Proceedings of the 2009 INFORMS Simulation Society Research Workshop
L.H. Lee, M.E. Kuhl, J.W. Fowler, and S. Robinson, eds.

A PROPOSED APPROACH FOR MODELING CARE PATHWAYS FOR INFRASTRUCTURE DESIGN BRIEFING

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1 INTRODUCTION

A wide range of modeling approaches has been identified adopted and developed to examine the problems and complexities of health care systems over the last 30 years. Modeling techniques showed their usefulness in health care management, service delivery planning, resource allocation, space utilization, etc (Gahal and Eldabi 2008). Models are helpful whenever a problem exists. whether the aim of modeling is problem identification, problem structuring or problem solving,

However, the use of models and modeling is not limited to problem structuring or solving, it can also be used to gain an understanding about how the real world operates, and to generate a debate and stimulate thinking about certain situations. Michael Pidd proposed that:

"Models are tools for thinking"

and he goes further to affirm this in:

"These tools for thinking may be used to add leverage to human thoughts and analysis"

Pidd 1996 p 29

In this paper, we discuss modeling as a tool for understanding in order to improve decision making and communication with the aim of modeling specifically Care Pathways and their interaction with the built environment, to facilitate infrastructure requirements capture. Therefore, in this paper we tend to use the word *situation* rather than problem.

2 THE NHS AND CARE PATHWAYS

The National Health Service (NHS) in the UK has been providing the British nation with accessible healthcare service based on need not capacity to pay since its creation 60 years ago. To remain sustainable in the 21st century the NHS needs to address various challenges, such as: rising expectations, demand driven by demographics, the continuing development of our information society, advances in treatments, the changing nature of disease, and changing expectations of the health workplace (DoH 2008). These all require amongst other things a greater emphasis on improving quality, performance and costs.

The latest government review of the NHS services (DoH 2008) called for *locally led, patient-centred and clinically driven change*. The report recommendations focused around three matters:

1. Promoting well-being and prevention beside tackling illness,
2. Providing higher quality and safer care, and
3. Adopting innovation in the care process and medical technology.

The review adopted the Care Pathway as the vehicle for improvement, because it is designed by medical staff, based on clinical evidence and is patient centred. Hence, the care pathway is central to the future of the NHS.

Clinical pathways (care pathways, integrated care pathways, critical pathways) are a practice of management designed and developed by healthcare specialists, to articulate the care process for patients. There are many definitions of clinical pathways in use, however, the Department of Health definition for care pathway is:

'A documented sequence of effective clinical interventions, placed in an appropriate time frame, they help a patient with a specific condition or diagnosis move progressively through a clinical experience to the desired outcome'. <dh.gov.uk, 2009>

Moreover, the aim of care pathways as identified by the European Pathways Association is to enhance the quality of care by improving patient outcomes, promoting patient safety, increasing patient satisfaction, and optimizing the use of resources. <http://www.e-p-a.org/000000979b08f9803/index.html>

A full review of Care Pathways has been produced by Davies (Davies 2008). Preliminary analysis of the implementation of care pathways has showed us that considerations of the infrastructure to support them are not included. Moreover, despite the rich literature in the effect of the infrastructure in clinical outcomes, or providing healing and therapeutic environments (Codinhoto et al 2008), there isn't any literature in the relation between care pathways

and the built environment, nor the role of infrastructure in supporting and facilitating care pathways.

From the above, and from the literature in the medical and nursing domain, care pathways in general are concerned with three matters: care (steps and processes), people (patients and clinicians) and management and integration; which are all interrelated in a sequence constrained by time, and arguably performed inside a space.

Each of these matters has its consequences on the supporting infrastructure as outlined in table 1 below.

Care pathways' issues	Infrastructure's consideration
Processes (care steps)	Integrated care pathways, patient journeys, patient flows
People (patients, staff and visitors)	Usage, movement, demand, flow rates, delays, waiting, peripheral demands
Integration	Functions, spaces, adjacencies

Table 1; Care pathways and infrastructure considerations

For new projects and even changes to existing infrastructure, the consequences and interaction of care pathways with its supporting facilities needs to be captured during the briefing process. Briefing is identified as the interface where clients express their needs and designers articulate solutions. It is the stage where care pathways issues are discussed, and their consequences in the infrastructure tested and formulated.

3 INFRASTRUCTURE DESIGN BRIEFING

The design of healthcare facilities, similar to other types of facilities, follows sequential activities undertaken by the design team and other project stakeholders to achieve an acceptable design solution. However, the sequence and order of the design activities varies from project to project depending on type of the project and the procurement process, among other factors.

Lawson's description of the design process is:

Usually there must be a brief assembled, the designer must study and understand the requirements, produce one or more solutions, test them against some explicit or implicit criteria, and communicate the design to clients and contractors.

Lawson 2006 p 48

Therefore, broadly a design process can be divided into two main stages:

- Briefing: where clients' needs and objectives are captured and processed into design requirements and constrains, the outcome of this process is a document called the brief.
- Design: is the process where requirements and constrains are challenged and formulated into design solutions. The outcomes of this process are design documents in the form of drawings, schedules, specifications, etc.

However, research and practice proved that these two stages need not to be performed as a linear process, and should be more iterative and fuzzy (Lawson 2006, Prasad 2008).

The briefing process that integrates with the design process can be demystified into three connected and interrelated activities:

1. Requirements identification; when client and project requirements are identified and captured.
2. Requirements processing; analysis of the requirements considering constraints, standards and legislation.
3. Design formulation; the translation into design solutions and options. Space specifications at this stage can benefit from reference to best practice, previous experience, comparisons with national and international projects, etc..

The three activities need to be linked and inseparable; moreover, the use of appropriate communication tools and techniques during the course of the briefing process is a key success factor.

Briefing for infrastructure design has received considerable attention in research for the last 30 years, various studies developed tools and techniques to improve the process and help both clients and designers to overcome briefing problems. These tools and techniques vary and depend on how design and briefing is seen and approached. (Blythe and Worthington (2001), Kamara et al (2002), Green and Simister (1999))

In the case of health care infrastructure the three activities of briefing mentioned above can be stated as:

1. Health care planning which takes place early in the development before the appointment of the design team and is usually performed by either in-house expertise or external consultants.
2. Design brief, the preparation of this will depend on the procurement route. The design team might not be appointed; however, the NHS has a wealth of guidance and reference with regard to functional requirements and schedules of accommodations (HBN, HTM, ADB, etc) which needs to be tailored to the specifics of the situation.
3. Design options and solutions, where the design team challenges the design brief and formulate designs.

If we take Private Finance Initiative (PFI) developments in the NHS as example, which provides a way of funding major capital investments, without immediate recourse to the public purse. Private consortia, usually involving large construction firms, are contracted to

design, build, and in some cases manage new projects. <http://www.dh.gov.uk/en/Procurementandpropos-als/Publicprivatepartnership/Privatefinanceinitiative/DH_677>.

In PFI developments, NHS Trusts provide design briefing information to architects and designers in the form of the Public Sector Comparator (PSC) which is a document that includes a design brief and an exemplar design solution. A summary of the health care planning process performed at the earlier stage is provided at the beginning of the brief document. (DoH 2007) [See table 2 below].

At the first stage of this research we performed an extensive study of two briefs for major hospitals as a typical sample in addition to the NHS briefing guidance documents (DoH 2004 and DoH 2007). A clear gap was identified. Architects, after receiving the briefs from their clients and when formulating design solutions, are faced with the challenge that they were neither involved in the health care delivery process planning, nor are they well informed about the desired outcomes of that process in the documents.

As the involvement of the architect in the initial healthcare planning might not be feasible due to procurement and other reasons, architects are struggling to understand the care delivery process requirements in the brief so that they can design appropriate infrastructure to support the care delivery process.

Bearing in mind that care pathways are now dominating the NHS agenda, we argue that an adequate understanding of care pathways is necessary to enhance the current briefing practice. Care pathways can be considered as a carrier of valuable information with regard to the health care delivery process; therefore, they have the potential to inform briefing if represented innovatively and in an understandable way to both health care clients and designers.

Section	Information provided
Design brief	Trust's healthcare philosophy
	Whole site development brief
	Functional content and schedule of accommodation
	Sustainability strategy
	Whole hospital policies
	Clinical output specifications
	Non-clinical output specifications
	Room data sheets
	Spatial planning drawings
	Construction requirements: Architectural, Structural and Civil engineering Energy and engineering Use and performance parameters Construction procedures
	Reviewable design data
	Commissioning
	Equipment
	Supporting documentation
PSC design solution	Scheme narrative
	Scheme information
	Cost information
Design evaluation	Design evaluation criteria
	PSC design solution evaluation report
Design bid-deliverable	Outline design deliverables
	Draft bid deliverable
	Final tender deliverable

Table2: PFI briefing documentation (DoH 2007)

4 RESEARCH DESIGN

We are not looking to model a specific care pathway in a specific facility or application but to develop a more generic approach that can be populated and tailored to specific instances in the future. The reason for this is that the skill base for modeling is lacking in NHS organizations. Most care pathways as published are text based paper flows for the management of processes. If this research project is successful and produces a useful tool then it must enhance the existing approaches and be a full process model with the attributes necessary to model demand on the system so that the space requirements can be communicated.

The addition of simulation to the model will allow the model to test various scenarios and to be able to consider variations in the process and patient demands over time. The questions to be answered are:

- Is it best to have a patient centered process?
- What are the variations in patient that the model has to cope with?
- How does that care pathway interact with other care pathways and associated diagnosis and treatment processes?
- How do the various actors in the pathway manage their activities and is it better to monitor the stages of the process against these requirements?

Whilst we are looking to develop a generic approach for the purposes of testing we have selected the maternity pathway as it covers primary care, specific requirements of a maternity unit and possible acute care in some circumstances. It is also one of the eight pathways that latest review has identified for the future operation of the NHS (DoH 2008).

A soft and representative approach is proposed for modeling the care pathway. Soft and representative systems are most suitable for tackling strategic management and planning issues such as: ambiguity of data at early stages, confusion and lack of clarity about problem definition and conflicts between various stakeholders (Pidd 1998). Moreover, a participative approach is thought to be

useful to meet the proactive and creative features of the briefing process.

The proposed research design is indicated in figure 1 below. It has three main characteristics:

1. Based on an understanding of a situation (care pathway) governed by certain objectives (associated infrastructure requirements) rather than problem solving or process reengineering.
2. An iterative process of inquiry, analysis and validation to meet the objective of testing the applicability of representing care pathways for briefing purposes.
3. Engage various stakeholders of the project to achieve better outcomes.

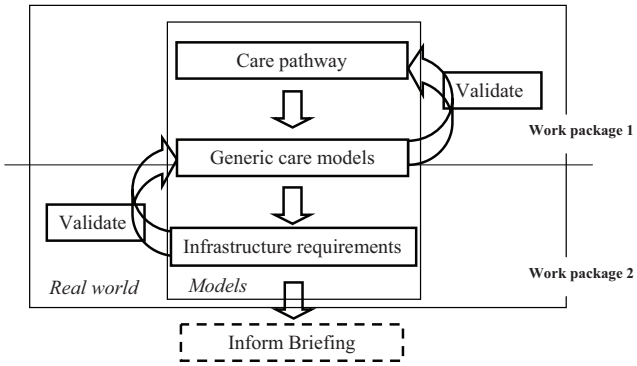

Figure 1: Research Design.

The research project is planned into two main work packages:

1. Work Package 1:

The package is to produce a generic care model representing the chosen care pathway; this will be achieved through the development of building blocks of generic care steps or processes. Moreover, Rich Pictures will be chosen as the method to provide a conceptual model as they are capable of representing two important types of information: *Soft* such as people's roles, attitudes, assumptions, etc and *Hard* or technical data (Pidd 1996).

Various modeling techniques will be explored at the beginning to develop some ideas about the model and its parameters, and as a guide to data gathering to achieve a *models drive data* strategy as proposed by Pidd (1996).

Semi structured interviews with health care practitioners and care pathways managers are proposed to obtain flow capacity data and to correct and improve the models.

2. Work Package 2:

This work package is proposed to identify the infrastructure requirements based on the validated generic care pathway model and evaluate these requirements against the care model needs. This will be achieved by designing and running visual scenarios of the modeled care pathway in semi structured interviews and focus groups with design practitioners to evaluate and validate the usefulness of the generated generic models.

Model assessment and validation is as important as the modeling process itself. Appropriate strategy will be developed during the course of the project.

5 CONCLUSION

We have presented the second stage of an ongoing research project to investigate the modeling of care pathways for infrastructure design briefing. The intended outcomes of the two work packages of this stage of the research will be:

1. An understanding of the infrastructure needs of care pathways, and the role of infrastructure in facilitating existing and new care pathways.
2. A toolkit of building blocks for generic models and steps suitable for modeling complex care pathway situations to allow their representation for design briefing and infrastructure implications.

The research project is in the early stages and up to date progress will be presented at the workshop.

ACKNOWLEDGMENTS

This work is part of ongoing research exploring the interaction between care delivery practices and the built environment, it is been conducted within Theme 4 of the Health and Care Infrastructure Research and Innovation Centre (HaCIRIC), which is a collaboration between the research centers at Imperial College London and the universities of Loughborough, Reading and Salford. HaCIRIC is supported by the EPSRC.

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