

Portable and Mobile Clinical Pods to Support the Delivery of Community-Based Urgent Care

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Abstract

This paper reports a qualitative project to define the design requirements for portable and mobile technologies to support the delivery of community-based urgent care through the clinical activities of Emergency Care Practitioners. A series of iterative data collection and analysis steps have produced robust findings, grounded in current and future clinical activities, together with initial design ideas for both mobile and portable pods. These have been presented to both operational and managerial stakeholders with very positive feedback, and provide the foundation for future design research.

Keywords

ergonomics, human factors, community care, ambulance

Introduction

In the last five years UK government policy has demonstrated a sustained move towards the increasing provision of urgent care in the community and closer to home, rather than in a hospital setting. To meet these changes the emergency ambulance service is shifting from an organization designed to convey patients to hospital to a professional group capable of assessing (diagnosing) the urgency of patient conditions and providing the appropriate treatment in the community; '*providing the right response, first time, in time*' (DH, 2005). In 1999 the role of the Emergency Care Practitioner (ECP) was developed in the ambulance service to raise the clinical skills of paramedics. A review by Mason *et al* in 2007 found that '*overall ECPs carried out fewer investigations, provided more treatments and were more likely to discharge patients home than usual providers*', suggesting that these increased clinical skills were achieving the goal of successfully delivering community-based urgent care.

In 2007/08 there were 7.2 million urgent and emergency ambulance calls in England, with 81% (5.9 million) resulting in an emergency response and 4.26 million patient journeys (NHS Information Centre, 2008). Before 1st April 2007 emergency and urgent calls were prioritized and classified into four categories:

- A, immediately life threatening (8 minute response);
- B, serious but not life threatening (19 minute response);
- C, not immediately serious or life threatening (locally agreed response time standards);

- Urgent, usually in response to a request from a GP, midwife or other health care professional for transportation via a separate phone line (NHS Information Centre, 2008).

After 1st April 2007 the urgent calls have been included in the emergency call system to ensure that all patients are triaged within the same response time target framework (DH, 2005). Urgent calls are usually classified as a category C, accounting for 40.4% of all calls received in 2007/08.

The overall vision for this project was to explore and develop a system of technologies (vehicles, equipment and consumables) to support the effective delivery of urgent care in the community. This included a range of portable pods to take equipment and consumables into the patient's home and mobile treatment units (vehicle pods) to provide a clinical environment for diagnosis and treatment. The specific aims of this component of the project were to:

1. Understand and identify current and future care activities in emergency departments, walk-in centres, ambulances and out-of-hours GPs which could be delivered in the community.
2. Explore and define the requirements for the portable and mobile pods.

A previous paper (Jones *et al*, 2008a) described the process of exploratory data collection using stakeholder workshops to identify and categorise clinical complaints for future treatment and care in the home/community by ECPs as physical minor, physical uncertain, physical major, social, mental and elective. Six presenting complaints were selected for further study: breathing difficulties (physical minor); chest pain (physical uncertain); lacerations (physical minor); falls (physical uncertain/social); neck pain (physical minor); head injury (physical minor) (Jones *et al*, 2008b). This paper will describe the iterative process used to develop the design requirements for the portable and mobile pods.

Method

Data were collected for the portable and mobile pod requirements using stakeholder workshops, audits, mock ups and clinical observations (Figure 1).

In 2007 two workshops were held with 22 stakeholders participating from acute, community and ambulance NHS Trusts (East Midlands and South West). They identified categories of complaints and lists of equipment and consumables for the portable pods (dataset 2, Figure 1). An audit of portable equipment used by ECPs was carried out (n=13; Reynolds, 2008; dataset 3a, Figure 1) to review and update a previous study of Fast Response Paramedics (n=16; Redden, 2002; dataset 1a, Figure 1). In 2008 a further workshop was held with fleet, clinical, service, and safety managers (n=15) from five Ambulance Trusts to present the findings of the 2007 workshops, audits and observations. Data were collected as a series of semi-structured questions in individual workbooks (dataset 5, Figure 1). Design decision groups (DDGs, dataset 6a, Figure 1) were held to challenge current practice (with word maps and round robin questionnaires) and support innovative re-design through mock-ups/prototypes (Wilson *et al*, 2005). Staff were given an opportunity to prepare bags for specific care pathways and carry out a drawing exercise to create portable pods with improved functionality and usability. For the second session, working prototypes were used as the focus for the discussion and modification of the design requirements.

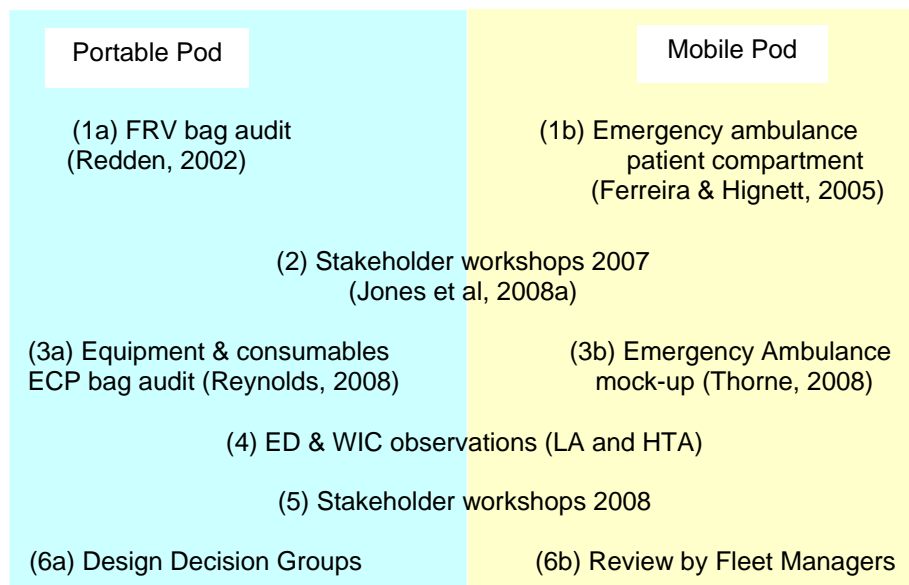


Figure 1: Project overview

Data were collected for both the portable and mobile pods from 84 patients at Emergency Departments (EDs, acute) and walk-in centres (WIC, primary care). Observational data were collected using a prepared template to record the equipment and consumables used, staff movements, and clinical procedures (link analysis, LA; Figure 2). Interviews were carried out with staff to gain a better understanding of the treatment process for the hierarchical task analysis (HTA). Some patients presented with multiple complaints, e.g. fall and laceration. Data collection commenced after triage and ended when the patient was discharged from the treatment unit or referred to other specialists. A full-size mock-up of an emergency ambulance was constructed and used to review the layout of the patient compartment (Thorne, 2008; dataset 3b, Figure 1). Six emergency ambulance crews simulated a chest pain response and tested the fidelity of using a simulator. The simulator was also used for the Fleet Managers review (n=12, dataset 6b, Figure 1) to discuss the design requirements for the mobile pod (urgent treatment unit).

All the datasets were analysed iteratively after each stage of data collection using NVivo, a qualitative data management programme that supports coding, searching and theorizing (Bazeley and Richards, 2000). This enabled the results from each dataset to inform the next stage of data collection.

NHS ethics approval was obtained from the Leicestershire, Northamptonshire & Rutland Research Ethics Committee 1, ref: 07/A2501/104.

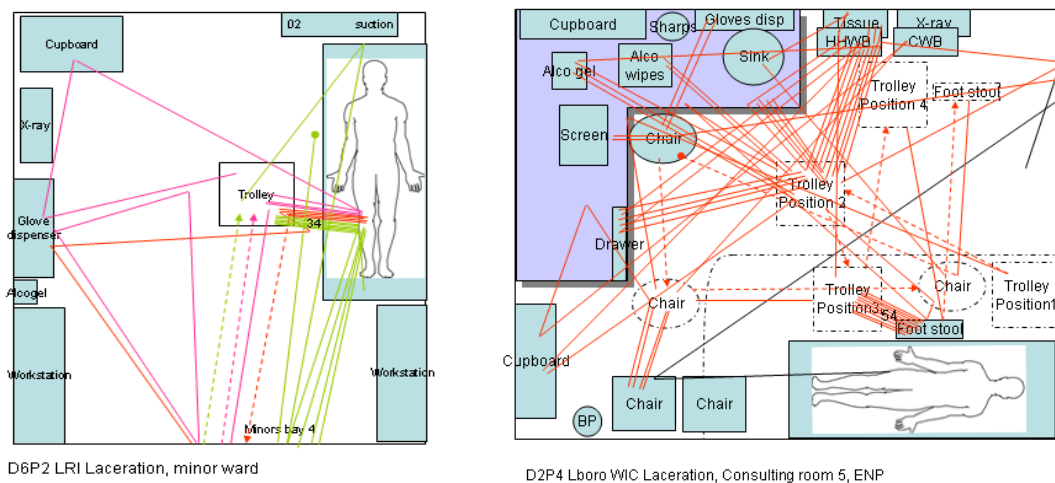


Figure 2: Examples of link analysis for laceration treatment (ED 2 and WIC)

Results

The results for both the portable and mobile pods are shown in table 1. The data were reviewed and recoded with the full code set to account for the new codes that emerged during coding and then triangulated to identify requirements for the mobile and portable pods. To enhance the validity of the results the data analyses were checked at two stages throughout the project. Firstly with the stakeholder workshop in 2008 and secondly by the DDGs (portable pods) and Fleet Managers review (mobile pods). The Fleet Managers felt that the research results had identified a need for a specifically designed urgent care vehicle to support the role of the ECP.

Discussion

It is encouraging, and in keeping with the project's overall objectives, that the mobile pod design requirements focus on clinical provision in the community rather than stabilisation and transportation to hospital. The work station requirements are more complex, reflecting the increased level of communication that is required to support enhanced assessment, treatment and discharge (H, Table 1); for example high quality video, vital signs, voice and text communication and patient information exchanged in real-time with the remote clinical specialists (Sahai et al, 2008).

Diagnostic facilities are likely to be available as portable equipment (taken to the patient) as well as mobile equipment (available within an urgent response vehicle). Some patients will require a period of monitoring or observation before discharge; this could be provided through better co-ordination of community healthcare services together with tele-care and tele-monitoring (Pérez et al, 2006).

ECPs spend longer assessing and treating patients than paramedics, and often need to access both sides of the patient. On a number of occasions staff moved furniture within the treatment cubicles to have better access to the injury site. The mobile pod will need to be adaptable to ensure the working environment is suitable for all likely treatments. The content and configuration of the portable pods has been described elsewhere (Hignett et al, 2009).

Table 1. Mobile Pod design requirements, including Portable Pods (D)

Primary code	Secondary/Tertiary codes
A. Diagnostic	<ol style="list-style-type: none"> 1. Heart Monitor, BP, ECG (3- or 12-lead) 2. Testing: urine, blood, MRSA, vision 3. X-ray including reading and 2nd opinion
B. Sanitation	<ol style="list-style-type: none"> 1. Bathroom facilities and clinical wash hand basin 2. Disposal: domestic, clinical, sharps 3. Dispenser: alcogel, soap, towels, aprons, gloves
C. Furniture	<ol style="list-style-type: none"> 1. Lay down space, including treatment/dressings trolley 2. Staff chair 3. Patient chair/treatment couch (adjustable) / limb rest 4. Other, e.g. clock, information board
D. Portable pods	<ol style="list-style-type: none"> 1. Assessment pod: BP cuff, thermometer, BM kit, urinalysis, ophthalmo/oto-scope, KY jelly, apron, peak flow meter, patient record form, clinical disposal/sharps, tongue depressor, tendon hammer 2. Other pods for suture, dressings (including pressure sores), catheter, maternity, IV access, cardiac/respiratory
E. Environment	<ol style="list-style-type: none"> 1. Space to move around patient, re-arrange furniture, multiple staff, family members 2. Lighting
F. Drugs and gases	<ol style="list-style-type: none"> 1. Gas cylinders (entonox, oxygen) 2. Secure drug storage (morphine)
G. Patient experience	<ol style="list-style-type: none"> 1. Privacy (curtain) 2. Security for possessions 3. Dignity (gown) 4. Comfort (blanket, sheet, pillow) 5. Drinking water
H. Work station	<ol style="list-style-type: none"> 1. Basic communication with other departments/specialist, community services and for 2nd opinion 2. Administration work station: computer, telephone

The concept of modularisation has been called the goal of good design (Gershenson *et al*, 1999), with benefits including ease of product updating, increased product variety, and ease of design and testing. The challenge for the design of modular products/systems is to maximise flexibility, with staff being willing and able to distinguish between the performance, quality and value attributes of different components (e.g.

equipment and consumables). However it is essential to retain clinical autonomy in diagnosis and treatment, and a degree of flexibility is therefore necessary to support individual variations (within both clinical practitioner and patient).

Further research is needed to determine which equipment and consumables should be carried in the portable pod (responder bag), and which should be carried/stored on the mobile pod (vehicle).

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