

Research paper

Hospitalfoodie: an interprofessional case study of the redesign of the nutritional management and monitoring system for vulnerable older hospital patients

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ABSTRACT

Background To date, a solution to the problem of hospital malnutrition in older patients in the UK has not been found through previous approaches using isolated interventions.

Aims To identify opportunities for, and to develop and prototype a new food and nutritional management system able to meet individual patients' daily requirements.

Methods Using an interprofessional team approach, design researchers worked alongside food scientists, dietitians, medical sociologists, ergonomists, computer scientists, technologists, key stakeholders and a 'food family' (those concerned with nutrition management, and food supply and delivery in hospital, i.e. food producers, caterers, ward staff, nurses dietitians, physicians, speech and occupational therapists), as well as with older people representatives. Through ethnography and workshop-based methods, major opportunities for service improvement were identified. An iterative design and development process was deployed using mixed methods including ethnography, mapping, personas, storyboarding, role-playing, enactment and

narratives. Prototypes of interactive interfaces were developed to test the workability of an electronic nutritional management and monitoring system linked to a nutrition composition database. In parallel, new food products were developed, led by food scientists, and a catering supply and delivery system for ward-based food provision was also developed. The methods used to facilitate inter-professional collaboration, the engagement of the food family, and to develop the food and nutrition service concept are described.

Results A demonstration prototype was displayed in exhibition format at a series of conferences to gather further feedback.

Conclusion Early responses to the 'hospitalfoodie' demonstration prototype were favourable and indicate that, with further development, the prototype may offer the means for improving nutritional care standards in hospitals and be adaptable for use across other patient groups.

Keywords: co-design, hospital food, interprofessional, nutritional management, older patients

How this fits in with quality in primary care

What do we know?

Within the health sector it is acknowledged that teamworking has an important contribution to make to the effective delivery and quality of health care. Health care improvement and innovation have tended to involve traditional sets of disciplines, i.e. the range of disciplines and sectors normally found within healthcare delivery. The multidisciplinary team research was conducted in a secondary (hospital) care service context with the aim of improving the quality of nutritional care in vulnerable older hospital patients. The new approach discussed here may be transferrable and of value to the development of improved primary care services.

What does this paper add?

There is wide consensus for the need for a food and nutrition service which provides greater quality, meets the individual and daily nutritional requirements of vulnerable hospital patients and provides a more enjoyable experience. This paper describes an interprofessional research and development (R&D) approach used for the first time to address this nutritional issue utilising a participative 'co-design' methodology to engage a 'food family' and key stakeholders in the creation of a demonstration prototype for an improved food and nutritional care service. This approach employed mixed methods, some familiar within health care, others innovative in this context. The findings suggest that there are advantages to embedding design researchers within healthcare R&D teams and that their methods should be integrated into the overall research methodology.

Introduction

When one thinks of interprofessional teams involved in healthcare service research and improvement, rarely does one think of designers as part of the discipline mix. This paper describes a research and development (R&D) process that began with an 'ideas factory', an interactive 5-day workshop, the aim of which was 'to look for innovative ways to explore the new dynamics of nutrition for older people'.¹ This 2008 workshop, forming part of the UK cross-research council's New Dynamic of Ageing (NDA) programme, provided an intensive, interactive and free-thinking environment where a group of participants from a diverse range of professions and backgrounds came together to immerse themselves in innovative and collaborative responses to the nutrition issue. The NDA selected this range of disciplines to include designers for their emerging track record of innovative approaches to healthcare service redesign. Through this workshop, a rare opportunity was provided and a spirit of innovation was implicit at the very genesis of one of the projects – 'mappal'² – emerging from this workshop, a spirit maintained throughout the duration of the project.

The unacceptable scale, significance and economic dimensions of malnutrition in older hospital patients within the UK's National Health Service (NHS) are well documented elsewhere.^{3–5} Each individual patient, but particularly those in vulnerable groups, e.g. those suffering from stroke, dementia and hip fracture, requires specific nutrient and fluid targets to be met daily dependent on, e.g. their nutritional status, medical condition, body weight and mobility level. Although

tools and processes are in place for screening for malnutrition, the current system for food provision is unable to adequately manage, deliver and monitor food, nutrient and fluid intake on an individual basis, nor is there an audit trail of management and accountability to ensure patients' individual nutritional requirements are being met.

While these nutritional concerns remained paramount throughout the R&D process, this paper focuses on the methods introduced by the designers within the team to overcome a number of challenges in the R&D of a new ward-based food and nutritional management concept.

Methodology

The Design for Health and Care team at The Glasgow School of Art undertakes healthcare-related research within larger interprofessional teams in areas as diverse as physical post-stroke and post-operative rehabilitation, spinal injuries management, diabetes management and ward-based infection visualisation and management. The team deploys innovative, participative people-centred action research methods,⁶ reflecting those used by a now established and growing 'service design' discipline within the field of design. Many design-led approaches have been piloted to help the NHS 'think differently' about how healthcare services could be delivered, such as diabetes and exercise management and the NHS Institute for Innovation and Improvement has been exploring the use of service designers in the redesign of healthcare services.^{7,8}

A rich resource of case studies and methods is now available which designers and the healthcare sector can consult, e.g. Meroni and Sangiorgi.⁹ Thus, designers are now able to draw and adapt from a rich taxonomy of methods, e.g. Tassi.¹⁰

The approach taken by mappmal was that the design and provision of new food products, nutritional interventions and monitoring had to be seen within the wider context of a redesigned 'food service'. To this end, an important element in understanding the issues was the timing and extent of public and patient involvement (PPI):¹¹ early and on-going involvement of a food family (FF; food producers, caterers, ward staff, nurses, dieticians, physicians, speech and occupational therapists, carers and older people) and key stakeholders (KS; representing relevant charities, and older people representative groups) helped set the agenda and enabled the research team to identify issues and priorities from the outset.

The challenges to the mappmal team were how to: (1) empower, inspire, facilitate and guide the extended FF and KS, as well as the research team from four different academic institutions (i.e. food scientists, dietitians, social scientists, ergonomists, technologists, computer scientists, doctors, speech and language therapists and designers) during the R&D process; (2) facilitate the FF and KS to share their valuable knowledge, insights and experience; (3) introduce and integrate new methods with more traditional ones; and (4) coherently manage the R&D process for the new food service prototype as part of the wider mappmal research project.

Co-design process

From the outset, an overarching methodology established a participative, co-research and evidence-based co-design process involving mixed methods to acquire qualitative data, explore ideas and iteratively develop new food service concepts into a demonstration prototype. This was achieved by early and on-going involvement of the FF and KS through a series of workshops and interprofessional working practices. At certain stages, the FF and KS were enabled to become part of the R&D team, and provided with the tools and means to 'co-design' the service. Figure 1 summarises the process. This process was particularly productive in creating synergy between the different members of the research team, the FF and KS, as well as coherence of viewpoint.

Some of the methods and approaches, previously described in more detail by Macdonald and co-workers,¹²⁻¹⁵ are summarised here.

Visually mapping the existing food provision

The existing 'status quo' of the food service and food journeys were visually mapped in detail using thematic analysis of interview and observational data collected from the FF by the social scientists and also data on 'food journeys' obtained from the team's nutritionists and food scientists to allow a clear overview and a shared understanding of the current service where none had existed previously. Using these

KEY STAGES	
Activities and methods	People
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	S, D, N S FS FS, D
2 analysing, visualising and validating findings mapping of existing food journeys thematic analysis and visualising of issues validation of findings @ WS1a	FS, D D, S FF, KS
3 conceptualising and co-design identifying opportunities and stimulating new thinking @ WS1b,c ideas generation @ WS2b service prototyping @ WS2c	N, S, FS, D, T, E, FF, KS FF, KS N, S, FS, D, T, E, FF, KS
4 iterative co-design and development determining core elements building narratives and scenarios development of new interface application evaluating early system concepts with FF + KS @ WS3a evaluating early interface prototypes with FF+ KS @ WS3b evaluating early food supply and delivery system concept @ WS4	N, FS, D, S N, FS, D, S D, T, CS N, S, FS, D, T, E, FF, KS N, S, FS, D, T, E, FF, KS S, D, FF, CM
5 communication through demonstration prototype demonstration prototype - working simulation of key elements exhibition design conference presentations (n=4) website design	N, FS, D, S D N, S, FS, D D
People key D Designers, S Sociologist, T Technologist FS Food Scientist, N Nutritionist, E Ergonomist FF Food Family, KS Key Stakeholders CM Catering Managers, CS Computer Scientist	WS = Workshop (number + activity)

Figure 1 Key stages in the development of the prototype showing the interprofessional nature of activities, methods and the team members involved at each stage

maps as the basis for a facilitated FF workshop activity empowered the FF to identify and clarify the problems and issues as well as positive aspects within the current service.

Facilitating a patient-centred approach to food provision

With the large range of different healthcare and clinical staff involved in nutritional care and the supply and delivery of food and meals to acutely ill individuals, it can often be difficult to fully appreciate how the service is experienced by service users themselves; the patient is the only individual who experiences this as a totality. The designers adapted 'storyboarding' (a series of drawings in sequence to illustrate a sequence of events) and 'persona' (a fictional character created to represent a user type within a targeted demographic) tools for use by the FF to develop patient-centred mealtime scenarios for individuals with stroke, dementia and hip fracture, describing events and issues pre, during and post mealtime. These used a set of individual vignettes of photographed Playmobil® scenarios comprising typical situations derived from ethnographic data and observational studies and reconstructed by the FF into mealtime storyboards (Figure 2). Speech and thought bubbles were also provided, intended to encourage thinking about the interactions, thoughts and feelings (positive and negative) of patients and staff throughout the mealtime scenarios.

'Thinking out-of-the-box'

The pressured demands of professional daily routines can habituate attitude and suppress thinking of alternative practices; the challenge here was how to help the FF to think 'outside-the-box' for fresh ideas possibly leading to improved solutions. For inspir-

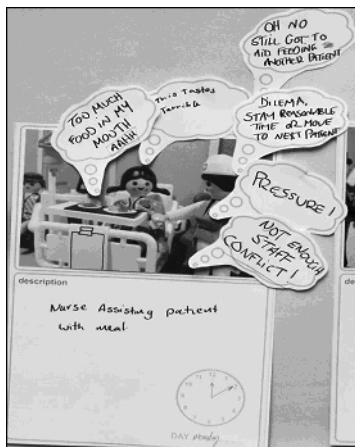


Figure 2 Example of a storyboard frame completed by the food family

ation, the FF were asked to consider how alternative (i.e. non-NHS) service organisations might provide and deliver the hospital food service, such as: (1) an armed services catering corps (delivering highly nutritious, easily prepared food, on demand in challenging environments); (2) a consumer-oriented food retailer (concerned with quality of food, choice and experience as well as a partnership approach to engaging staff); and (3) a popular lifestyle computer systems retailer (lifestyle media and technology presented in a seamless, user-friendly manner). To assist the FF, clear principles by which each of these organisations delivered their services were provided in a set of 'prompt cards'. The existing mealtime experiences were retold by FF teams, this time from the perspective of each of the new service providers (Figure 3). This 'discovery' phase of the project enabled the first possibilities to be entertained of how an alternative service might be provided.

From an analysis of these and further 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 through which the new food service concept could be developed and prototyped.

Results

Conceptualising a total food provision and nutrition management system

Through the above process emerged the concept of 'hospitalfoodie', a total food provision and nutritional management system, intended to facilitate increased engagement of all types and grades of staff in the process of providing adequate food and nutrition to older people in hospital, and to raise the profile of food provision as part of total patient care. The aspects of management and monitoring would be facilitated



Figure 3 The food family exploring imagined mealtime experiences as provided by alternative service providers

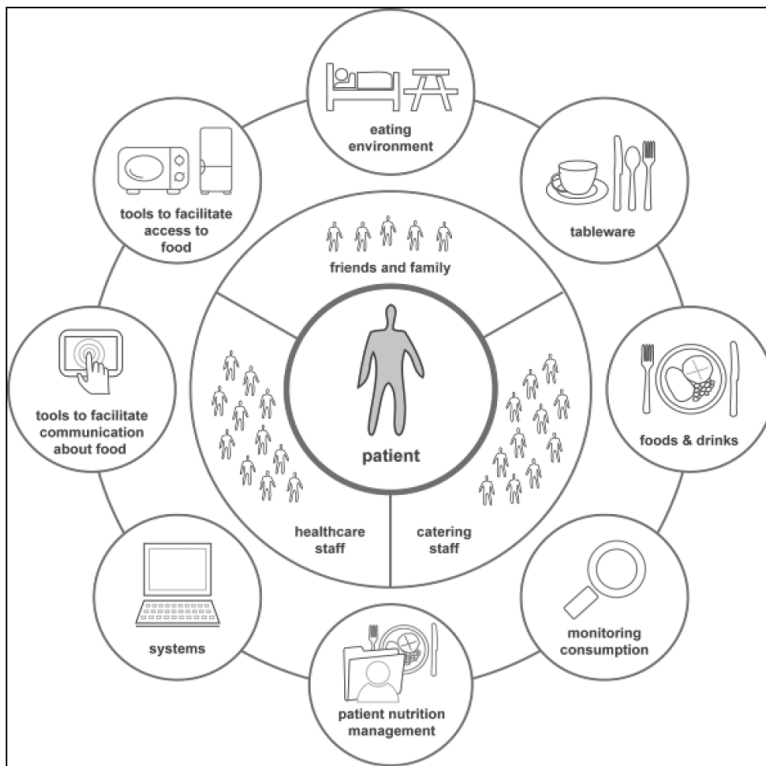


Figure 4 An early 'hospitalfoodie' concept diagram showing elements comprising the total food provision system

using new technologies. The research team used a series of early concept diagrams such as Figure 4 to consider and evaluate potential elements constituting the hospitalfoodie concept. As the concept evolved, some elements were later regarded as non-core while new elements were added.

Developing a new service prototype

Once the hospitalfoodie concept had emerged, the challenges for the team were: to develop and refine the concept system; to develop, build and test mock-ups and prototypes for the separate elements of the system; and to produce a demonstration prototype showing how these individual elements worked together. The FF was consulted at every stage to test out the feasibility of ideas and obtain their feedback and suggestions for improvements.

Service narratives

One of the most powerful tools for the articulation of hospitalfoodie and the subsequent development and refinement of the prototype was the 'service narrative'. The process of constructing storyboard narratives allowed the different members of the research team to explore the supporting role that various elements

and technologies comprising hospitalfoodie would play in, e.g. storing information on each individual's nutritional requirements and status, responding to their nutritional needs, monitoring their intake and prompting the system to indicate to staff-appropriate food and drink options. In this way, the specification of 'smart' technology elements, the composition and frequency of delivery of new, specially designed foods and 'mini-meals' and the means to supply and deliver these could be explored and specified for a range of patient types (Figure 5). A series of these service narratives was used at different stages in the development process to ensure that the system would deliver the core goal of meeting each individual's daily targets for nutrient and fluid intake. Collaboration between the nutritionist, the social scientist and design researcher was particularly well facilitated through this method, although all members of the research team were able to contribute comment through the narrative method which was also used to solicit feedback from the FF.

A number of narratives was used to develop the new service blueprint; this describes a service in enough detail to implement and maintain it carefully.¹⁶ For example, from the patient perspective, it was important to understand how the service presented itself through an easy to understand and use interface in



Figure 7 The application helps ward staff to monitor food eaten by patients. Staff directly observe what remains on the plate and 'wipe away' the equivalent from the screen

Discussion

This paper describes an R&D approach used for the first time in this area of health care, i.e. to address nutrition provision within the hospital setting. The mappal team utilised a participative co-design methodology to engage the FF and KS to capture their tacit knowledge and experience, insights and ideas and as the basis for generating a prototype demonstrating an innovative concept for an improved food service. To achieve this, the team employed mixed methods, some familiar within health care, others innovative in this context. Interprofessional collaboration can bring benefits, but also methodological challenges, particularly when professionals regarded as outside the traditional 'healthcare set' – in this case designers – form part of the team. Here, it is important to acknowledge the tensions as well as the synergies. Design as a field tends to be solutions-driven, whereas research is essentially knowledge-driven. Innovation requires genuinely workable solutions that are acceptable to and workable by end-users but to achieve these requires thinking 'outside-the-box'. However, service deliverers can often be resistant to change. The challenge for the research team has been to acknowledge and help balance this tension between the requirement for an audit trail using a robust evidence base, on the one hand, and creating situations which provide contributors with an opportunity to step outside the current system to allow sufficient 'free headspace' for informed speculation towards potential solutions, on the other hand. This close working relationship between designers, scientists, sociologists and technologists and the introduction of new methods has enabled the team to 'think differently' about the chronic issue of malnutrition in the hospital setting. The perceptions of some non-design members in the team help 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.' (Nutritionist 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)

By deploying innovative methods, the designers' contribution has been arguably able to: (1) help everyone 'think differently' about addressing a chronic issue; (2) help raise the quality and relevance of the FFs' and KSs' contributions; (3) create a strong and effective social dynamic between the FF, KS and the research team; and (4) develop a person-centred food and nutrition delivery and monitoring service concept. The findings suggest that there are advantages to embedding design researchers within healthcare R&D teams and that their methods should be integrated into the overall research methodology.

Conclusions

What are the potential lessons to be learnt from this project where previous approaches have failed? Chronic 'wicked' healthcare service delivery problems may require a creative rethinking of methods to achieve solutions. R&D projects such as this require sufficient time to allow for a development phase to explore how new approaches can exploit the evidence base acquired in earlier phases, and allow space for informed speculative thinking. Potential groupings of healthcare research disciplines teams could be receptive to the idea

of embedding experienced service design researchers within the team to develop an integrated methodology and a synergistic approach across team disciplines, and between the team and their clients and stakeholders to open up the 'innovation space'. Undoubtedly, the NDA 'ideas factory' was an essential catalyst in promoting the idea of designers as one of the key disciplines in the team, in building that original trust at the very conceptualising of the project, and in establishing an innovative approach to the malnutrition issue from the outset. The potential pay-off, however, is that the outcome of the whole team's efforts, i.e. a structured and iterative approach to innovation, is greater than the sum of normally separate contributions from different disciplines.

The hospitalfoodie demonstration prototype was showcased, to favourable response, at a series of UK gerontology, geriatric, design for health and nutrition conferences in the latter half of 2011. This will now require further stages of development and evaluation and trialling to prove it can deliver effective improvements in ward-based nutritional care.

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ETHICAL APPROVAL

The study was approved by Hull and East Riding Local Research Ethics Committee (now replaced by Yorkshire and the Humber Bridge Research Ethics Committee).

PEER REVIEW

Commissioned, not externally peer reviewed.

CONFLICTS OF INTEREST

The researchers have submitted a further research proposal to the ESRC's Follow-on Funding scheme which, if successful, would involve the British Association for Parenteral and Enteral Nutrition (BAPEN).

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