2012); in making prototypes as a source of creative inspiration for designers (Fitton, et.al., 2012); proposing design concepts in workshops (Glasmann and Kanstrup, 2008); or designing via creative design activities (e.g. animated scenarios) (Katterfeldt et.al., 2012, Iversen and Smith, 2012). Our study aimed to evaluate the use of methods in co-design by post-project interviewing young people (with diabetes type 1) designing innovative diabetes self-care service proposals.

Ten young people (8 girls, 2 boys) mostly in their mid-teens (one 9-year old), their families, a Diabetes Specialist Nurse and four design researchers participated in eight creative workshops from July 2011 to May 2012. The 2-hour workshops followed a process of sharing experiences and identifying relevant issues, creative exploration of 'blue-sky' possibilities, convergence to practical proposals and prototyping (Design Council, 2005). Popular cultural references (e.g. Cool Wall, X Factor, Dragon's Den, Wallace & Gromit) were used at different stages of the design process to establish a design language (Sustar, et. al. 2013). In interviews, the young people reported that the project enabled them to: share their diabetes experiences with peers (for the first time, for some); to reflect on their relationship with their condition; and to contribute ideas towards final design proposals:

"It was good because it wasn't [the designers'] opinion, we all had a choice and they combined it [ideas] so everyone got involved." (Young Person)

Designers have to use popular references with caution, as some might be boring or misunderstood (e.g. Wallace & Gromit) by young people.

Through participation and ownership of outcomes these young people believed they were representing other young people with diabetes more widely 91

and, consequently, influencing their own and others' futures.



Figure 1: Young people participating at the workshop

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**Designing out curative syringe reuse: maximising global acceptance and impact by design**

*Keywords: patient safety, infection prevention, unsafe injections practices, frugal design*

Injections are the most common health care procedure performed in the world and the most deadly. Each year clinicians administer 16 billion iatrogenic injections using a pre-used syringe resulting in 1.3 million deaths, 26 million life years lost and 32% of all new Hepatitis B cases (Hutin & Chen, 1999). Following a global call by the World Health Organisation (WHO) in 1986 the auto-destruct syringe has since become a prerequisite device for all immunization programmes (95%). However cost has prevented its widespread adoption in a curative context (5%). Reaffirming absolute patient safety is illusory (Fischhof et al, 1981). Our presentation (and exhibit) describes a two-year process to develop an effective innovation and implementation strategy to contribute to a global reduction in curative syringe reuse violations through design. This undertaking involved precedent case studies, force-field analysis, and dialogues with global networks and specialists. Our acquired knowledge base captured



Figure 1: Transforming syringe label exhibit, Design4Health 2013

the complexity of the challenge, sharpened the acuity of our strategic approach and identified essential team competencies: high-level advocacy, frugality, unilateral benefits (Howitt, 2012) and an acceptance for satisfice solutions (Simon, 1959). The outcome is not a new syringe but a transformative label that synthesizes theories of risk perception, chromism and visual design (Fig.1).

A patented intervention that adds intrinsic value to any production syringe thereby amplifying its impact to global patient safety: disposable, auto-destruct or pre-filled. Marc Koska OBE Founder of the SafePoint Trust recognised the significance of our condition-change feature, as a package sterility indicator while transiting the supply chain and as a visual alarm indicating prior use of medical devices to unsuspecting patients. Assisted by Marc Koska, a new draft mandate that aims to outline future performance requirements for WHO-certified injectable technologies now specifies our technological advance. Project execution is now our primary objective.

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## Energying and empowering communities to design positive health and care services

*Keywords: service design, co-design, community engagement*

This paper presents a design-led, asset based approach (Morgan and Ziglio, 2007; Foot and Hopkins, 2010; GCPH, 2011) to community engagement (NICE, 2008) and co-design for person-centred health and care service development. Working in partnership, the Institute of Design Innovation at Glasgow School of Art and the Health and Social Care Alliance Scotland (The Alliance) are mapping and harnessing the assets of communities across Scotland to build an engaged community of co-designers to participate in an ambitious service development project. This collaboration is one strand of a project team that includes Government, health, social care, voluntary sector, academia, enterprise and industry partners. The 'Living it Up' project aims to develop a digitally enabled, thriving community of opportunities to support better health (using assistive technologies), wellbeing and active lifestyles in Scotland. Living it Up is co-funded by the Scottish Government and the Technology Strategy Board as part of the 'dallas' (Delivering Assistive Living Lifestyles At Scale) programme. The three-year project commenced in June 2012; currently initial service prototypes are being developed with the community.

Focusing on five diverse geographical areas, our research aims to uncover what the communities want to see and need as vital parts of the programme, how they can meaningfully get involved and how their own experiences can enhance the proposed outcomes. Methods include designing and delivering 'pop-up' community events in public spaces, targeting a range of individuals for semi-structured interviews and focus groups, co-design workshops, prototype testing and evaluation and an online forum.

By exploring individual assets within communities and across project partners

the team have been able to identify new ways of engaging with communities to utilise and expand 'what makes them good', challenging partners to 'think differently' and co-design services by harnessing the rich experiences of the individuals and communities who will benefit.

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## Co-designing evidence based health interventions for people in the retirement transition

*Keywords: co-design, older adults*

The LiveWell programme aims to develop pragmatic and acceptable lifestyle-based interventions to improve the health and wellbeing of people in the retirement transition. The project aims to help older adults change their lifestyle and targets eating patterns, physical activity and social relationships. The project team combines expertise in Human Nutrition, Behavioural Science, Movement Science, Medical Sociology, Gerontology, and mental wellbeing. User involvement through co-design maximises opportunities for usable and acceptable interventions but also requires the integration of multiple epistemologies.

Through information integration from qualitative research and systematic reviewing, researchers accumulated evidence for service opportunities and effectiveness of interventions in the retirement transition (Heaven et al, in press). Effective behaviour change techniques (Michie et al, 2009) and modes of delivery (Davidson et al, 2003) were identified. The researchers were supported by design expertise to integrate the evidence gathered and deliver a series of three workshops using co-design methods. Co-designers were potential intervention-users, deliverers, commissioners and researchers. The activities involved: i) describing the current retirement transition for a range of personas (Pruitt and Adlin, 2006), which were informed by the qualitative research evidence and further developed by workshop participants; and ii) brainstorming and storyboarding new ideas for possible service interventions using a variety of prompts informed by the wider evidence base.

Personalisation through identification of needs/desires and the role of a mentor in identifying resources and setting goals were key emerging design

themes. Integration of ideas was achieved through structured opportunities for discussion and a diversity of interactive methods.

Co-design methods integrated multiple sources and types of data, generating design recommendations for theoretically sound and evidence-based interventions. Intervention prototypes will be tested for acceptability and feasibility with older adults. The resulting interventions are more likely to be adopted by intended target groups.

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## Interactive prototypes as props in workshops to trigger the design of services for dementia rehabilitation

*Keywords: design for services, workshop, interactive prototypes, dementia*

It is known that physical training can help people with Alzheimer's disease to show less physical limitations and better motoric skills (Neeper et al. 1995). Physical rehabilitation and exercises are included in the services offered by most eldercare organizations. In the CRISP project (ten Bhömer et al. 2012) we are developing new services for rehabilitation of people with dementia, with a focus on the combination of textiles and technology. In a workshop setting we used interactive prototypes to discuss the implications of embedding these new services in the existing services of the eldercare professionals. The prototypes helped to envision new scenarios and additional touchpoints necessary to implement the new service. Further, the different viewpoints of the eldercare professionals triggered new possibilities for the prototypes in different contexts with different target users.



Figure 1: The workshop setting



Figure 2: Future service by one of the participants

During the workshop, a design researcher, two therapists and a care manager evaluated two prototypes (Figure 1). The first one was a shirt that design to

make rehabilitation exercises more fun by using sound feedback, for people with early and moderate dementia. The second one was a blanket with integrated vibration elements that reacts on touch and is used to trigger new communication patterns between a person with severe dementia and another person (partner, family or caregiver). The workshop followed the phases of co-reflection (Tomico et al. 2009) and consisted of a reflection part, in which positives and negatives about the current prototypes were written down. During the ideation part these were used as input to let the participants envision and sketch out their future service (Figure 2). In the confrontation this future service was brought back to reality by creating a requirements list for the next iteration of the prototypes, and a concrete plan to test the prototypes with the indented user group to validate some of the assumptions.

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## Multiple sclerosis (MS) Outpatient Future Groups: Designing tools of interaction in health service improvement activities

*Keywords: Outpatient experience, multiple sclerosis, patient and staff participation, speculation in design*

**Context of research:** The NHS has put great effort into service redesign, improving information provision and the patient experience for people with long-term conditions (Cayton, 2006). Despite this, it was reported that little has changed in MS services in England and Wales (Royal College of Physicians, 2011). The MS Outpatient Future Groups study aims to improve the outpatient experience for people with multiple sclerosis (MS) who attend the outpatient department at The Royal London Hospital (RLH).

**Main aim:** How can design tools be used to engage patients and staff and encourage them to imagine alternative health futures as a service improvement activity? Can this emerging design space increase sustainability within service improvement efforts?



Figure 1: Images of the Ordinance Survey outpatient map with contours and the participants prop pack using the metaphor of an ideal journey (going on holiday).

**Methodology:** Qualitative study using ‘future groups,’ a reinterpretation of the recognised focus groups method (Kitzinger, 1995) directed towards exploring future alternatives. This method employed metaphors and physical ‘props’ to engage participants to speculate about future health experiences and interactions, recording their feelings as contours on UK Ordinance Survey Map of the patient journey. Participants were people with MS and outpatient staff; staff nurses, nursing assistants, junior sisters and reception staff.

**Results:** Data from the study, together with feedback from participants showed that the success in uptake of the props was due to the design and attention to detail in crafting the metaphor of an ideal journey. Participants valued the activity and invested their own ideas and feelings in the activity. The combination of participants in the groups incorporating a diversity of perspectives and knowledge of the service led to a collaborative approach in which staff highlighted potential piratical problem and patients ensured ideas were holistic. **Conclusion:** Engagement of service users increased validity of the design proposals emerging from the future groups and encouraged adoption of the improvements. Metaphors enabled participants to remove themselves from current financial, organisational and physical constraints, enabling them to suggest sustainable improvements for the outpatient clinic.

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### Medical Devices: From the idea to a sterile product

*Keywords: sterile products, prototypes, product testing, cleanroom*

For over 10 years Single Use Surgical have been taking ideas and transforming them to sterile products used in the operating theatre. Many aspects of problem definition and development are common to any product development, but there are particular challenges relating to the operating theatre environment and the regulatory framework. This seminar details some of the practical issues encountered in this journey.

Often the problem and potential solution has arisen in theatres, and so interest and access is facilitated. There are guidelines and protocol for these theatre visits and involving the correct people can ensure fewer blocks later on. Sometimes it is possible to produce proof of concept non-sterile prototypes that can be used in a non-clinical situation but still in theatres (eg at end of case). These visits result in much higher quality feedback than meetings with the same people in an office environment.

A sterile prototype is actually medical device, and requires full CE marking, together with technical file, risk analysis, sterilisation validation and product liability insurance. This can be less of a challenge where reference can be made to similar product families. Production of the prototype has to be in the same controlled environment as volume production, and so we invested in a cleanroom for prototypes at SUS. (This cleanroom is also available for daily hire at £100/day). Final feedback from prototypes can give confidence for final tooling and volume production.

Selling a finished surgical product generally takes around 10 times the effort and cost of developing it. SUS now sell to over 450 UK hospitals and export 30% to over 20 countries. Understanding the challenges of the different mar-

kets also influences product design. Post market surveillance and customer feedback provide further opportunities for product improvements, sometimes many years after initial launch.

[www.susl.co.uk](http://www.susl.co.uk)

## Undressed visuals for low-literate pharmacy visitors

*Keywords: visual aids; patient information; low-literacy; medication safety*

Successful visual aids in patient information improve patients' recall and comprehension of instructions, and encourage safe use of medication. In particular people with low literacy skills are empowered by pictograms, because of decreased dependence on the written word (Katz, Kripalani and Weiss 2006). However, existing pictogram series are not adjusted to the abstraction level of low-literate people, or lack a system of visuals of the body. Such visuals are required to explain the benefits of a medicine; information that plays a crucial role in enhancing patients' usually low adherence to therapy (Krueger, Berger and Felkey 2005).

This study is part of the evidence-based development of medical pictograms for low-literate patients. For 4 organs, 11 sketches were made that varied in levels of detail and context (figure 1). In an interview questionnaire, 191 visitors of a city pharmacy in the Netherlands were asked to indicate which depiction of an organ they considered clearest. Participants' functional literacy was determined by the validated Dutch version of the Rapid Estimate of Adult Literacy in Medicine (REALM-D). 15.7% (30/191) of the participants were classified as low-literate, enabling a comparison of pictogram choice between low- and high-literates.

Overall, organs drawn with medium detail level and shown within the directly surrounding body area were considered clearest. The skeleton was the favoured background for two of the four organs. Compared to literate patients, the low-literate group preferred less detailed depictions of organs. They also considered images showing only the organ clearer than the same organ depicted within the body.

These outcomes, together with the participants' remarks, will be used as

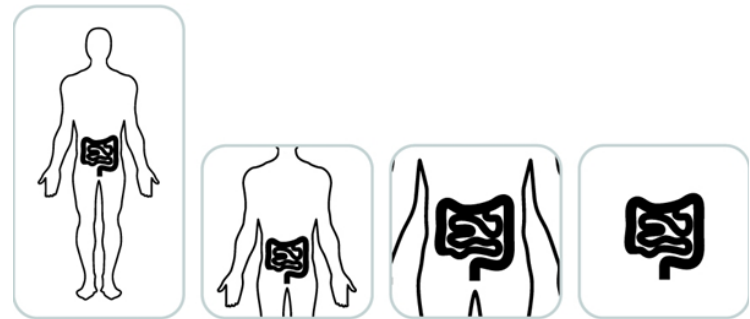


Figure 1: Variable "frame" for icons of the intestines ©BDD

guidelines for the iterative design process of organ icons. Resulting visuals will be incorporated in pictograms of medication instructions, and tested in the context of a visual/textual secondary patient information leaflet that is to be distributed at pharmacies.

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## How do end-users perceive the designs of healthcare waiting environments?

*Keywords: healthcare design, waiting room, environment, perception, emotion, end-user, visual analysis*

A growing body of research shows evidence that the design of a physical environment can impact on people's health and well-being (Devlin and Arneill, 2003, Huisman et al., 2012). Much effort is spent on improving the functionality of healthcare environments but the visual aspect of design and its impact on end-users is often neglected. Getting the design right for healthcare waiting areas is significant since they are one of the first interaction points between end-users and their healthcare journey, and where early impressions and quality judgments take place (Bitner, 1992, Ulrich, 2006).

The appearance of healthcare waiting environments often reflects the style of decision-makers, designers and architects. Consequently, the purpose of this study is to establish how various designs of healthcare waiting environments are perceived by the end-user. This is necessary to create more user-centric environments in the future.

66 participants were recruited to evaluate a series of 14 images showing a variety of designs of healthcare waiting environments. The evaluation was made on 28 emotional, cognitive and associative perceptual semantic scales which were developed from a previous study. Visual analysis of the images and quantitative analysis of the obtained rating scores provided a holistic understanding of end-user perception. Using their mean values, the images were used to construct visual scales. Figure 1 gives an example of such a visual scale. The design and healthcare communities can benefit from this study in the following ways:

1. The study provided indications for future hypotheses investigating which

design aspects can contribute to a better end-user experience of healthcare waiting environments. 2. The developed scales can be used as a visual map to guide those involved in the design process.



Figure 1: Visual Scale of "Pleasantness"

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## Portable 'gardening workstation': Facilitating elderly gardening activities

*Keywords: industrial design, elderly, gardening, dementia, soil ingestion*

Maintaining a high quality of life through participation in stimulating activities and social engagement, are worthy goals for all senior citizens. Unfortunately, enjoyable outdoor activities such as gardening can be difficult for the elderly to continue to be active in as they age, without alternative access methods being available. In 2012, the Masters of Design (Industrial Design) program at the University of South Australia was approached by Uniting Care Wesley (UCW), a non-government provider of community services, to develop a portable 'gardening workstation' in order to facilitate elderly gardening activities. Many age-care residents have fond attachments to their gardens and whilst the UCW had provided raised garden beds, many of the elderly residents who encompass a wide range of limitations and disabilities, still have considerable difficulty with even the simplest conventional gardening tasks.



Figure 1: Portable Gardening Workstation

The research proposal, requested the development of a portable 'gardening workstation', which could hold pot plants or planter boxes and enable elderly gardening activities. An unforeseen major obstacle to this goal however, was the need for any system developed to prevent dementia residents being able

to access soil, in order to reduce the risk of soil ingestion. This need saw the development of special plant propagation containers, which could safely limit finger access to soils. A hessian, biodegradable, peat-based, restricted-access plant container was developed and trialled.



Figure 2: Restricted-access plant propagation containers

Working in close collaboration with carers, residents and gardening enthusiasts, students developed and tested fully engineered, functional prototypes. The modified outcomes of the prototype tests now have the potential to improve the quality of life for residents, by providing therapeutic and social opportunities, to interact with nature, each another and their carers. The solution shown in figure 1, is now being considered for local manufacture.

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### Evidence based design of single-bed patient rooms: Exploring the processes behind two successful stories

*Keywords: Evidence-based design, healthcare, single-bed patient room*

Evidence Based Design (EBD) is a promising approach in reducing the prevailing quality gap and pursuing new quality goals (Gesler, 2004). The ultimate aim of the EBD is to increase the use of rigorous evidence. However, project level actual procedures of EBD are neither self-prescriptive nor unique at every application. The process can be facilitated by a range of ways for collecting and applying evidence during the design process (Wanigarathna et al., 2012). This nature of EBD has opened up many prospects to implement EBD at project level. But, these tailored procedures and their relative merits at different contexts are less reported.

The aim of this paper is to contribute to this knowledge gap by responding to two main questions. Firstly, how the principles of EBD are applied by different project organisations, in different project contexts. Secondly how these different approaches to EBD ensure the success of ultimate design of the hospital. In the paper, the evidence based design process of a single-bed patient room was selected as an example to respond to two questions. The EBD processes used during designing were explored through interviews with representatives of design team and hospital trust and through documented evidence. Further interviews with representatives of hospital trust and hospital staff revealed the performance of the design.

Two project organisations have taken different approaches to design. Interviews confirmed both designs as successful in terms of performance at the operational phase. EBD approaches taken during designing have been influenced by opportunities to access the rigorous evidence. Project teams have ensured the success of the design through different approaches to col-

lect, evaluate and apply evidence. The processes have also been influenced by project unique circumstances and requirements. Success of the design has not largely been dependent on the design approach, but corresponding and appropriate activities.

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## Using co-creation methods in service design innovation

*Keywords: assistive technology, service design, co-creation*

A new consumer informal care service, out with statutory Telecare services, is under development in the West Midlands to help people live independently and help friends and relatives support them. This unique service uses connected home sensor technologies to notify relatives or friends if, for example, the temperature was too low, or if an appliance normally used regularly (e.g. kettle) is not used. It also sends SMS messages to friends and family to let them know that their loved one is up and about, and alright.

Two co-creation workshops explored the potential customer journey through the service from beginning to end to develop the service blueprint. The structure of the workshops was based on the co-creation model defined by Sanders and Stappers (2008) as “any act of collective creativity, i.e. creativity that is shared by two or more people”. Participants engaged in several activities as tools of service design (Stickdorn & Schneider 2012) including service visualisation, customer personas, and a metaphorical bus journey to explore the users’ engagement with the future service.

Workshops included potential customers and people who could make up part of that person’s ‘neighbourhood’ for example, friends, family members or neighbours and industry and service representatives (n=24).

The trial service was piloted over a 3 month period in winter 2012/2013. Thirty nine participants were interviewed half way and at the end of the trial, and kept a diary of their experiences. Results showed that customers, families and friends found the system non-intrusive, reassuring and easy to use, without reducing social contact amongst the neighbourhood.

Two further co-creation workshops with 17 participants were conducted in April 2013 to further refine the service blueprint and move the service towards

commercialisation. This paper will explore the methodology used and how co-creation methods have enhanced the development of the service design.

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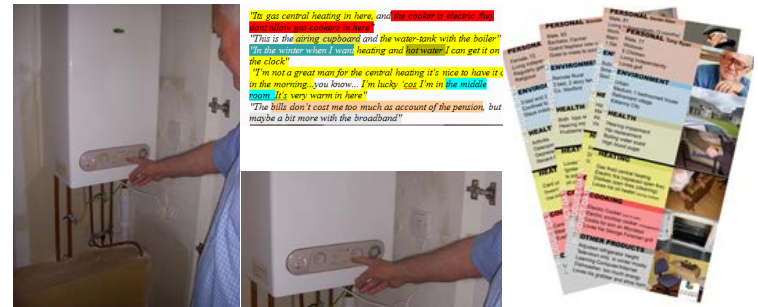
## Ethnography in Designing for Older People

Keywords: Design for older people, Ethnography, Design Methodology

As the global population rapidly gets older, designers are continually seeking means to gaining understanding and eliciting true user insights into older people's design and wellbeing needs. Comprehensive field studies that are both empathic and sensitive are cited as essential in this regard, with ethnographies predominantly heralded for achieving this (Seidel, 2009, Newell et al., 2010). However, it has been identified that Ethnography, because of its roots in Anthropology, has not been fully elucidated for the purposes of designing, particularly for older people (White, 2013).

Following the results of a yearlong design ethnographic field study into domestic product design requirement, this paper discusses and outlines the process of Design Ethnography specific to older people. It will reflect on the role of the design ethnographer and inform future practice; detailing the key stages and considerations of the process.

This paper will firstly outline the early stages of design ethnography prior to fieldwork; noting ethical considerations required. Further to this it will detail how to construct an "information rich" (Patton, 2002, p.242) sample of participants. Secondly it will describe fieldwork data collection methodologies (Fig. 1) through Interviewing, Observation, and Participatory Techniques. Thirdly, it will outline techniques of analysing Ethnographic data for the purposes of designing through colour coding (Fig. 2) and developing personas (Fig. 3). Finally the practical output of a design ethnographic study will be discussed, illustrating the critical nature of conceptual output.



"No gas central heating in here, and the cooker is electric, the  
 food also gas cooker, or hot"  
 "The water-tank with the boiler"  
 "The water-tank with the boiler, heating and the water can get it on  
 the clock"  
 "I'm not a great man for the central heating it's nice to have it a  
 in the morning, you know... I'm lucky 'cos I'm in the middle  
 room. It's very warm in here"  
 "The bills don't cost me too much as account of the pension, but  
 maybe a bit more with the broadband!"



Figure 1: Fieldwork Data Collection Figure 2: Colour Coding Analysis

Figure 3: Personas

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National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care, South Yorkshire (CLAHRC-SY)(NIHR CLAHRC for SY) <sup>1</sup>Sheffield Teaching Hospital NHS Foundation trust, <sup>2</sup>Sheffield Hallam University, UK

## The governance of design research in healthcare

*Keywords: Design Research, Governance, Ethics*

In this paper, we review our experiences dealing with research governance issues in healthcare. We indicate key ways in which creative and exploratory design research can engage with healthcare organisations to overcome barriers that limit the ability of both parties to realize the potential benefits of design research.

A key lesson has been about the complex interactions between general ethical principles as defined by a long history of ethical guidance in health (WHO, 2008) and the specific governance and oversight arrangements that apply in our particular setting (DoH, 2005), namely an on-going National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care, South Yorkshire (CLAHRC-SY).

Specific challenges in undertaking design practice and research stem from an incompatibility between the iterative nature of design research and practice and processes currently in place to approve projects. There is also the added complexity of terminology, where certain processes are followed due to classification of a project as 'research' (Brain et al 2013) as opposed to 'service improvement' or 'practice development', regardless of the activity proposed or the purpose of the project.

We will reflect on the wide range of different collaborative research, design and service improvement activities we have undertaken and how we have ensured the appropriate approval processes are obtained. These approaches include classifying design research as service improvement/review activity, as bench science and instances where design activity is provided as a service

developing an 'intervention' which is subsequently evaluated using traditional research methodologies.

Design research in healthcare is an emergent discipline trying to interact with historical systems set up for different purposes. We believe that over the last four years we have developed ways to work with these systems that ensure the balance between appropriate governance and the uniquely exploratory nature of design is realised.

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## Understanding the influence of user context in persuasive self-management systems for Diabetes control: the example of Chinese older adults

*Keywords: persuasive technologies, motivation, diabetes, chronic disease, self-management, user experience, user context*

Self-management is a tedious task for diabetes patients. It requires high motivation which is challenging.

One problem of many persuasive technologies is that they treat users as a homogeneous group. However, ignoring user context may reduce system effectiveness (Oinas-Kukkonen & Harjumaa, 2008).

Since research into these issues has been limited in the Asian context, this study explores user experience from psychosocial perspectives in an effort to understand the motivations and experiential problems older Chinese adults have in using digital technologies in diabetes self-management. Understanding the user perspective can help at identifying user needs and the factors that affect the successful adoption of technology for medical management (Illioudi, Lazakidou and Tsironi, 2010).

The paper studies two different types of digital self-management systems: one is a multi-media web-based self-management course (Fig. 1); and the other is a group of several logbook type mobile application systems (Fig. 2 & 3). These were significantly different in forms and features, as well as in the use of persuasive strategies. Two groups of patients used the systems in their normal everyday situation for about six to ten weeks. Their trial concluded with patient experience interviews.

The results revealed that although the web-based self-management system provided higher motivation for system use, there were considerable problems in terms of understanding and the experience of accessibility by using both

kinds of system. The study shows that neither approach was sensitive enough to user context this could influence the effectiveness of the persuasive strategies and motivation in self-management and system use.

This study demonstrates that understanding the user context from the patient perspective can help to design more effective monitoring and self-management systems to improve health and well-being. This study discusses the implications of these findings for the design and future direction of research and persuasive technology.



Figure 1: Multimedia Web-based Diabetes Management Course

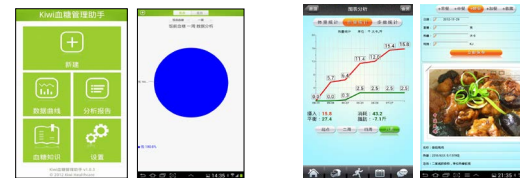


Figure 2: Diabetes Management System Figure 3: Weight Management System

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**Warning: Packaging can damage your health. Exploring the usability of hospital food and beverage packaging**

*Keywords: packaging, nutrition, older people*

As part of the 'inclusive design' agenda, researchers have shown significant interest on food use and access by older consumers (Duizer et al. 2009). Researchers have further made significant attempts to understand the strength of users needed to access packaging (Voorbij and Steenbekkers, (2002), Langley et al., (2005), Kuo et al., (2009) and Yoxall et al., (2010)). To date this work has concentrated on food access by independent older adults living in the community where inability to access food has been seen as a major 'frustration'. However, food and beverage packaging has been identified as a contributing factor to malnutrition among the elderly and disabled in hospitals (Walton et al, 2006) making access and use of packaging a significant health issue.

The focus of this research was to describe the types of food and beverage packaging used in New South Wales hospitals in Australia and hence determine the 'problematic' packaging from the users' perspective and to understand in more detail how these problems were manifested and the issues surrounding nutrition.

Participants (140 elderly inpatients and 64 staff members) were recruited from four local public hospitals. Staff members were also tested as to contrast and compare with the older patients. Data were collected using interviews, questionnaires, observations and grip strength testing. Several food and beverage packages were found difficult to open by at least 40% of patients. These included milk and juices (52%), cereal (49%), condiments (46%), tetra-packs (40%) and water bottles (40%). The difficulties were attributed to 'fiddly' packaging, hand strength and vision; however, only tetra-packs demonstrated a relationship between time taken to open and hand strength, suggesting other aspects of hand function may be more important than strength when opening food and beverage packages.

Therefore a separate study of over 100 people was undertaken to understand 'fiddly' packaging and establish the effect of dexterity of pack accessibility and how this could best be examined. Hence a test methodology was devised using standard pegboards to examine the worst performing packs outlined from the previous research. This new methodology and recommendations for packaging use in hospitals are presented in the paper.



Figure 1: participant under test

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## Corporeal Design and the fates of bodily fat after surgery – an artistic perspective

*Keywords: speculative design, corporeal design, perceptions of identity, the cultured body, fat management, plastic aesthetic surgery*

Our bodies are increasingly being experienced as objects to be honed and worked on (Orbach 2009). In the quest for an optimised body that incarnates beauty, wealth, health and success, larger parts of society are engaging in fat managing activities. Beyond calculating calories or burning fat on workout equipment, modifying the body takes place in operation theatres, which, besides irreversibly changing peoples' perception about their body-image, is proving to have addictive potential (Pitts-Taylor 2007). Taking the diverse cultural and social fates of fat as a guiding thread, the paper will elaborate on the author's on-going investigation in Corporeal Design practices (Zellweger 2010) and will discuss the topic through the presentation of his recent object-based works. Artefacts, which were exhibited in galleries and museums in London, Amsterdam or Lausanne, will be presented and responses discussed



Figure 1: Excess 2550, from the Excessories-series, glass, 2012

Figure 2: Fat, from the Excessories-series, 30x40 cm print, 2012

The artistic enquiry has mainly followed two strategies. The methodological

shift from a studio-based individual practice to an interdisciplinary exchange and collaboration with a plastic surgeon has offered the author insights outside specialised literature and the media. Being in contact also with medical staff and patients in and outside the operation theatre has led to original material, like video documentation and photography as primary sources. Secondly, expanding the traditional understanding of jewellery design (the author's original background) has allowed the unleashing of its embedded knowledge, i.e. its ability to deal with perceptions of identity, meaning and distinction. Jewellery has provided a valuable perspective that informs a view on the cultured body as modifiable artefact.

The investigation has led to the development of tangible body-related objects responding to factual, fictional and ethical dimensions of the subject. The enquiry aims to create emotional response and raise public awareness on a contemporary phenomena that borderlines issues on health and wealth, on dignity and obsession.

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**Effect on Frequency Changing of Tactile Feedback on Touchscreen Devices**

*Keywords: frequency discrimination, tactile feedback, human perception*

As people get older their senses deteriorate; Verrillo (1980) found out that the loss of perception dramatically increases above 50 years old. Yet many electronic touchscreen devices rely on people’s senses for interaction. Haptic feedback, such as vibrations, uses a person’s sense of touch to enhance the user-device interaction adding feedback to visual or audio cues. The aim of this project is to investigate the ability to perceive tactile effects in relation to age. Such that we might ascertain the potential use of haptics to reduce the barriers older people face when interacting with touchscreen devices, especially those with visual impairments. This should lead to improved design and usability of touchscreen devices for the future populations.

This paper has studied how the finger sensitivity changes with respect to age for the differentiation of tactile effects. The study focused on two frequency ranges around 125Hz and 250Hz, presenting a pair of vibrations to participants for discrimination. Participants were asked if the sensation was the same or different for each pair. At each frequency base (125Hz and 250Hz) 11 pairs were tested with a differential change of 5Hz and 25Hz, respectively, with each pair being tested twice. In total, 33 people were included in the test, 17 participants between 20 to 40 years old and 16 between 60 to 90 years old. Figure 1 shows the senior participant was evaluating the designed tactile effects.



Figure 1: Senior participant on tactile testing

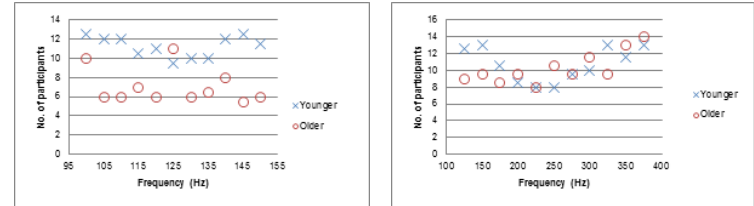


Figure 2: Number of correct responses at each frequency for younger (20-40) and older (60-90) participants around each range base (125Hz and 250Hz).

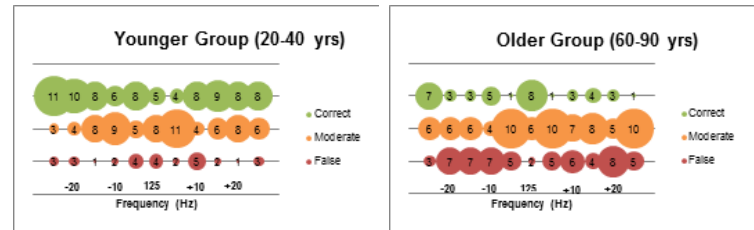


Figure 3: Discrimination results at 125Hz ± 25 for younger and older group

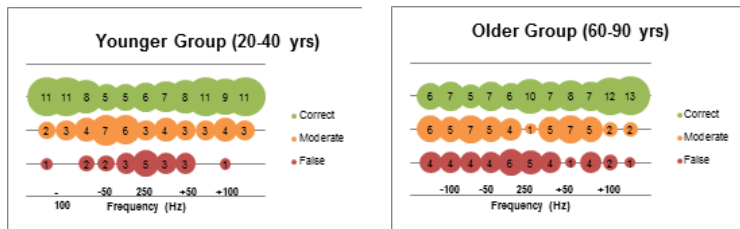


Figure 4: Discrimination results at 250Hz ±125 for younger and older group

Table 1: Discrimination results legend for Figure 3 and 4

	Test result
Correct	Identified correctly both times
Moderate	Identified correctly once
False	Did not identify correctly either time

From the graphs in figure 2 to 4 and with table 1, it can be concluded that the younger group follows the similar trend within the range around 125Hz and 250Hz, the ability to discriminate does not change significantly. However, in the older group, the performance increases significantly at the higher frequency (250Hz), compared to the differential change at around 125Hz. Showing a larger frequency differential aided the correct identification of a change in vibration frequency.

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## Design of a caregiver collaboration tool using subtle group awareness

*Keywords: communication tool design, caregiving collaboration, caregiver burden, group awareness*

Caregiving for seniors with mild cognitive impairments (MCI) brings the challenge to provide the right care task at the right time, thus requiring highly cooperative collaboration among caregivers [Christensen and Gronvall 2011]. Caregiver burden [Pollard 2008] refers to caregivers' stress caused by MCI patients' problems with disorientation and wandering, which quickly deteriorates as the illness progresses [Schoenmakers et al. 2009]. This paper presents a design case study on the development of a collaboration tool for formal and informal caregivers. The design was informed by user research on caregivers' group awareness focusing on emotional experiences of caregiving, which has been to the best of our knowledge, rarely explored in related studies on collaborative care. This design aims at enhancing caring experience through subtle cues on care activities and whereabouts of seniors; the delicate balance between awareness and privacy was considered throughout the development process.



Figure 1: Interface design with subtle group awareness, Design4Health 2013



Figure 2: History interface of seniors' conditions, Design4Health 2013



Figure 3: Map interface of emergency situation, Design4Health 2013

The evaluation of an iPad application was conducted with seven participating caregivers to examine if the concept is understandable and the design is useful. Roughly 70% of all functions were implemented in a PowerPoint animation and presented on a laptop. By completing preset functional tasks and leaving comments about the design, the participants showed that they appreciated the awareness gained by engaging with the interface design and expressed that they would like to use it to manage their care work. Particularly, the solution could minimize miscommunication between caregivers by inviting participants to articulate their activities in collaboration. For future work, participants suggested to explore how the application could be further tailored to address the needs of the senior.

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