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Reducing emergency hospital admissions:

a population health complex intervention of an enhanced model of primary care and compassionate communities

Abstract

Background

Reducing emergency admissions to hospital has been a cornerstone of healthcare policy. Little evidence exists to show that systematic interventions across a population have achieved this aim. The authors report the impact of a complex intervention over a 44-month period in Frome, Somerset, on unplanned admissions to hospital.

Aim

To evaluate a population health complex intervention of an enhanced model of primary care and compassionate communities on population health improvement and reduction of emergency admissions to hospital.

Design and setting

A cohort retrospective study of a complex intervention on all emergency admissions in Frome Medical Practice, Somerset, compared with the remainder of Somerset, from April 2013 to December 2017.

Method

Patients were identified using broad criteria, including anyone giving cause for concern. Patient-centred goal setting and care planning combined with a compassionate community social approach was implemented broadly across the population of Frome.

Results

There was a progressive reduction, by 7.9 cases per quarter [95% confidence interval (CI) = 2.8 to 13.1, $P=0.006$], in unplanned hospital admissions across the whole population of Frome during the study period from April 2013 to December 2017, a decrease of 14%. At the same time, there was a 28.5% increase in admissions per quarter within Somerset, with a rise in the number of unplanned admissions of 236 per quarter [95% CI = 152 to 320, $P<0.001$].

Conclusion

The complex intervention in Frome was associated with highly significant reductions in unplanned admissions to hospital, with a decrease in healthcare costs across the whole population of Frome.

Keywords

cohort studies; community development; general practice; patient care planning; primary care.

INTRODUCTION

Reducing emergency admissions to hospital has been a cornerstone of healthcare policy in an attempt to shift care from the most expensive part of the healthcare system, secondary and tertiary care, into the community. There is little convincing evidence of systematic interventions that have successfully achieved this aim. Despite efforts, emergency admissions in the UK rose by 47% between 1998 and 2013, from 3.6 million to 5.3 million, with only a 10% increase in population over this period. These admissions are expensive: in 2012 they cost the NHS £12.5 billion (€16.8 billion, \$18.3 billion).^{1,2}

Systematic reviews of prediction models have a role to play in identifying those people with chronic disease who are at risk of emergency admission to hospital.³ However, these models have only a limited role in reducing the burden of unplanned admissions in the UK.⁴

In 2013, the Nesta Foundation produced a report that described a comprehensive redesign of health care to cope with the rising number of people with long-term conditions.⁵ The model built on interventions that had already shown some success in delivering improved health outcomes. In relation to primary care, the model included flexible collaborative consultations, development of self-management plans,

and social prescribing. The House of Care model has played a central role in developing care planning.^{6,7} Care planning alone has a limited impact on improving outcomes.^{8,9} Community-centred approaches have generated significant recent interest, with the publication of a report by Public Health England recommending them as part of an overall strategy for health and social care.¹⁰ There are no reports of the impact of testing care planning and community development together as a complex intervention on health outcomes.

Frome Medical Practice is a single general practice in Frome, Somerset, in the South West of England. The practice provides comprehensive primary care for 28 510 people. The practice embraced the House of Care model of person-centred care planning, and modified the national template to enable all care plans to be undertaken using principles of personalised care planning. A community development service, known as Health Connections Mendip, was formed. Through the combination of targeted identification of people at risk of unplanned admission, systematic care planning for this group and referral to the social prescribing scheme, and proactive community development, the practice has been able to demonstrate an increasing trend of reduction of emergency admissions to secondary and tertiary care.

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How this fits in

There is little evidence for successful interventions that have significantly and sustainably reduced unplanned admissions to hospital. The authors report on a complex intervention across a population of 28 510 people cared for by a single GP practice in Frome, Somerset. The intervention involved rigorous identification of all those in need, not limited by age or diagnosis, followed by care planning and referral to the community development service for goal setting and social network enhancement. The authors have been able to demonstrate a 14% reduction of unplanned admissions, compared with a 28.5% increase in the remainder of Somerset.

Compassionate Communities may include an element of social prescribing.¹¹ However, it is important to remember that it is not primarily that activity which defines their action. Social prescribing is often a way that patient populations are connected — or reconnected — to their communities, by linking their personal lives with new social activities and networks that were previously unknown to, or little used by, them: book clubs, walking clubs, coffee mornings, gym classes, befriending groups, and more.¹² These kinds of referrals work well enough for physically mobile populations, but less well, or not at all, for those largely confined to home for mental or physical health reasons, or for reasons of geography or financial barriers. Compassionate Communities bring networks to people, whereas social prescribing requires people to go to the networks. Both types of movement are useful in Compassionate Communities, but social prescribing alone favours mainly those in better health, and is a resource less common in end-of-life care circumstances.

The hypothesis for the design of the complex intervention was that combining a group of interventions, all of which have shown some impact on health outcomes, would result in a significant reduction in unplanned admissions into hospital.

METHOD

The study is a cohort retrospective analysis of a complex intervention on all patients identified for care planning at Frome Medical Practice from 1 April 2014 to 30 December 2017. A systematic identification of patients for care planning was performed. The criteria for identifying patients were broad

and from a variety of professionals and services. It was not limited to those with long-term conditions or older people, and anyone who gave cause for clinical concern could be referred into the service. Care planning was performed with a high degree of reliability. Patients were referred to the social prescribing service as necessary. In addition, patients were systematically identified through a nurse or GP review of all discharge summaries following hospital readmission within 72 hours of discharge. Those patients identified as being of clinical concern were referred into the administrative hub. Actions from the gathered information, including the discharge summaries, were generated and were of various types, including GP visit, medication review, and further services, as appropriate. All of these patients received a phone call offering them a review, and the opportunity to discuss patient-centred goal setting and care planning.

The individual identified was offered an appointment at home or at the surgery to review their care and to make a care plan focusing on enhancing their health and wellbeing. Care planning and/or patient-centred goal setting included treatment escalation and resuscitation choices.

Once care planning had taken place, individuals were offered referral to the Health Connections Service. Health Connections Mendip arranged one-to-one appointments with health connectors for those who were interested. Goal setting and further care planning took place if wanted.

Health Connections Mendip is a community development service with five major components outlined below.

The Mendip Directory. This consists of an extensive list of local resources, ranging from professional support, such as Citizens Advice, housing, and drug and alcohol services, to voluntary and community groups. The Directory is web based and is available to the public as well as professionals.

Community development. Health Connections Mendip originally mapped the extensive variety of community resources, including community groups, peer support networks, and use of volunteer support. More than 400 professional, voluntary, and community groups were identified. These were placed on the Mendip Service Directory, available to professionals and public alike. This is used extensively with over 45 000 hits on the website in the last year (Table 1). If gaps were present,

Table 1. Total number of Health Connections Mendip service directory website hits per year

Year	Website hits for the service directory, <i>n</i>
2015–2016	28 433
2016–2017	32 814
2017–2018	45 744

new groups were started; for example, a macular degeneration group, a leg ulcer club, a bereavement group, and a stroke group. The Health Connections Mendip Service was not limited to those identified by the hub, and could include anyone at Frome Medical Practice. The groups helped people to meet, set health goals, and manage long-term health issues. These groups were included in the Mendip Directory and provided a useful resource for social prescribing for professional practice.

One-to-one support. Health Connections Mendip employed health connectors who worked on patient-centred goal setting and care planning for a number of sessions. Part of their role was to help patients and carers enhance and build their naturally occurring supportive networks. Building resilient networks was considered to be important to the physical and emotional health needed for the demands of long-term care-giving for those suffering from chronic illness.

Community connectors. Community connectors are volunteers from the community who are trained to help people by signposting to services like health, housing, education, exercise, and debt, using the Mendip Directory as an information resource.

Health Connections Mendip. The organisation runs its own groups when gaps in community resources become apparent. For example, weekly Talking Cafes were started to give people a place to meet. Here, they can be signposted to support services, to 6-week self-management programmes, and to On Track goal-setting groups, as appropriate.

Patients made choices about the level of support they wanted. The Health Connections Mendip service was available directly to the population of Frome, and was not limited to referrals made solely by the primary care team.

Care plans were reviewed on an ongoing basis as circumstances changed. A weekly multidisciplinary meeting took place to discuss complex patients, those discharged from hospital, and those whose circumstances had changed. The project was further supported by a primary care discharge liaison employed by Frome Medical Practice and working at the Royal United Hospital in Bath. Near-patient testing facilities, and ambulatory services provided through an enhanced community hospital role, were also part of the model.

Setting

The GP practice in Frome provides care to inhabitants of the town and the surrounding area. The number of patients enrolled in the practice is 28 510. Local GPs work as one large practice. An internal hub was set up in the practice to identify patients at risk of unplanned admissions. These patients were tracked to ensure that goal setting and care planning took place, and were referred to Health Connections Mendip. Health Connections Mendip identified >400 groups or services in the area, and, when gaps were found, new groups were formed. Data collection for analysis ran from April 2013 to December 2017.

Participants

Eligibility criteria. Patients were identified using a variety of methods. A mixture of databases were searched, such as the Quality and Outcomes Framework long-term conditions database, along with specific searches by diagnosis on the practice database, and by clinical impression. The clinical impression identification was open to all health professionals and was not limited to doctors. Some patients who would not necessarily be picked up by database searches benefit from the use of the models of care due to the limits of predictability of care using screening tools.^{13,14} These are:

- people aged ≥ 95 years;
- those with dementia;
- those identified as high risk of admission using the Health Numerics Risk tool;
- those with stage 4 and 5 chronic kidney disease;
- those scoring on the Medical Research Council breathlessness scale at 4 and 5;
- those on telehealth monitoring;
- nursing and residential home residents; and
- palliative care register patients.

In addition, anyone identified to be clinically of concern by the discharge liaison team, the practice team, the district nursing team, a community hospital ward doctor, a discharge summary review, through recent contact, or by ambulance or out-of-hours contacts was eligible. This included carers, and the practice has a coding system to specifically identify carers.

Key outcomes

The primary outcome measures were unplanned admissions to hospital for

all patients of all ages who were under the care of GP practices in Somerset. Hospital Episode Statistics (HES) were used to measure the number of monthly unplanned admissions. This information was aggregated into 3-monthly totals.

Data for Frome patients were compared with data from the whole of Somerset, excluding the Frome patients. The dataset from which the data were taken included both sets of figures.

Data sources

Each unplanned admission to hospital is counted in the HES. Patient-identifiable data were not made available. The dataset gave practice-level information, GP federation cluster, and date of admission. This meant that the data comparing Frome Medical Practice with the rest of Somerset all came from the same data source.

Bias

Frome Medical Practice is the single practice for all the residents of Frome and the surrounding area; thus the population described is a complete cohort. This is helpful in reducing bias, as particular groups or areas are not excluded. Frome has a mixture of populations, with areas of both deprivation and affluence. Its demographics are similar to the profile for the rest of Somerset, except it has a slightly larger proportion of people aged 25–44 and <10 years.¹⁵

Study size

The study population included all those cared for by Frome Medical Practice, as the intervention took place for all patients deemed to be in need of increased support at the practice. The comparison group were all people under the care of a GP in the county of Somerset. Although other initiatives have taken place in Somerset that have components of the Frome model of care, the Frome model is unique in applying all four of the component interventions together. This has meant that it is possible to test the outcomes of the Frome model against other areas in the county, as well as the county as a whole.

Quantitative variables

The outcome measure on which the authors focused was the aggregate number of unplanned hospital admissions. These were recorded for patients for the Frome Practice and the remainder of the Somerset practices, and for the pre- and post-intervention periods. The total number of admissions was aggregated by a quarter to reduce the

variability of the monthly data, particularly for the Frome Practice, where, due to it being a single (although large) practice, the monthly variation was substantial.

Statistical methods

Using the quarterly data, monthly variations are smoothed out considerably and with high counts, for which a Poisson distribution tends towards a normal distribution; a general linear regression model was considered to be appropriate to model these data. Four models were generated, evaluating the effect of time on admissions in Frome and (the rest of) Somerset in the periods before and after the intervention began.

Regression models were used for each analysis, with each quarter as a single (linear) covariate. Instead of using a single complex model, the analyses were stratified by Frome/Somerset. All analyses were undertaken using Stata (version 13.1).

The complete dataset of all admissions was used for analysis. The authors were not aware of any cases being lost to follow-up.

RESULTS

During the time period of the study, there were 235 195 unplanned admissions to hospital for patients registered in Somerset. In Frome, there were 9885 unplanned admissions to hospital.

In the pre-intervention period, there was a slight, but not statistically significant, trend for the number of unplanned hospital admissions to increase with time, by 38 cases per quarter ($P=0.56$) in Somerset, and by 9.5 cases per quarter in Frome ($P=0.27$). However, these were recorded for only five quarters, so the analyses may be underpowered to detect a meaningful trend.

In the post-intervention period, there was a sharp increase in the number of admissions per quarter within the Somerset cohort, compared with the pre-intervention period, with an increase in the number of unplanned admissions of 236 per quarter (95% confidence interval [CI] = 152 to 320, $P<0.001$) (Figure 1). In contrast, within the Frome cohort there was a progressive reduction — by 7.9 cases per quarter (95% CI = 2.8 to 13.1, $P=0.006$) — in unplanned hospital admissions (Figure 2).

The number of admissions per 1000 population in Frome during quarter 1 of 2014, at the beginning of the intervention, was 25. For Somerset this was 27.8. The figure for Frome by the end of the study period, quarter 3 2017, was 21.5, whereas in Somerset this figure had increased to 35.7 per 1000 population, giving a rate of

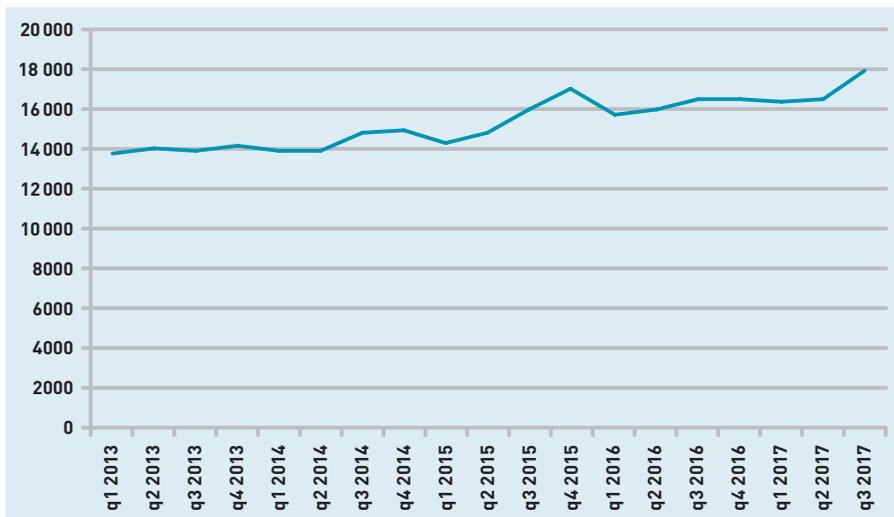


Figure 1. Total quarterly unplanned admissions in Somerset, April 2013 to December 2017.

reduction of 14.0% in Frome, and a rate of increase in the remainder of Somerset of 28.5%.

The cost of unplanned admissions in Frome for 2013–2014 was £5 755 487, and £4 560 421 for 2016–2017, a reduction of 20.8%.

The quarterly average number of one-to-one new appointments to see a health connector in the Health Connections Mendip service for April 2016 to March 2017 was 50. For the period of April 2017 to December 2017 the number was 69. The figure for the previous years is not available for Frome alone, but is available for the whole of Mendip.

DISCUSSION

Summary

The results demonstrate two main outcomes. First, the number of total

unplanned admissions across the population of Frome decreased significantly over the study period from April 2013 to December 2017. The number of unplanned admissions per quarter at the end of the study period was 14.0% lower than at the beginning. Second, during the same time period, the number of unplanned admissions across Somerset increased sharply. The number of unplanned admissions at the end of the study period was 28.5% higher per quarter compared with the beginning.

The intervention has continued after the study period finished. Costs of unplanned admissions for 2013–2014 in Frome were £5 755 487. For 2016–2017, the costs were £4 560 421. This represents a 20.8% reduction. Cost data are not yet available for the financial year of 2017–2018. Changes in costs are not linear, as payment by results tariffs change over time. Further rollout of the Frome model is taking place in the Mendip area of Somerset, with a population of 112 500 people.

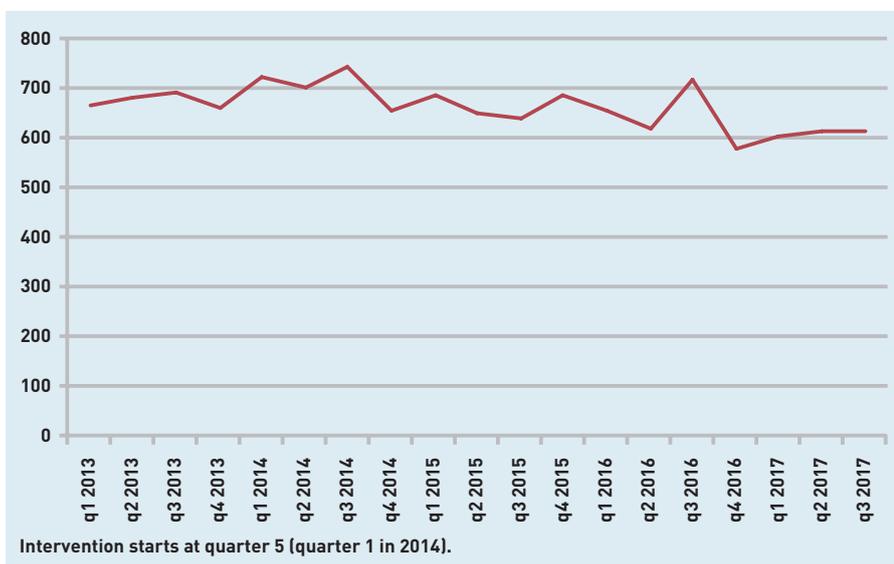
The method of identifying those in need of the intervention in Frome was unlike many other studies that have looked to reduce unplanned admissions to hospital. Rather than relying on identification of people through risk scores or a long-term conditions register, the health professionals at the Frome Practice identified individuals irrespective of diagnosis. In addition, referral from any source, including self-referral, was possible to the Health Connections service. The openness of the patient identification system is likely to have increased the impact of the whole population approach.

The complexity of the intervention has been summarised in four steps:

- patient identification;
- goal setting and care planning;
- enhancement of naturally occurring supportive networks; and
- linkage to community resource.

However, the impact of the Frome project in terms of working practices and organisational culture is diverse. GPs, for example, are able to print off the list of resources available from the Health Connections Mendip directory.¹⁶ This website is available to the public, which may have had a further impact on hospital admission reduction. The Frome model is both a medical and social intervention. The model directly involves community action. That being the case, it is not possible to conduct an analysis of those people who were

Figure 2. Quarterly unplanned admissions in Frome Medical Practice, April 2013 to December 2017.



exposed to an intervention compared with those who were not. For example, currently there are >600 community connectors. On average, a community connector will have 20 conversations with people about the resources that are available on the Mendip Directory per year. This is >12 000 conversations in a population of 29 000 people. The aim of community development is to enable as much resource as possible to exist within the community, without always involving health or social care services.

Social connectedness has long been known to be a primary determinant of health and longevity.¹⁷ The authors have found a way to bring this into routine clinical practice in Frome in a systematic way. This may explain some of the reasons for the success of the Frome model at reducing unplanned admissions to hospital.

Strengths and limitations

The significant size of the study population strengthens the reliability of the results. The study setting of Frome meant that the population examined covered all patients who were registered with the general practice. This helps to reduce the risk of bias through exclusion.

Although the results are promising, it is not clear how generalisable they are. The four interventions are, in principle, applicable in a variety of circumstances. Government policy and a number of reports recommend use of these initiatives.^{5,6,18,19}

This is an observational study and, as such, does not provide proof of causation. The intervention set out to address the needs of people in the hope of providing better care. The original intention did not focus solely on reduction of admissions to hospital. During the 2 years of the study period, no other significant initiatives took place in the town, either in health care or the social infrastructure or demographics of the town itself.

Comparison with existing literature

The results of the application of the Frome model of care are promising and support earlier but smaller-scale indications of success noted for their broad public health mix of clinical and community development healthcare approaches.²⁰⁻²³

Uniting primary care and community development worked well in Frome. There are further, more elementary, indications that these work well in other locations in the UK.^{20,21,24} Nevertheless, general practices are diverse, and it remains to be seen if the same principles can be applied equally effectively in inner-city practices

across England, as well as in more rural settings.

This diversity in general practice models highlights the issue of community diversity more broadly. How receptive particular groups in urban areas in the UK, especially some older single household groups, or different ethnic or religious groups, may be to social prescribing and community development opportunities remains questionable. This lack of major empirical data stands out against a background of small studies about the support needs and barriers of these populations that often send out paradoxical, at times even counterintuitive, recommendations.²⁵⁻²⁷

Implications for research and practice

Many questions remain unanswered, and will require further evaluation. Within Somerset, a variety of admissions avoidance interventions took place in other areas at the time. This complicates the interpretation of the sole impact of the Frome model. The observational nature of the study does not prove causation and further quantitative prospective controlled studies are needed. The complexity of the intervention was summarised into four components. It is not clear how much impact each component had, or the relative importance of combining all four together. Through the development of the model in Frome, along with the rollout across the Mendip area of Somerset, the authors have learnt some principles that could inform a wider rollout of the Frome model in other areas.

First, all functions of the model should be implemented, based on what is known from the literature and from partial implementation in other areas of Somerset that did not result in similar admissions reductions to those found in Frome. The authors believe it is the full model implementation that seems to be the cause of reduction in unplanned admissions. Data from partial implementation in other areas of Somerset failed to stop the rise in population unplanned admission numbers.

Second, implementation in Frome and across Mendip has been owned by primary care. Change has been from the ground up, designed by the people who do the work, rather than a top-down command-and-control style change.

Third, clinical impression, rather than risk stratification or use of databases, was used to identify those in need of support.

Fourth, quality improvement methodology was used as the tool for change. Not only does this build continuous improvement

from the ground up, it also allows for small-scale testing to find out what works prior to wider use. In addition, safe, reliable systems are needed to be able to make the changes across a population to effect unplanned admissions reduction.

Fifth, the community development worker is seen as a member of the clinical team. Their role has the added advantage of being able to move across organisational silos of professional care and community. The authors feel that it is the integration of both of these areas that has contributed significantly to the success of the project.

Sixth, working relationships across teams and organisational silos come first. Building relationships is seen as the key starting point for change. Without these good relationships, ground-up change is difficult.

In addition to these six key lessons, the authors recommend other factors that will help to build a successful project.

Build on what is already there. Elements of good practice already exist. Building on these means that some of the infrastructure work is done and proper respect is given to the efforts already made. Given the siloed nature of health and social care, a steering group for an area is helpful in coordinating

an effective project. Although the authors believe they have described the key functions of the Frome model, they advise that these be adapted to suit local structures. There is no one-size-fits-all solution. Wider rollout should be participatory in nature, adapting to local circumstances and structures, built from the ground up.

The authors recommend that any implementation project should be funded for 3 years. Their experience is that cost reductions begin after the first year; 3-year funding gives time for overall cost reduction to pay for the model. The return in investment for Frome was £6 for every pound spent.

This study does not provide a comprehensive answer as to why the Frome model has been effective. Many further studies will be needed to allow greater understanding of the model and its effectiveness. This includes looking at demographics, as well as seeing what the impact of implementation is in other areas. Notwithstanding the limitations, the current study offers the first major indicator that these kinds of approaches can address the year-on-year increase in unplanned admissions in the UK.

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Ethical approval

Not applicable.

Provenance

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Competing interests

The authors have declared no competing interests.

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