British Journal of General Practice

The impact on primary care of a case-management intervention for reducing emergency attendance: randomised control trial

Cohen, Jonathan; Nguyen, An; Rafiq, Meena; Taylor, Paul

DOI: <https://doi.org/10.3399/BJGP.2021.0545>

To access the most recent version of this article, please click the DOI URL in the line above.

Received 17 September 2021

Revised 10 February 2022

Accepted 21 February 2022

© 2022 The Author(s). This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>). Published by British Journal of General Practice. For editorial process and policies, see: <https://bjgp.org/authors/bjgp-editorial-process-and-policies>

When citing this article please include the DOI provided above.

Author Accepted Manuscript

This is an 'author accepted manuscript': a manuscript that has been accepted for publication in British Journal of General Practice, but which has not yet undergone subediting, typesetting, or correction. Errors discovered and corrected during this process may materially alter the content of this manuscript, and the latest published version (the Version of Record) should be used in preference to any preceding versions

The impact on primary care of a case-management intervention for reducing emergency attendance: randomised control trial

Jonathan N Cohen MRCP^a, General Practitioner; An Nguyen PhD^b, Data Analyst; Meena Rafiq MRCP^c, Academic GP/Clinical Research Fellow; and Paul Taylor PhD^a, Professor of Health Informatics

^a Institute of Health Informatics, UCL, London, UK

^b Health Navigator Ltd, UK

^c Epidemiology of Cancer and Healthcare Outcomes (ECHO), Institute of Epidemiology and Health Care, UCL, London, UK

Corresponding Author: Dr Jonathan Cohen, Institute of Health Informatics, UCL, 222 Euston Road, London, UK, NW1 2DA

Email: Jonathan.cohen@doctors.org.uk

Tel: +44 20 7679 2000

Conflict of interest: Dr An Nguyen is Head of Analytics of Health Navigator Ltd. For the remaining authors there was no conflict of interest.

Word count:

Abstract: 249

Main Text: 2915

Number of Figures: 4

Number of Tables: 3

Abstract

Background

The impact of case-management interventions to reduce Emergency Department (ED) attendances on primary care workload is unknown.

Aim

To examine how a telephone-based case-management intervention targeting high consumers of ED attendances, impacts primary care utilisation.

Design and setting

Single site data extract from a larger RCT, using patient-level data from primary care electronic health records (2015-2020).

Methods

363 patients at high-risk of ED usage were randomised to receive a 6-month case-management intervention (253 patients) or standard care (110 patients). Poisson regression models calculated monthly rates of primary care usage over time for two-years post-randomisation comparing both arms. Usage was subclassified into face-to-face, telephone, letter and community and secondary care referrals and stratified by patient demographics.

Results

No significant difference was found in the mean annual rate of primary care events between the intervention and control arms ($P=0.70$). Secondary care referrals saw a 26% reduction in the mean annual referral rate (IRR 0.74 95%CI 0.64-0.86 $P<0.001$) and letters sent increased by 6% in the intervention arm compared to controls (IRR 1.06 95%CI 1.01-1.11 $P=0.01$). In case-managed patients aged ≥ 80 there was a 33% increase in primary care usage, with a corresponding 10% decrease in patients aged <80 when compared to controls (IRR 1.33 95%CI 1.28-1.40 $p<0.001$, IRR 0.90 95%CI 0.87-0.92 $p<0.001$, respectively).

Conclusion

A targeted case-management intervention to reduce ED attendances does not increase overall primary care utilisation. Redistribution of usage is seen among some patient groups, particularly the elderly, which may have important implications for primary healthcare planning.

Keywords

Case-management, primary care, frequent attenders, high intensity users, healthcare utilisation, AI

How this fits in

Case-management interventions, if carefully targeted at the right patient population, successfully reduce ED attendances, however their impact on primary care utilisation is unknown. This study shows a case-management intervention to reduce ED attendances does not increase overall primary care usage. In addition, it leads to a 26% reduction in referrals to secondary care services in patients receiving the intervention. The intervention has differing effects on primary care utilisation in specific patient groups, with an increase in usage in those aged ≥ 80 years and a decrease in under 80s. This may represent a redistribution of services to those with greater clinical need with important associated implications for primary care service planning and provision.

Introduction

Over the past decade, the number of patient visits to emergency departments (ED) has increased across almost all high-income countries ¹. In the UK, there has been an estimated 9% increase in ED attendance between 2013 and 2017 ². This strain has been further highlighted over the last 18 months with the COVID-19 pandemic causing surges in ED attendance rates and placing unprecedented demands on hospital emergency services ³.

Many ED attendances are avoidable or would be more appropriately treated by other healthcare providers, including general practice (GP) and community services. NHS England found 24% of ED attendances were inappropriate or avoidable ², with 11% discharged without requiring treatment and 39% receiving advice only ⁴. Additionally, a small number of patients account for a disproportionately high number of ED attendances ⁵⁻⁷; 5% of patients are estimated to account for over 25% of all ED visits ⁸.

Improving access to primary care services⁹⁻¹¹ and promoting continuity of care^{9 12 13} effectively reduces ED use. Additionally, patients who are confident in managing their own health conditions have 32% fewer attendances to the ED and 38% fewer emergency hospital admissions ¹⁴. Case-management strategies are a proposed solution to support these factors to reduce ED attendances. These are *“a collaborative process of assessment, planning, facilitation, care coordination, evaluation, and advocacy for options and services to meet an individual’s comprehensive health needs”*¹⁵.

Case-management strategies have been shown to reduce unscheduled emergency care and costs by identifying patients at a higher risk of unplanned hospital attendance, often with multiple comorbidities and psychosocial factors, and coordinating patients’ care with available services ^{16 17}. They can produce a 12-26% reduction in emergency hospital admissions in frequent ED attenders ^{18 19 20}. However, no evaluation has been conducted of their impact on wider healthcare utilisation of other services, particularly primary care. This is important as any diversion of patient care from ED may increase demands on primary care, itself a system under increasing strain²¹⁻²³.

This study seeks to examine the effect of a case-management intervention designed to reduce ED attendances on primary care usage and to quantify in granular detail what specific aspects of primary care services are impacted.

Method

Study Setting

This single site study in the Vale of York Clinical Commissioning Group (CCG) is part of an ongoing larger parallel, two-arm randomised control trial (RCT) being conducted by Nuffield Health and Health Navigator (HN) (IRAS project ID 173319, clinicaltrials.gov ID 2015-000810-23). The study assessed the impact of a telephone-based case-management health coaching intervention using an algorithm generated selection of high-risk patients for future ED attendance. Recruitment started in August 2015 and is ongoing.

Study population

Daily patient-level data on hospital attendances were obtained from York Teaching Hospital and linked to primary care records. An artificial intelligence (AI) driven risk prediction algorithm identified patients at high-risk of becoming heavy users of emergency and non-elective services (see supplementary Box S1 and Figures S1 and S2 for protocol details) who were invited to participate in the trial. Consented patients were randomised using an online random sequence generator to either intervention or control groups using a 2:1 ratio in favour of the intervention group.

Study intervention:

Intervention group patients received an initial face-to-face meeting to discuss the intervention, followed by a telephone-based case-management programme with regular 15-minute telephone calls from a HN health coach over a 6-month period (see supplementary data Box S1 for protocol details). A personalised care plan was developed, and patients received motivational conversations, support for self-care, patient education and

coordination of social and medical services. Motivational conversations were informed by existing theories^{24 25}; components included demonstrating empathy, dealing with resistance, supporting self-efficacy and developing autonomy. No medical advice or treatment was delivered. Patients in the control group received standard care, defined here as the provision of social prescribing and community services delivered by primary care and the local community trust.

Data collection and management:

Pseudo-anonymised data were extracted from GP electronic health records including age, sex and Index of Multiple Deprivation (IMD) (as a marker of socioeconomic status (SES)) and primary care utilisation (rate of patient contacts) during the 6 months before and 2 years following the intervention. Patient contacts were stratified into face-to-face consultations, telephone contacts and letters sent to patients (containing test results, appointment invitations etc.), with the date and type of each primary care contact recorded. Data on GP referrals (date and destination) were collected as a secondary outcome measure to reflect the impact of the intervention on broader GP workload. Referrals were sub-classified into community or secondary care referrals to additionally assess the impact on use of community services.

Statistical Analysis

Chi-squared tests were used to compare baseline characteristics between patients in the intervention and control arms. Poisson regression analyses were used to calculate the annual rate of all primary care events for the intervention and the control arms by calculating the total number of events per person per year in each arm. Incident rate ratios (IRRs) were estimated to compare the rate in the two arms. To obtain a detailed understanding of the effect of the intervention on different aspects of GP workload, separate Poisson models were used to examine the rates of face-to-face consultations, telephone calls, letters and community and secondary care referrals in both arms.

To explore if any differences in primary care utilisation were limited to specific patient groups, the annual rate of all primary care events was estimated after stratifying by age, sex and IMD quintile.

Further Poisson regression analyses were used to compare the rate of all primary care events over time between the two arms by estimating the monthly rates per patient for 6 months before and 24 months after the intervention. Monthly IRRs with corresponding 95% confidence intervals were estimated to compare each arm. These analyses were repeated using separate models for face-to-face consultations, telephone calls, letters sent, community referrals and secondary care referrals to observe how specific types of primary care usage changed over time. Further analyses were conducted stratifying the monthly rate of all primary care events over time by age and sex to see if trends were similar across these groups. All analyses were conducted according to intention to treat principles and using Stata (version 15; StataCorp, College Station, TX, USA).

Results

Descriptive analysis:

382 patients were recruited between 1st August 2015 – 1st November 2018. 19 patients were excluded due to death or moving GP practice as permission to access these patient data was unavailable (see CONSORT diagram Figure 1). 363 patients were included in the analyses, 253 patients in the intervention arm, 110 patients in the control arm. All included patients had data for 2 years follow-up post-intervention. Both arms were comparable with regards to age, sex and SES (Table 1). The mean age was 71 years in the intervention arm and 72 years in the control. 24% of patients in the intervention arm were aged 80 years and over, compared with 33% in the control arm. Half of the patients in both arms were from the most deprived socioeconomic group (Table 1).

Primary care utilisation by type:

Patient contacts

There was no significant difference in the mean annual rate of all primary care events between the intervention and control arms; with 46 events per person per year in both (IRR 1.00 95% CI 0.98-1.03 P=0.70, Table 2).

When observing specific types of primary care usage, there was a 6% increase in the mean annual rate of letters sent to patients in the intervention arm compared to the control (IRR 1.06 95% 1.01-1.11 $P=0.01$). No difference was observed in the rate of face-to-face consultations or telephone contacts between the two arms (IRR 0.98 95% 0.95-1.02 $P=0.31$, IRR 1.02 95% CI 0.95-1.08 $P=0.64$, respectively, Table 2).

Patient referrals

A 26% decrease was observed in the annual rate of secondary care referrals in the intervention arm compared to the control arm; (IRR 0.74 95% CI 0.64-0.86 $P<0.001$). No difference was observed in community referral rates between the two arms (IRR 1.04 95% CI 0.88-1.22 $P=0.67$, Table 2).

Primary care utilisation by patient demographics:

Patients aged ≥ 80 in the intervention group had a 33% increase in the mean annual rate of primary care events compared with the control arm, with a corresponding 10% decrease in events in patients aged under 80 (IRR 1.33 95% CI 1.28-1.40 $p<0.001$, IRR 0.90 95% 0.87-0.92 $p<0.001$, respectively, Table 3). There was a 7% reduction in the mean annual rate of primary care events in men and a 7% increase in women in the intervention arm compared with the control (IRR 0.93 95% CI 0.89-0.96 $p<0.001$, IRR 1.07 95% CI 1.04-1.11 $p<0.001$, respectively, Table 3). In the most affluent group, although numbers were small, a 49% increase in the rate of primary care events was found in the intervention arm compared to the control arm (IRR 1.49 95% CI 1.36-1.63 $p<0.001$) (Table 3).

Primary care utilisation over time:

All primary care events

A rapid increase in primary care utilisation in the six months preceding the intervention was observed in both arms. In the intervention arm, the monthly rate of primary care events rose from a baseline of 2.5 events per patient at -6 months to 6.2 events per patient at the time of intervention, with a similar trend in the control arm (Figure 2). Following randomisation, in

both arms an initial rapid decline in the monthly rate of primary care events was found in the first 2 months, followed by a slower downward trend towards the baseline rate (Figure 2).

Primary care events by type

Similar trends were observed for utilisation of the five types of primary care events (Figure 3), with comparable monthly rates over time observed in intervention and control arms. In the intervention arm, face-to-face consultation dropped from a monthly rate of 3.0 in the month immediately post intervention to 1.6 two years after the intervention; telephone consultations dropped from 0.8 per month to 0.5 at 2 years post intervention; and letters dropped from 2.3 per month to 0.9, with comparable rates seen in controls (Figure 3). When examining referral rates over time, both community and secondary care referral rates were stable for the whole study period in both arms (Figure 3).

Primary care events by patient demographics

Patients aged ≥ 80 in the intervention arm had higher monthly rates of primary care usage for 2 years following intervention compared to controls in all but two months (Figure 4). Correspondingly, patients < 80 in the intervention arm had lower monthly rates in 21 of 24 months compared to controls. Primary care utilisation over time was comparable for men and women in both arms (Supplementary Figure S3).

Discussion

This case-management intervention for high users of ED services has no overall impact on primary care utilisation when examining all primary care events across the study population. There is a statistically significant decrease in secondary care referrals and an increase in letters sent to patients in the intervention arm. The intervention has differing effects on primary care utilisation in specific patient groups, with an increase in usage in those aged ≥ 80 years and females, and a decrease in under 80s and males. A steep increase in primary care utilisation was observed in the six months prior to the intervention indicating that data from GP EHRs could be used to potentially enhance existing risk prediction models to identify patients at increased risk of ED attendance earlier.

Strengths and limitations:

The strengths of the study include the use of patient-level GP data from EHRs and the RCT study design. The granular nature of this data enabled comprehensive evaluation of the impact on specific aspects of primary care use. The RCT design allowed comparison with a control group, with randomisation and intention to treat analysis minimising bias and ensuring comparability between the two arms. Additionally, the two-year follow-up period enabled examination of trends over time and if any effects were sustained. The large sample size allowed examination of effects by patient demographic and type of primary care usage.

The study uses routinely collected data. Practices may vary in the accuracy and completeness in of their recording and missing data may mean that our figures for primary care usage are underestimates, however this will affect both arms equally. Participating patients in both arms may be susceptible to the Hawthorne effect²⁶, however this is likely to be minimal as data is remotely extracted from EHRs without direct patient involvement or observation. The population of the Vale of York may not be representative of the UK population; patients identified by the AI algorithm in this study may therefore differ from those identified in other regions of the UK. This has implications for the generalisability of the study findings across other UK regions and further work is needed to confirm these findings in a larger population. Additionally, exclusion criteria were applied to select patients most likely to be able to engage with telehealth interventions, therefore findings will only be generalisable to similarly selected patient groups. The study identifies and includes patients who are using healthcare services at an increased rate. The subsequent rate of healthcare usage may include an element of regression to the mean. Finally, we recognise the changes in healthcare delivery and patient health-seeking behaviour in response to the COVID-19 pandemic. Sensitivity analysis found excluding follow up from 1st March 2020 did not impact the findings of this study. Future research of primary care utilisation should explore use of video and e-consults.

Comparison with the literature:

Previous studies have demonstrated that case-management interventions to reduce ED admissions are effective^{17-19 27-29}. However, their impact on other services has not been explored.

Studies of case-management interventions for purposes other than reducing ED attendances have examined some impacts on primary care usage. A case-management intervention for patients with chronic disease was found to have a 5% reduction in short-term primary care utilisation, however this was based on quasi-experimental qualitative data from patient questionnaire estimations of usage rather than quantitative data ³⁰. Conversely, a meta-analysis on case-management interventions for patients at risk of hospitalisation did not find any significant impact on usage of primary care ³¹. However, they only examined a composite outcome of GP visits combined with home care, social worker and nursing visits. A systematic review of case-management services to integrate care between healthcare services found that two UK studies observed a reduction in GP appointments and one found no difference, concluding further work is needed in this area ³².

This study for the first time quantifies the impact on primary care of a case-management intervention designed to reduce ED attendances. It expands on previous studies by exploring the impact on different types of primary care utilisation, the effect in different patient groups and the effect over time for 2 years following introduction of the intervention. Future studies should examine the effects of the intervention on wider health services, including further community services, and for sustained effects over a longer time period.

Implications:

This study has shown that an intervention that reduces ED attendances does not create additional workload in primary care. In addition, the decrease in secondary care referrals may reduce hospital workload. This may be due to patients having their conditions managed effectively in the community, supported by health coaches, without the need for onward referral, thereby freeing capacity in secondary care. Previous studies have shown that continuity of care is associated with reduced secondary care usage¹². The continuity provided by the health coaches in this study may contribute to lower use of other services. The intervention is comprehensive but could be economically scaled-up. Each nurse has an active caseload of 40-50 patients and supports 120 patients per year. As high-risk patients for unplanned care are a small proportion of all patients, a large workforce would not be required to expand the intervention into larger healthcare systems. Given the reduction in secondary care referrals, this may represent a good use of resources.

To further understand the implications of these results, we need to first consider what a 'good' outcome is. The study found that patients aged ≥ 80 had increased primary care usage, with those aged under 80 experiencing a reduction. The majority of patients with complex medical needs are aged over 80³³. A possible inference from these findings is that this group experienced prior unmet clinical needs, challenges accessing their GP, or a lack of knowledge of available services. The intervention potentially facilitates and resolves these issues, enabling these patients to have increased appropriate contact with their GP. This may be considered an 'ideal' outcome as care of chronic disease is optimised in primary care. The corresponding reduction in primary care contact in patients aged under 80, where the collective burden of chronic disease is lower, may indicate that the intervention supports these patients effectively without the need for their GP's involvement or secondary care referral. While this could potentially reduce opportunities for health promotion, routine monitoring and follow up, practice reminder systems and initiatives, such as the Quality Outcomes Framework (QOF)³⁴, mitigate this.

The marked increase in primary care events six-months prior to the intervention has implications for future risk-prediction modelling. The existing algorithm exclusively uses hospital data to identify patients at high-risk of accessing emergency care. Incorporating routinely collected primary care data from existing large, nationwide datasets into risk-prediction models could improve the current model's accuracy in detecting high-risk patients, identify patients as high-risk sooner before accessing unscheduled care and enable prediction of other outcomes like increased primary care utilisation to enable earlier intervention.

The implications of this study can be framed in a broader outlook when planning an integrated health service and commissioning further services in the future; interventions which seek to encourage patients away from an existing pathway may have an impact elsewhere in the system. However, patient needs may be more appropriately and efficiently met in different settings, which could reduce overall utilisation of healthcare resources. This study demonstrates that a case-management intervention, designed to reduce ED attendances, does not impact overall primary care utilisation and may redistribute services to those with greater clinical need.

Tables and Figures:

Table 1: Baseline characteristics of the study population. SD, standard deviation; IMD, Index of Multiple Deprivation; P, p value from chi-squared tests

	Intervention Group (%) n= 253	Controls (%) n= 110	P Value
Number of patients (% of total)	253 (70)	110 (30)	
Female	127 (50.2)	65 (59.1)	0.12
Age at randomisation			
<45	8 (3.2)	3 (2.7)	0.28
45-64	48 (19.0)	23 (21.0)	
65-79	136 (53.8)	48 (43.6)	
≥80	61 (24.1)	36 (32.7)	
Mean age (SD)	71.3 (11.8)	72.2 (11.3)	
IMD			
1 (least deprived)	10 (4.0)	9 (8.2)	0.55
2	39 (15.5)	14 (12.7)	
3	35 (13.9)	14 (12.7)	
4	42 (16.7)	18 (16.4)	
5 (most deprived)	125 (49.8)	55 (50.0)	
Study entry year			
2015	68 (26.9)	27 (24.6)	0.74
2016	62 (24.5)	28 (25.4)	
2017	46 (18.2)	25 (22.7)	
2018	77 (30.4)	30 (27.3)	

Table 2: Annual rate of all primary care events in patients who had the Health Navigator intervention (n=253) and control group (n=110) (calculated as total number of events per person per year). IRR, incident rate ratio comparing rate in intervention group with controls; 95%CI, 95% confidence interval; P value, from Poisson regression model comparing rate in intervention group and controls

	Rate (95%CI)	IRR (95%CI)	P Value
All events			
Control	46.08 (45.19-46.98)	1	0.70
Intervention	46.29 (45.70-46.89)	1.00 (0.98-1.03)	
Face-to-face			
Control	25.04 (24.36-25.71)	1	0.31
Intervention	24.63 (24.20-25.07)	0.98 (0.95-1.02)	
Telephone			
Control	5.92 (5.61-6.25)	1	0.64
Intervention	6.01 (5.80-6.23)	1.02 (0.95-1.08)	
Letter			
Control	12.95 (12.48-13.48)	1	0.01
Intervention	13.71 (13.39-14.04)	1.06 (1.01-1.11)	
Community referral			
Control	0.91 (0.79-1.04)	1	0.67
Intervention	0.94 (0.86-1.03)	1.04 (0.88-1.22)	
Secondary care referral			
Control	1.21 (1.08-1.37)	1	<0.001
Intervention	0.90 (0.82-0.99)	0.74 (0.64-0.86)	

Table 3: Annual rate of all primary care events in patients who had the Health Navigator intervention (n=253) and control group (n=110) (calculated as total number of events per person per year) by sex, age and socioeconomic status

	Intervention Group Rate (95%CI)	Control Group Rate (95%CI)	IRR (95%CI)	P Value
Sex				
Male	44.66 (44.83-45.49)	48.23 (46.82-49.69)	0.93 (0.89-0.96)	<0.001
Female	47.92 (47.07-48.77)	44.59 (43.45-45.74)	1.07 (1.04-1.11)	<0.001
Age at inclusion				
<80	44.44 (43.78-45.12)	49.50 (48.38-50.65)	0.90 (0.87-0.92)	<0.001
≥80	52.11 (50.85-53.41)	39.04 (37.62-40.51)	1.33 (1.28-1.40)	<0.001
IMD				
1 (least deprived)	60.81 (57.49-64.32)	40.92 (38.07-43.98)	1.49 (1.36-1.63)	<0.001
2	48.80 (7.28-50.38)	48.32 (45.82-50.97)	1.00 (0.95-1.07)	0.76
3	41.14 (39.67-42.67)	51.72 (49.12-54.45)	0.80 (0.75-0.85)	<0.001
4	47.55 (46.10-49.05)	48.13 (45.92-50.45)	0.99 (0.93-1.05)	0.67
5 (most deprived)	45.81 (44.98-46.66)	44.24 (43.02-45.50)	1.04 (1.00-1.07)	0.04

Figure 1: CONSORT Flow diagram

Figure 2. Monthly rate of all primary care events over time post Health Navigator intervention compared to control group. Green line indicates start of the Health Navigator intervention. Orange line represents intervention group, Blue line represents control group.

Figure 3. Monthly rate of different primary care events over time post Health Navigator intervention compared to control group. Green line indicates start of the Health Navigator intervention. Orange line represents intervention group, Blue line represents control group. Panel A: Face-to-face consultations; Panel B: Telephone calls; Panel C: Letters sent; Panel D: Secondary Care referrals; Panel E: Community referrals.

Figure 4. Monthly rate of all primary care events over time post Health Navigator intervention by age group. Green line indicates start of the Health Navigator intervention. Orange line represents intervention group (n=253), Blue line represents control group (n=110). Panel A: Patients aged ≥ 80 years; Panel B: Patients aged < 80 years.

Additional Information

Funding

Dr Jonathan Cohen was funded a Claire Wand Fund Grant for General Practitioners. MR was funded by an RM Partners Pan London Cancer Research Fellowship. The study was financed by the Vale of York CCG and Nuffield Health. The funding sources played no direct role in the planning, conduct or analysis of the study.

Ethical Approval

The study has received ethical approval from the NHS Research Ethics Committee and is registered with the NIHR (CPMS 19857) and HRA (IRAS 173319).

Acknowledgements

The authors would like to note the outstanding efforts of the health coaching nurses and other staff involved in the provision and development of this intervention who made this study possible, and of course the patients. In addition, they thank the Vale of York CCG and all GP practices who participated in the study. JNC would like to thank the Claire Wand Fund for their support.

References:

1. Berchet C. Emergency Care Services: Trends, Drivers and Interventions to Manage the Demand 2015 [Available from: <https://www.oecd-ilibrary.org/docserver/5jrts344crns-en.pdf?expires=1579196066&id=id&accname=guest&checksum=38714EECE8197E1B42EDE6DA76C32F32> accessed 17.01.20 2020.
2. NAO. Reducing emergency admissions: Department of Health & Social Care NHS England; 2019 [Available from: <https://www.nao.org.uk/wp-content/uploads/2018/02/Reducing-emergency-admissions.pdf>.
3. McCabe R, Schmit N, Christen P, et al. Adapting hospital capacity to meet changing demands during the COVID-19 pandemic. *BMC med* 2020;18(1):1-12.
4. NHS-Digital. A+E Wait Times. In: King's Fund, ed., 2017.
5. Cook LJ, Knight S, Junkins Jr EP, et al. Repeat patients to the emergency department in a statewide database. *Acad Emerg Med* 2004;11(3):256-63.
6. Hansagi H, Olsson M, Sjöberg S, et al. Frequent use of the hospital emergency department is indicative of high use of other health care services. *Ann Emerg Med* 2001;37(6):561-67.
7. Hunt KA, Weber EJ, Showstack JA, et al. Characteristics of frequent users of emergency departments. *Ann Emerg Med* 2006;48(1):1-8.
8. LaCalle E, Rabin E. Frequent users of emergency departments: the myths, the data, and the policy implications. *Ann Emerg Med* 2010;56(1):42-48.
9. van den Berg MJ, van Loenen T, Westert GP. Accessible and continuous primary care may help reduce rates of emergency department use. An international survey in 34 countries. *Fam Pract* 2016;33(1):42-50.
10. Baker R, Bankart M, Rashid A, et al. Characteristics of general practices associated with emergency-department attendance rates: a cross-sectional study. *BMJ Qual Saf* 2011;20(11):953-58.
11. Bruni ML, Mammi I, Ugolini C. Does the extension of primary care practice opening hours reduce the use of emergency services? *J Health Econ* 2016;50:144-55.
12. Hansen AH, Halvorsen PA, Aaraas IJ, et al. Continuity of GP care is related to reduced specialist healthcare use: a cross-sectional survey. *Br J Gen Pract* 2013;63(612):482-9. doi: 10.3399/bjgp13X669202
13. Huntley A, Lasserson D, Wye L, et al. Which features of primary care affect unscheduled secondary care use? A systematic review. *BMJ open* 2014;4(5):e004746.
14. Deeny S. Briefing: Reducing emergency admissions: unlocking the potential of people to better manage their long-term conditions 2018 [Available from: <https://www.health.org.uk/sites/default/files/Reducing-Emergency-Admissions-long-term-conditions-briefing.pdf> accessed 17.01.2020 2020.
15. Case Management Society of America. What is a case manager? 2021 [Available from: <https://cmsa.org/who-we-are/what-is-a-case-manager/2022>.
16. Lee K-H, Davenport L. Can case management interventions reduce the number of emergency department visits by frequent users? *Health Care Manag* 2006;25(2):155-59.
17. Kumar GS, Klein R. Effectiveness of case management strategies in reducing emergency department visits in frequent user patient populations: a systematic review. *J Emerg Med* 2013;44(3):717-29.
18. Edgren G, Anderson J, Dolk A, et al. A case management intervention targeted to reduce healthcare consumption for frequent Emergency Department visitors: results from an adaptive randomized trial. *Eur J Emerg Med* 2016;23(5):344.
19. Reinius P, Johansson M, Fjellner A, et al. A telephone-based case-management intervention reduces healthcare utilization for frequent emergency department visitors. *Eur J Emerg Med* 2013;20(5):327-34.

20. Sjobom P, Philips A, Bell F, et al. Transferability of innovative care models: Results from a large scale telephone based health coaching RCT. *Intl J Integr Care* 2017;17(5)
21. BMA. Pressures in general practice 14 December 2021 [Available from: <https://www.bma.org.uk/advice-and-support/nhs-delivery-and-workforce/pressures/pressures-in-general-practice> accessed 1 Jan 2022.
22. King's fund. Is general practice in crisis? Big election questions. 2018 [Available from: <https://www.kingsfund.org.uk/publications/articles/big-election-questions-gp-crisis> accessed 1st Jan 2022.
23. NHS Digital. Appointments in general practice: comparing 2018 to 2019. 2020 [Available from: <https://digital.nhs.uk/data-and-information/publications/statistical/appointments-in-general-practice/december-2019/page1>.
24. Miller WR, Rollnick S. Motivational interviewing: Preparing people for change. Book Review. 2002
25. Rollnick S, Miller WR, Butler C. Motivational interviewing in health care: helping patients change behavior: Guilford press 2008.
26. Adair JG. The Hawthorne effect: a reconsideration of the methodological artifact. *J Appl Psychol* 1984;69(2):334.
27. Skinner J, Carter L, Haxton C. Case management of patients who frequently present to a Scottish emergency department. *Emerg Med J* 2009;26(2):103-05.
28. Pope D, Fernandes CM, Bouthillette F, et al. Frequent users of the emergency department: a program to improve care and reduce visits. *CMAJ* 2000;162(7):1017-20.
29. Shah R, Chen C, O'Rourke S, et al. Evaluation of care management for the uninsured. *Med Care* 2011:166-71.
30. Shah V, Stokes J, Sutton M. Effects of non-medical health coaching on multimorbid patients in primary care: a difference-in-differences analysis. *BMC Health Serv Res* 2019;19(1):593.
31. Stokes J, Panagioti M, Alam R, et al. Effectiveness of case management for at risk patients in primary care: a systematic review and meta-analysis. *PloS one* 2015;10(7):e0132340.
32. Baxter S, Johnson M, Chambers D, et al. The effects of integrated care: a systematic review of UK and international evidence. *BMC Health Serv Res* 2018;18(1):1-13.
33. NICE. Social care of older people with complex care needs and multiple long - term conditions: NICE; 2015 [Available from: <https://www.nice.org.uk/guidance/ng22/documents/social-care-of-older-people-with-complex-care-needs-and-multiple-longterm-conditions-draft-guideline-nice2> accessed 23.01.20.
34. NHS Digital. Quality Outcomes Framework (QOF) 2021 [Available from: <https://digital.nhs.uk/data-and-information/data-tools-and-services/data-services/general-practice-data-hub/quality-outcomes-framework-qof> accessed Jan 2022.