The relationship between combined predictive model scores and the likelihood of hospital admission

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INTRODUCTION

A longterm condition is one that cannot, at present, be cured, but can be controlled by medication and/or other therapies.[1] These conditions include asthma, COPD, hypertension, diabetes, coronary heart disease (CHD), atrial fibrillation, heart failure, chronic kidney disease, transient cerebral ischaemia and stroke, hypothyroidism, depression and other mental health problems, dementia, epilepsy and cancer.[1] The prevalence of many of these conditions is rising due to the aging of the population, and this is increasing the demand for health and social care.[1] Research indicates that longterm conditions can be effectively managed in primary care and this can help prevent unnecessary hospital admissions.[2] Effective management of longterm conditions in primary care requires an integrated approach to case management.[3] Integrated health and social services deliver more efficient, better coordinated care.[4,5] However, there is considerable variation in the approaches to case management that are adopted.

Across the UK, health and social care system organisations are looking at how best to develop integrated models of care. In Stockport, the clinical commissioners have developed the Stockport One Service. This is an integrated health and social care model based on the principle of 'one person, one service and one integrated plan with one point of contact'. It is supported by Stockport NHS Foundation Trust, Stockport Metropolitan Borough Council, Pennine Care and Age UK.

A multidisciplinary team has been established, which includes a social worker, district nurse, occupational therapist, physiotherapist, community psychiatric nurse, and a medicine manager, who work with 'high-risk' patients. Typically, this might be an older or vulnerable person with a longterm condition who needs a range of services. The team assesses each individual patient and works with them to develop a personal care plan to address their needs.

The Stockport One Service uses the Combined Predictive Model (CPM) to identify such patients. This tool was developed by the Nuffield Trust to identify individuals who are at high risk of hospital admission within the ensuing 12 months.[6] The service also targets a smaller group of patients who have been individually selected by their general practitioner (GP). Research suggests that the predictive-modelling approach is superior to case finding alone, which relies upon the clinicians' ability to predict who will become high risk in the future and limited to individuals who come into contact with healthcare professionals.[7]

The CPM uses information from inpatient, outpatient, accident and emergency, and GP medical records to determine the presence of the following longterm conditions: asthma, COPD, depression, diabetes, hypertension, cancer, CHD, chronic pain, and congestive heart failure, as well as prescribed polypharmacy.[6] Each patient is given a risk score between 0-100, with 100 being the highest risk of re-hospitalisation. Patients with a score above 50 are at high risk of hospital admission and are being targeted by the Stockport One Service.

Although the Stockport One Service is still in its initial implementation stage, concerns have been raised that the CPM may be missing some groups of patients who might equally benefit from the service. This evaluation was established to address these concerns and inform further development of the Stockport One Service.

The aims of this study

1. To determine the likely effectiveness of the CPM in identifying all relevant patients in the Stockport area who would be predicted to be admitted to hospital
2. To analyse the comorbidities of a sample of those patients with the highest number of emergency admissions to the local trust and determine what common factors could be addressed by the Stockport One Service for admission avoidance

METHOD

All patients registered in Marple and Werneth general practices who had more than two emergency hospital admissions at Stepping Hill Hospital, Stockport NHS FT, between 1 September 2012 and 31 December 2012 were identified by the trust's Clinical Effectiveness Unit from HES data. These patients were then divided into two groups based on their CPM score obtained from August 2012 output: patients identified as high risk of emergency hospital admission within the next 12 months (score 50 and above), and those identified as low risk (score below 50).

A case review for each patient was undertaken by extracting data from the electronic discharge summaries for the relevant emergency admissions concerning source and reason for admission, as well as presence and types of comorbidities.

The data was analysed by LM, who identified their common features and grouped the patients into five categories:

A. patients with frequent admissions due to exacerbations / complications of their longterm conditions
B. patients with multiple comorbidities living in a nursing home or a residential home
C. patients with a history of alcohol dependence
D. patients returning with the same presentation whose underlying diagnoses remain unclear
E. other

RESULTS

A total of 28 patients registered in Marple and Werneth had more than two emergency hospital admissions at Stepping Hill Hospital during the study period. Thirteen of these patients had been identified by the CPM as high risk in August 2012 and 15 were identified as low risk (see figure 1).

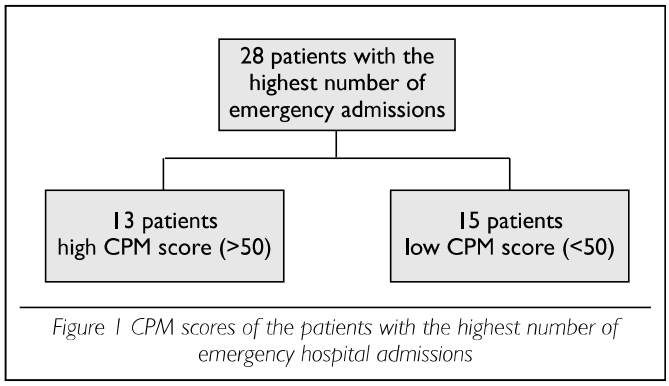

Figure 1 CPM scores of the patients with the highest number of emergency hospital admissions

The clinical reasons for the emergency admissions of these 28 patients were categorised into the five distinct groups.

A. Patients with frequent admissions due to exacerbations / complications of their longterm conditions: 11 (39%)
This group of patients all had more than one longterm condition. Their emergency hospital admissions were due to exacerbations or complications of one principle longterm condition.

B. Patients with multiple comorbidities living in a nursing home or a residential home: 7 (25%)
Four of the seven patients in this group had a history of dementia. They also had other longterm conditions such as diabetes, angina, heart failure and depression. There was a common theme of presentations with confusion and falls secondary to dementia, urinary tract infections, and side effects of prescribed medication.

C. Patients with a history of alcohol dependence: 3 (11%)
This group of patients presented with a variety of problems related to alcohol dependence including head injury, falls, pancreatitis, domestic abuse, and collapse.

D. Patients returning with the same presentation whose underlying diagnoses remain unclear: 3 (11%)
Two patients returned with a persistent headache and all investigations were normal. One returned with abdominal pain which had been investigated by different teams within the hospital but did not have a clear diagnosis.

E. Other: 4 (14%)
The patients in this group were all aged over 85 years. Some of them had longterm conditions including diabetes, coronary artery disease, cancer, and transient ischaemic attack. They appeared to have been managing well at home before presenting with a new condition such as a stroke or cellulitis, which resulted in further admissions due to complications or failure to cope at home.

Figures 2 and 3 show how the CPM scores related to the patient groupings identified above.

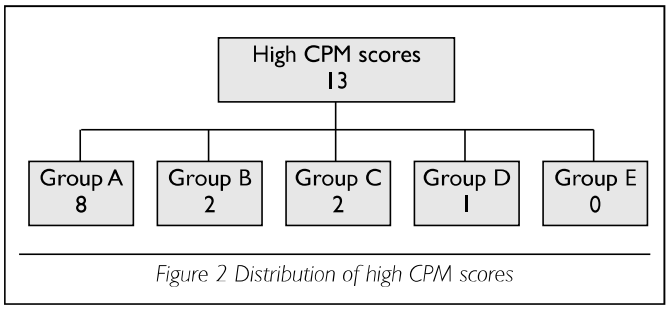

Figure 2 Distribution of high CPM scores

The CPM identified eight (72%) out of a total of 11 patients with longterm conditions as high risk for hospital admission, but only two (29%) of the seven patients from nursing and residential homes, and none of the four patients in the 'other' group.

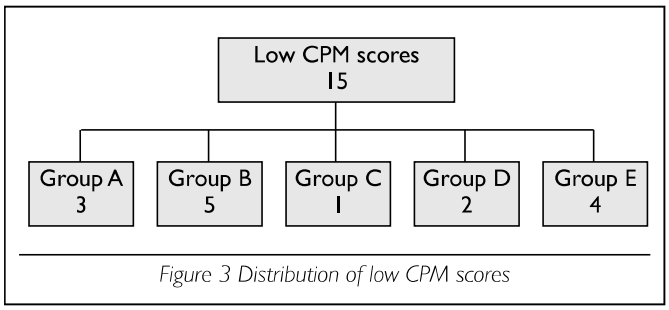

Figure 3 Distribution of low CPM scores

At the time of analysis of the discharge summaries (April 2013), five of the 28 patients were deceased. Two of the deceased patients were categorised into group A, two into group B, and one into the 'other' group.

DISCUSSION

This evaluation is limited by the sample size and its timescale; nonetheless, we question the reliance on the CPM as a principle mechanism identifying patients at high risk of admission.

The CPM identified only 13 of the 28 patients who had the highest number of emergency hospital admissions within this small sample. A conceivable explanation maybe that the CPM is effective at identifying high-risk patients with multiple longterm conditions who live in their own home, but less effective at identifying similarly high-risk patients from nursing and residential homes. Eight out of a total of 11 patients with longterm conditions living in their own home were identified as high risk for hospital admission by the CPM, but only two of the seven patients from nursing and residential homes were identified. A recently published study identified that predictive modelling tools such as the CPM are effective at identifying

patients with multiple longterm conditions who are high risk of hospital admission.[8] However, this evaluation indicated that there may be differences in the predictive efficacy of predictive models for different subgroups of patients. Further empirical work needs to be undertaken to identify the predictive power of these models for specific patient groups, for example, nursing and residential home residents as well as patients with mental health issues.

The finding that five of the 28 patients were deceased at the time when their discharge summaries were analysed also indicates that a significant proportion of the high-risk patients are approaching the end of their lives. It is debatable whether many of these admissions are avoidable.[9]

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