Service innovation in hospital nutrition healthcare through co-design

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Abstract

How does one inspire innovation in public sector healthcare service delivery when faced with sectoral inertia due to the scale and complexity of the challenge? This paper describes an approach and the means used to design a new prototype food service to address malnutrition in vulnerable older adult hospital patients. The co-design process used was based on the ideas that tacit knowledge, experience and insights can be readily mobilised if provided with the appropriate means and encouragement and that innovation comes from creating a blend of ideas from multiple sources. A set of design methods was adapted and used to empower, train, inspire, facilitate and guide not only non-design members of the research team - including food scientists, nutritionists, medical sociologists, ergonomists, and technologists - but also the range of individuals concerned with hospital food and nutrition, i.e., key stakeholders and a 'food family' of staff, carers and older people's representatives. From this approach, of 'skilling-up' non-design professionals with some of the methods and processes used by designers, key insights and ideas emerged which led to a set of service principles and opportunities for development. The collaborative development process was guided by a set of service narratives which not only helped to develop shared understanding across the team, but also to generate specifications for each element of the new food service. This process led to a demonstration prototype which includes new products, technologies, environments and procedures, with the ultimate aim of raising the profile of food and thereby improving nutrition.

***Keywords*:** Service innovation, healthcare, co-design, hospital nutrition, older adults

Introduction: context of the research

The unacceptable scale, significance and economic consequences of malnutrition in older hospital patients within the UK's National Health Service (NHS) are well documented elsewhere (BAPEN, 2003; European Nutrition for Health Alliance, 2005; Age Concern, 2006). Previous isolated interventions, e.g., the Better Hospital Food Programme, have tended to focus on specific areas of food provision or on guidelines for ward staff to assist with patient meal times. Despite numerous such interventions and guidelines, a 'joined-up' approach to the provision of adequate nutrition to older people in hospital had not previously been considered. Although tools and processes are in place to screen for malnutrition, the current food provision system is unable to adequately monitor food, nutrient and fluid intake on an individual basis, nor does it provide an audit trail of accountability to ensure patients' individual nutrition requirements are being met.

In response to these issues, the 'mappmal' researchers, funded through the cross-research council's New Dynamics of Ageing programme, wished to consider the hospital food and nutrition system as a whole, to include new foods, new products to assist the supply and delivery of food, new staff procedures, conducive settings for eating and, where appropriate, to exploit state-of-the-art technologies (New Dynamics of Ageing, 2012).

The mappmal team comprised a range of academic disciplines (i.e., food scientists, dietitians, social scientists, ergonomists, technologists, computer scientists, clinicians, speech and language therapists and designers) from four academic institutions (Newcastle University, The Glasgow School of Art, University of Reading, and Loughborough University) and involved a food family (FF) (i.e., food producers, caterers, ward staff, nurses dietitians, physicians, speech and occupational therapists, carers, and older people), and key stakeholders (KS) representing the NHS, relevant charities and regulatory organisations.

Hospitalfoodie

Three and a half years' work by this team resulted in the 'hospitalfoodie' demonstration prototype. A nutrition management system is accessed through touch-screens at the patient bedside and staff interfaces. Tailored menus enable personalised food provision allowing ordering closer to eating times. Six smaller energy- and nutrient-dense 'mini meals' per day are provided, supplementing existing catering systems with ward-based food provision using a new 'mini-meal' trolley.

The system is designed to engage all types and grades of staff in the process and raise the profile of food provision as part of total patient care. At each meal, nutrition intake is monitored through an innovative 'wipe away' food monitoring application linked to a nutrition composition database. This is intended to facilitate screening for malnutrition, calculate individual nutrition requirements and monitor each patient's

achievement of targets. In the event of a shortfall, alerts will prompt time-limited actions allocated to a designated staff member, building accountability, providing performance data for auditing requirements and facilitating increased management of food and nutrition.

Questions and challenges

While the nutritional issues remained paramount throughout the research and development (R&D) process, this paper focuses on the role of designers working within the multidisciplinary team. The main questions and challenges facing the designers are outlined here and discussed below.

1. How could the inclusion of designers help the healthcare team 'think differently' about the problem and potential solutions?

2. Where were the opportunities for design interventions in the current food service to minimise malnutrition?

3. How could designers help inspire innovative patient-centred thinking in public sector healthcare service delivery particularly when faced with sectoral inertia due to the scale and complexity of the challenge?

4. How could they develop or adapt design methods and activities to engage and 'skill up' i) the other researchers in the research team and ii) the FF and KS as part of the R&D team to utilise their tacit knowledge and experience, and their insights and ideas for improvement?

Methods, tools and approaches

Due to the recent and rapid growth of activity in the service design field, a rich resource of methods, tools and case studies is now available to designers. Design-led approaches have been piloted to help the NHS 'think differently' about how healthcare services could be delivered. For example, Cottam & Leadbeater (2004) explore innovation in approaches to diabetes management. Bate & Robert (2007) provide a user-experience-centred response to the NHS system reform programme, set out in the Department of Health's (2005) patient-led plan. The NHS Institute for Innovation and Improvement has been exploring the use of service designers in the redesign of healthcare services (Design Council, 2008), and Pickles, Hide & Maher (2008) discuss practical methods of working with patients to redesign services. Tassi (2009) provides a tool summarising useful methods, as do Stickdorn & Schneider (2010) who along with Meroni & Sangiorgi (2011) provide a number of useful and relevant case studies. A number of service design consultancies also make their methods and case studies available on-line such as Engine (2012) and thinkpublic (2012).

The team's designers surveyed recent literature and exemplars from this field for approaches, methods and tools appropriate to the mappmal project to both engage participants and to make ideas and concepts more tangible through an iterative R&D process using mock-ups and working prototypes. The types of activities, the methods selected and used and the main stages in the process are summarised in Table 1.

Table 1: Activities and methods used at key stages in the development of the demonstration prototype.

	Key Stages	Methods
1	**Identifying issues with the status quo and opportunities for improvement**	Ethnographic studies in 5 NHS hospitals
		Interviews (n=52) with FF and KS
		Sensory testing of existing hospital foods
		Mapping of existing food journeys
2	**Analysing, visualising and validating findings**	Mapping of existing food journeys
		Thematic analysis and visualising of issues
		Validation of findings (workshop 1)
3	**Conceptualising and co-design**	Identifying opportunities and stimulating new thinking (workshop 1)
		Idea generation and scenario building (workshops 1 & 2)
		Service prototyping (workshop 2)
4	**Iterative co-design and development**	Determining core elements
		Building narratives and scenarios
		Prototyping of new interfaces
		Evaluating early system concepts with FF & KS (workshop 3)
		Evaluating early interface prototypes with FF & KS (workshop 3 & user testing session)
		Evaluating early food supply and delivery system (workshop 4)
5	**Communication through demonstration prototype**	Demonstration prototype - working simulation of key elements
		Exhibition design
		Conference presentations (n=6)
		Website design

Co-design and open innovation

Across the diverse disciplines in the mappmal team there was a need for greater in-depth understanding of the problems and needs of the patients receiving - and the staff delivering - the service. A significant difference from previous 'nutrition' initiatives was the deployment of a co-design process together with an 'open-innovation' approach. The open innovation paradigm assumes that 'external' ideas (i.e. in this case ideas from the FF and KS) as well as 'internal' ideas (i.e., from the members of the mappmal team) have value, that innovation can result from creating a 'blend of ideas from multiple sources' (Young Foundation,

2010) and that tacit knowledge and experience can be readily mobilised if provided with the appropriate means and encouragement. In this regard the FF and KS and non-design members of the research team represented a previously under-exploited resource for R&D predicated on the idea that it is not only designers who can design and use design methods.

The characteristic of the methodology deployed in mappmal was its participative, co-design approach using a variety of design methods in workshop-based activities. Insights and ideas were developed through a series of iterative workshops involving the FF and KS using visuals, simulations, mock-ups and prototypes. The design methodology was not stand-alone but was integrated into the overall project methodology and so was subject to robust scrutiny by the clinical, healthcare and social-science research disciplines in the team. This process also helped create a strong and effective social dynamic within the research team.

Thinking differently

How was 'thinking differently' facilitated as the basis for identifying service improvement opportunities? This was achieved through a mix of methods and activities. Our first such activity asked the FF and KS to suspend 'NHS-type thinking' and imagine the ideal mealtime experience which might be delivered by different types of service providers, i.e., a consumer lifestyle-orientated technology company, a food supermarket chain owned by its employees, or an armed services logistics corps, each highly focused on their customers' needs and expectations. To assist this activity, clear principles by which each of the above organisations delivered their services were provided in a set of 'prompt cards'. Following a facilitated brainstorming session, storyboards of the new mealtime experiences were created by the FF teams to integrate and demonstrate their ideas. Coughlan, Fulton Suri & Canales (2007) highlight the benefits of creating early physical and 'experience' prototypes of ideas generated by participatory design workshops, using methods such as role-playing and scene enactment, "…giving permission to explore new behaviours…". This 'discovery' phase allowed the FF, KS and mappmal team the first insights into alternative possibilities for innovative and improved nutrition management and food services. From an analysis of these and other workshop activities, key insights into the requirements and ideas for a new food service emerged. These were formalised into a set of service principles and opportunities for a new food service concept which would be iteratively developed and prototyped for feedback at further workshops.

People-centred thinking

According to the team's medical sociologist the nature of the existing service is one of "… transitory people doing interrupted work … everybody is in transit all the time doing something on the way to doing something else". Particularly where there are a large number of different healthcare and clinical staff

involved in the delivery of the service to acutely ill individuals, this can result in a form of myopia in appreciating how service users actually experience a service. However, an effective and efficient service should be user-friendly for all those involved in the delivery and receipt of that service. Mapping the 'big picture' of food journeys from interview data and developing an understanding of the patients' mealtime experiences were initial objectives. For the design team, the second of these objectives was confounded by lack of access to acutely ill patients due to practical and ethical issues. Patient-centred thinking was achieved through the combination of methods summarised in Table 1 and which have been discussed in some detail previously by the authors (Macdonald, Teal & Moynihan, 2010a, b; Macdonald, Teal, & Rice, 2010). In summary, the use of ethnography, visual mapping techniques, personas and mealtime scenario-building using photos of vignettes compiled from hand-sized toy figures helped the team and FF to understand more clearly some of the problems with the current status quo from both staff and patient perspectives.

One method which was particularly helpful was the 'narrative' technique which helped the team understand the very human aspects (from each of the patient, ward staff, clinical staff, nutritionist, catering manager or hospital manager perspectives) of the emerging prototype system. To help develop the service concept a set of 'food service narratives' was scripted that reflected the core nutritional goal of ensuring that calorie, protein and fluid intake met individual daily targets. These narratives, describing nutrition-related events during the daily life of a patient's hospital stay from admission to discharge took three forms. The first was a set of simple text documents which enabled the narratives to be easily edited by all members of the research team and were used to reach team consensus.

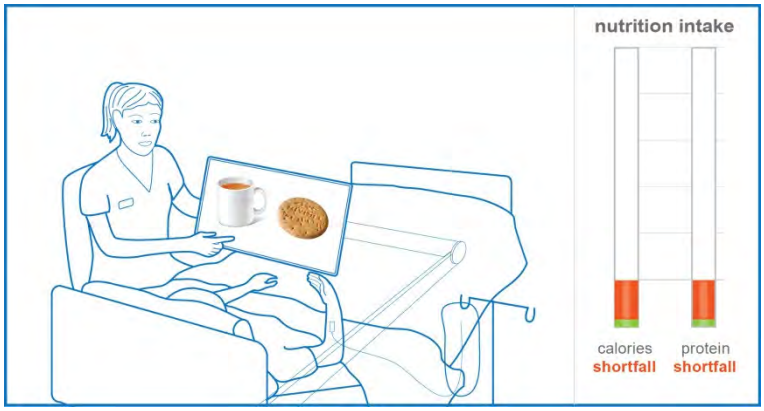

Figure 1. Illustrated service narratives as used in PowerPoint®

The second was a modular set of illustrated PowerPoint® storyboards which visualised typical scenarios (Figure 1). These explored the supporting role that various service elements and technologies played in responding to individual patient nutritional needs, for monitoring intake and prompting appropriate food and drink options. In this way, the requirements of, e.g., ordering and monitoring technologies, and the role

and frequency of delivery of new, specially designed foods (developed by the food scientists in the team) could be specified. From the patient and nursing staff perspectives it was also important to visualise how the service presented itself to – and welcomed - the patient, helped in the selection of meal options and in creating a stimulating, attractive, and non-medicalised experience. This version of the narratives was used by the team's sociologist in further interviews with the FF and KS to reveal any issues with the new service concept.

The third version of the narrative was used by the team to communicate the hospitalfoodie concept as part of the demonstration prototype exhibition shown at a series conferences which were used to solicit feedback (see section 4.2). For the final conference presentation in the series, a professional quality version of this narrative was commissioned by the team (Figure 2) which was also used on the project website (hospitalfoodie, 2011).

Figure 2: Stills from the professionally commissioned narrative video. (Images © Peter Baynton 2011).

The hospitalfoodie prototype

Prototyping elements of the system

Visuals, enactment, mock-ups and interactive prototypes were amongst the range of methods used to make ideas and concepts more tangible, allowing the mappmal team, FF and KS to identify issues and opportunities for improvement and innovation. For example, a number of ideas were considered for monitoring nutrition intake before a concept for a 'wipe-away' app was selected as showing the most potential (Figure 3). The rationale for and testing of this app is described in detail in Comber et al (2012). In similar fashion, the preferred versions of the patient-facing (Figure 4) and staff-facing menu systems resulted from the iterative mock-up and prototyping development process.

Figure 3: The user ‘wipes away’ food items eaten based on a visual assessment. The app is linked to a nutrition database calculating nutrients and calories consumed.

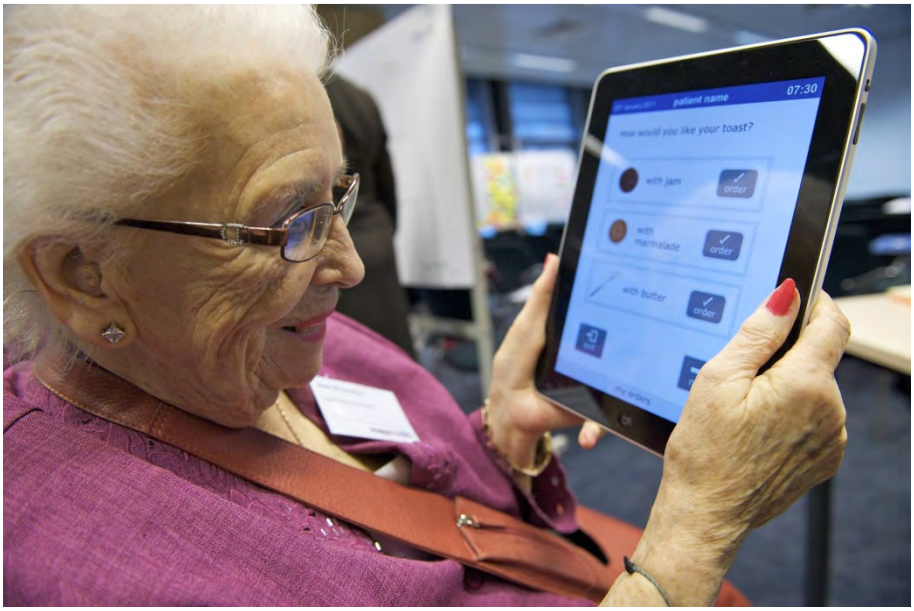

Figure 4: A food family member provides feedback on an early version of the patient menu interface at one of the FF and KS workshops. Photo © Cate Gillon 2011.

Communicating the concept

In the final phase of the project the system was exhibited as a demonstration prototype (Figure 5) at a series of four key conferences representing key stakeholder communities, i.e., geriatrics, gerontology, design-for-

health and nutrition. This was designed to solicit further feedback by providing: i) an overview and explanation of how the system worked as a whole, its key features and attributes and how it addressed key nutritional issues; ii) prototype interactive interfaces designed both for staff and patients; and iii) an illustration of how the system would supply and deliver 'mini-meals' through specially designed foods and a mini-meals trolley. Feedback was solicited through a set of postcards each of which focussed on a particular aspect of the prototype, e.g., 'mini meals' and 'ward food provision' and through a comments form via the hospitalfoodie website.

Figure 5. Delegates interacting with the touch-screen interfaces in the demonstration prototype exhibition. Photo © Cate Gillon 2011.

Conclusions: the contribution of design

At the end of this process, what, in the view of the other researchers in the team, did designers bring to and contribute to the project? The perceptions of some non-design members in the team have helped reveal the value of design in this context. For example:

> "As a non-designer I now have a knowledge and understanding of creative ways of expressing ideas and concepts visually to make them more tangible and facilitate understanding. The design methods that have been employed … have created the threads that link the key elements of the prototype together. The design element of the project has also introduced me to a new variety of means to facilitate engagement with key stakeholders to elicit feedback". Dietitian and project lead

> **"**Until I started working on [the project] I had no understanding of what service or process design meant, nor participatory design, nor iterative design. I think at the end of three years I now find it hard to imagine how truly multidisciplinary teams working on a multilayered problem can get anywhere without a designer on board. To me designers can visualise ideas and communicate them to a wide audience in a way most disciplines cannot, but perhaps more importantly they can see how a full system should fit together to work well in a way isolated parts of a system cannot." *Food scientist*

The contribution made by designers in this context is clearly different from - but complementary to - that made by the scientists and social scientists in the team. This project demonstrated the designer's translational abilities, using an evidence-base generated by the other researchers, and ideas generated by

the FF, KS and mappmal team through the participative co-design process, to give tangible form to new ideas and concepts through mock-ups and working prototypes in an iterative R&D process. This process helped build the specification for the system. The demonstration prototype is now (at April 2012) at the stage where, with further development work on the interfaces and software system, it can be taken forward for testing in simulation trials and ward trials.

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