

Original Article

The development and deployment of integrated electronic care records in a regional adult and paediatric cystic fibrosis unit



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Abstract

Background: Electronic care records (ECRs) for cystic fibrosis (CF) provide a basis for accurate, reliable capture of clinical measures and interventions, and epidemiological trends, providing the basis for improved efficiency and patient safety.

Methods: A primary care system was modified for hospital use and clinical codes devised for all aspects of CF care. Performance and usability were assessed.

Results: Of a total of 620 patients 619 consented to their data being recorded in the system. Five hundred and twenty three new codes were created and embedded behind 60 new templates. Following introduction of ECR, completion of annual assessments increased from 43% to 92%, retrieval of drug costs rose significantly and time to correspondence with primary care fell from 34 days to <2 days. Staff satisfaction was high.

Conclusion: The system is fully operational allowing the unit to function as a paperless service. Efficiencies of staffing activity, process management and cost retrievals are evident. Sharing of coding structures is important in future care.

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Keywords: Cystic fibrosis; Electronic care records; Codes

1. Introduction

The potential of e-health was emphasised by the World Health Assembly in 2005 and encouraged member states to develop and implement e-health technologies [1]. Subsequently major investments have been made. At least £12.8 billion has been expended in England on a Programme for the National Health Service (NHS). In the US \$38 billion has been committed to e-health [2].

In the UK outcomes from IT initiatives have been varied. Projects within secondary care have generally failed to show the success achieved in primary care [3]. In part this is due to limitations imposed by infrastructure and under-investment within

hospital systems, and also reflects the complexity of integrating pathology, radiology, medical imaging and correspondence through a variety of portals. A lack of prior system analysis and limited engagement of healthcare professionals and clinicians in system design have contributed to the lack of progress [4].

The creation of electronic care records (ECRs) for the management of cystic fibrosis (CF) has significant potential to positively impact on patient care. Potential advantages include capture of complete information for treatment decisions, new and more efficient options for patient interaction, assessing clinical trends, audit, outcome data, pharmacology costs, data sharing and a more effective use of resources. Unfortunately, systems that can communicate such detailed live data are lacking.

This paper describes the development and implementation of a new ECR system based on a new comprehensive coding structure

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and examines the impact of its introduction on the management of patients with CF.

2. Methods

2.1. Development

2.1.1. Timeline and system requirements

Available in-house, legacy and industrial software were reviewed in 2006. Key criteria included functionality, facility for generic data capture, established pedigree and editable functionality that would allow the clinical team to develop and deploy summary views, templates and new codes. The systems needed to be secure, reliable and to evolve over time so as to reflect future changes in technology. The primary care system (PCS) from Egton Medical Information Systems Ltd. (EMIS) was selected as a suitable system that could be modified to meet the chosen criteria. The system was installed across three hospital sites.

Specifications for administration, consultation type, templates, health summary, medication and word templates were developed through consultation with nursing, physiotherapy, dietetics, psychology, secretaries, social work, pharmacy and medical staff who specified the templates and codes required across inpatient and outpatient settings.

2.1.2. Codes

The creation of an in-house dictionary of codes was the foundation for future development, capturing every aspect of care as coded data rather than free text. This included past and present diagnoses, histories, examinations, microbiology, genetics, physiology, interventions, medications, allergies and pathology. These codes were hidden behind templates, allowing live data to be captured in a standard form for all users.

The initial ECR software relied on a Read Code hierarchy. Relevant CF codes were absent. To overcome this, the number of missing codes were defined and documented by the lead clinician (DP) and new codes continually created in response to the unit's requirements.

2.1.3. Templates

Templates were developed as the main user interface. Each template was tested by the team and modified following feedback. Emphasis was placed on limiting the number of mouse clicks to a minimum. Data capture was not limited to CF to ensure a whole system approach to health care. The ECR was linked to the hospital pathology server to enable electronic filing.

2.1.4. Structural adaptations and technical support at ward and clinic levels

To ensure full integration of ECR, modification to accommodation was required to facilitate access to computers in each consultation environment. In 2011, the introduction by the hospital trust wireless network with computers on wheels allowed ward round interactions to be recorded at the bedside. Overhead projectors were installed in the two MDT meeting rooms where ward rounds and clinical meetings took place using ECR and picture archiving and communication systems

(PACS). Dedicated network printers were installed for printing correspondence. Secure home access through dedicated Trust computers was available to the on call team.

2.2. Performance of the EPR system

2.2.1. Live system analysis

The staff were trained to use ECR through a series of individualised training sessions. Weekly meetings were convened between the MDT leads as a forum for continuous feedback to enable adaptation and development of new codes.

2.2.2. Staff questionnaire

A modified version of the task-orientated questionnaire for evaluating ECR systems was developed [5]. Information was sought from all members of staff on ease of use of the system, perception of work performance and care quality, work satisfaction, subjective perception of success of the ECR, its perceived impact on early detection of clinical deterioration and team communication. Views were sought in 2008 and 2011.

2.2.3. Clinical process evaluation

Evaluation of the completion of specific protocol investigations tested the system's sensitivity in meeting standards of monitoring of care through regular audit. This included annual completion of fasting vitamins, oral glucose tolerance tests for detection of diabetes and the time taken to complete discharge summaries before and after implementation.

2.2.4. Financial cost retrieval

Medication costs retrieved from primary care were evaluated on the adult unit pre- and post-implementation of ECR.

3. Results

Consent was obtained from 619 patients (390 adults and 229 children) for their data being recorded on the system. Only one patient declined, due to mistrust of all electronic records within the NHS. A single set of paper records remains. Patient electronic records were accessible across three hospital sites. Computers were installed in clinical areas and linked to a main server through the hospital intranet and NHS N3 infrastructure. The total cost of initial deployment including hardware was approximately £29,000 (Table 1). The overall costs of implementation were reduced as development and deployment were undertaken in-house by the project lead.

The ECR became fully operational by the start of 2008 within 12 months of installation. Implementation was carried out in three phases, starting with outpatients, followed by ward rounds and discharges and finally inpatient care. The latter was revolutionised by the timely deployment of a trust wide wireless network. Paper notes were used in parallel with ECR during the initial phases, allowing the team to become accustomed to a new way of working. The benefits increased over time as the summary records became more complete.

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