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

Abstract

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

Aim
To examine the impact of a telephone-based case-management intervention targeting people with high ED attendance on primary care use.

Design and setting
A single-site data extract from a larger randomised control trial, using the patient-level data from primary care electronic health records (2015–2020), was undertaken.

Method
A total of 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 were used to calculate monthly rates of primary care use over time for the 2 years post-randomisation, comparing both arms. Usage was subclassified into face-to-face, telephone, letter, and community and secondary care referrals, 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 (incident rate ratio (IRR) 0.74, 95% confidence interval (CI) = 0.64 to 0.86, $P<0.001$) and letters sent increased by 6% in the intervention arm compared with the control arm (IRR 1.04, 95% CI = 1.01 to 1.11, $P=0.01$). In the case-managed arm, in patients aged ≥80 years there was a 33% increase in primary care usage (IRR 1.33, 95% CI = 1.28 to 1.40, $P<0.001$), with a corresponding 10% decrease in patients aged <80 years when compared with controls (IRR 0.90, 95% CI = 0.87 to 0.92, $P<0.001$).

Conclusion
A targeted case-management intervention to reduce ED attendances did not increase overall primary care use. Redistribution of usage is seen among some patient groups, particularly older people, which may have important implications for primary healthcare planning.

Keywords
artificial intelligence; case management; frequent attenders; healthcare utilisation; high-intensity users; primary healthcare.

INTRODUCTION

Over the past decade, the number of patient visits to emergency departments (EDs) has increased across almost all high-income countries.1 In the UK, there was an estimated 9% increase in ED attendance between 2013 and 2017.2 This strain has been further highlighted over the past 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 GP and community services. NHS England found 24% of ED attendances were inappropriate or avoidable,4 with 11% discharged without requiring treatment and 39% receiving advice only.5 Additionally, a small number of patients account for a disproportionately high number of ED attendances;6–8 5% of all patients are estimated to account for >25% of all ED visits.6

Improving access to primary care services7–11 and promoting continuity of care12,13 effectively reduces ED use. Additionally, patients who are confident in managing their own health conditions have 32% fewer attendances at EDs 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.16–18 They can produce a 12%–26% reduction in emergency hospital admissions in people who frequently attend EDs.19–21 However, no evaluation has been conducted of their impact on wider healthcare service use, particularly primary care. This is important as any diversion of patient care from EDs may increase demands on primary care, itself a system under increasing strain.21–23

This study set out to examine the effect of a case-management intervention designed to reduce ED attendances on primary care use and to quantify in granular detail the impact on specific aspects of primary care services.

METHOD

Study setting
This single-site study in the Vale of York Clinical Commissioning Group is part of an ongoing larger parallel, two-arm randomised control trial (RCT) being conducted by Nuffield Trust and Health Navigator (Integrated Research Application System project ID: 173319; and clinicaltrials.gov ID: NCT01–000810–23). The trial is assessing the impact of a telephone-based case-management health coaching intervention using an algorithm-generated...
selection of patients at high risk of 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-driven risk-prediction algorithm identified patients at high risk of becoming heavy users of emergency and non-elective services (see Supplementary Box S1 and Supplementary 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 the intervention or control group using a 2:1 ratio in favour of the intervention group.

Study intervention
Patients in the intervention group 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 Health Navigator health coach over a 6-month period (see Supplementary 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, 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 (EHRs) including age, sex, Index of Multiple Deprivation (IMD) [as a marker of socioeconomic status], and primary care use [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, for example, test results and appointment invitations, 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 subclassified into community or secondary care referrals to additionally assess the impact on use of community services.

Statistical analysis
To compare baseline characteristics between patients in the intervention and control arms, \( \chi^2 \) tests were used. 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 sent, community and secondary care referrals in both arms.

To explore if any differences in primary care use 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 (CIs) 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 use 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).

**RESULTS**

**Descriptive analysis**

A total of 382 patients were recruited between 1 August 2015 and 1 November 2018. There were 19 patients who were excluded because of death or moving GP practice as permission to access their patient data was unavailable (Figure 1). There were 363 patients included in the analyses, 253 patients in the intervention arm and 110 patients in the control arm. All included patients had data for the 2-year follow-up post-randomisation. Both arms were comparable with regards to age, sex, and socioeconomic status (Table 1). The mean age was 71 years in the intervention arm and 72 years in the control arm. In total, 24% of the patients in the intervention arm were aged ≥80 years compared with 33% in the control arm. Half of the patients in both arms were from the most deprived socioeconomic group.

**Primary care use 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 0.98, 95% CI = 0.95 to 1.02, P = 0.31; IRR 1.02, 95% CI = 0.97 to 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 with the control arm (IRR 0.74, 95% CI = 0.64 to 0.86, P < 0.001). No difference was observed in community referral rates between the two arms (IRR 1.04, 95% CI = 0.88 to 1.22, P = 0.67, Table 2).

**Primary care use by patient demographics**

Patients aged ≥80 years in the intervention group had a 33% increase in the mean annual rate of primary care events compared with the control arm (IRR 1.33, 95% CI = 1.28 to 1.40, P < 0.001), with a corresponding 10% decrease in events in patients aged <80 years (IRR 0.90, 95% CI = 0.87 to 0.92, P < 0.001, Table 3). There was a 7% reduction in the mean annual rate of primary care events in males and a 7% increase in females in the intervention arm compared with the control arm (IRR 0.93, 95% CI = 0.89 to 0.96, P < 0.001; IRR 1.07, 95% CI = 1.04 to 1.11, P < 0.001, respectively). 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 with the control arm (IRR 1.49, 95% CI = 1.36 to 1.63, P < 0.001).

**Primary care use over time**

All primary care events A rapid increase in primary care use during the 6 months preceding the intervention was observed in both arms. In the intervention arm, the monthly rate of primary care events rose

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**Table 1. Baseline characteristics of the study population (n = 363)**

| Characteristic | Intervention group, % (n = 253, 69.7%) | Control group, % (n = 110, 30.3%) | P-value* |
|---------------|-----------------------------------------|----------------------------------|---------|
| Sex, female, n(%) | 127 (50.2) | 65 (59.1) | 0.12 |
| Age at randomisation, years, n(%) | 0.28 |
| <65 | 8 (3.2) | 3 (2.7) |
| 45–64 | 46 (19.0) | 23 (20.9) |
| 65–79 | 136 (53.8) | 48 (43.6) |
| ≥80 | 61 (24.1) | 36 (32.7) |
| Age, years, mean (SD) | 71.3 (11.8) | 72.2 (11.3) | 0.55 |
| IMD quintile, n(%) | 0.74 |
| 1 (least deprived) | 10 (4.0) | 9 (8.2) |
| 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, n(%) | 0.74 |
| 2015 | 68 (26.9) | 27 (24.5) |
| 2016 | 62 (24.5) | 28 (25.5) |
| 2017 | 46 (18.2) | 25 (22.7) |
| 2018 | 77 (30.4) | 30 (27.3) |

*P-value from χ² tests. 5Data are only available for 251 patients in the intervention group. IMD = Index of Multiple Deprivation. SD = standard deviation.

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**Figure 2. Monthly rate of all primary care events over time post-randomisation compared with control group.**

Green line indicates start of the Health Navigator intervention.
from a baseline of 2.5 events per patient at –6 months to 6.2 events per patient at the time of the 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.

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

Primary care events by patient demographics

Patients aged ≥80 years in the intervention arm had higher monthly rates of primary care use for the 2 years following the intervention compared with the control group in all but 2 months (Figure 4). Correspondingly, patients aged <80 years in the intervention arm had lower monthly rates in 21 of 24 months compared with controls. Primary care use over time was comparable for males and females in both arms (Supplementary Figure S3).

**DISCUSSION**

Summary

This case-management intervention for frequent users of ED services had no overall impact on primary care use when examining all primary care events across the study population. There was a statistically significant decrease in secondary care referrals and an increase in primary care referrals.

**Table 2. Annual rate of all primary care events in patients who received the Health Navigator intervention (n = 253) and the control group (n = 110) (calculated as total number of events per person per year)**

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

*P-value from Poisson regression model comparing rate in intervention group and control groups. CI = confidence interval. IRR = incident rate ratio comparing rate in intervention group with control group.

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

| Characteristic | Intervention group, rate (95% CI) | Control group, rate (95% CI) | IRR (95% CI) | P-value* |
|---------------|-----------------------------------|------------------------------|--------------|----------|
| Sex           |                                   |                              |              |          |
| Male          | 44.66 (44.83 to 45.49)            | 48.23 (46.82 to 49.69)       | 0.93 (0.89 to 0.96) | <0.001   |
| Female        | 47.92 (47.07 to 48.77)            | 44.59 (43.45 to 45.74)       | 1.07 (1.04 to 1.11) | <0.001   |
| Age at inclusion, years |                                   |                              |              |          |
| <80           | 44.44 (43.78 to 45.12)            | 49.50 (48.38 to 50.65)       | 0.90 (0.87 to 0.92) | <0.001   |
| ≥80           | 52.11 (50.85 to 53.41)            | 39.04 (37.62 to 40.51)       | 1.33 (1.28 to 1.40) | <0.001   |
| IMD quintile  |                                   |                              |              |          |
| 1 (least deprived) | 60.81 (57.49 to 64.32)            | 40.92 (38.07 to 43.98)       | 1.49 (1.36 to 1.63) | <0.001   |
| 2             | 48.80 (47.28 to 50.38)            | 48.32 (45.82 to 50.97)       | 1.00 (0.95 to 1.07) | 0.76     |
| 3             | 41.14 (39.67 to 42.67)            | 51.72 (49.12 to 54.45)       | 0.80 (0.75 to 0.85) | <0.001   |
| 4             | 47.55 (44.10 to 50.05)            | 48.13 (45.92 to 50.43)       | 0.99 (0.93 to 1.05) | 0.67     |
| 5 (most deprived) | 45.81 (44.98 to 46.66)            | 44.24 (43.02 to 45.50)       | 1.04 (1.00 to 1.07) | 0.04     |

*P-value from Poisson regression model comparing rate in intervention group and control groups. CI = confidence interval. IMD = Index of Multiple Deprivation. IRR = incident rate ratio comparing rate in intervention group with control group.
increase in letters sent to patients in the intervention arm. The intervention has differing effects on primary care use in specific patient groups, with an increase in use in those aged ≥80 years and female, and a decrease in those aged <80 years and male. A steep increase in primary care use was observed during the 6 months before 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 these 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 2-year follow-up period enabled examination of trends over time and to establish if any effects were sustained. The large sample size allowed examination of effects by patient demographic and type of primary care use.

The study identified and includes patients who were using healthcare services at an increased rate. The subsequent rate of healthcare use may include an element of regression to the mean. Finally, the authors recognise there were changes in healthcare delivery and patient health-seeking behaviour in response to the COVID-19 pandemic. Sensitivity analysis found excluding follow-up from 1 March 2020 did not have an impact on the findings of this study. Future research of primary care use should explore use of video and e-consults.

**Comparison with existing literature**

Previous studies have demonstrated that case-management interventions to reduce ED admissions are effective; 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 of the impact on primary care use. A case-management intervention for patients with chronic disease was found to lead to a 5% reduction in short-term primary care use; however, this was based on quasi-experimental qualitative data from patient questionnaire estimations of usage rather than quantitative data. Conversely, a meta-analysis on case-management interventions for patients at risk of admission to hospital did not find any significant impact on use of primary care. However, that study 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 for primary care use are underestimates; however, this will affect both arms equally. Participating patients in both arms may be susceptible to the Hawthorne effect, however, this is likely to be minimal as data are 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 artificial intelligence 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.

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The marked increase in primary care events during the 6 months before 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 at high risk sooner before accessing unscheduled care, and enable prediction of other outcomes, such as increased primary care use 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 that 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 have an impact on overall primary care use and may redistribute services to those with greater clinical need.
REFERENCES

1. Berchet C. Emergency care services: trends, drivers and interventions to manage the demand. 2015. https://www.oecd-library.org/docserv/5jts344crms-en.pdf (accessed 13 Apr 2022).

2. National Audit Office. Reducing emergency admissions. 2018. https://www.nao.org.uk/wp-content/uploads/2018/02/Reducing-emergency-admissions.pdf (accessed 13 Apr 2022).

3. McCabe R, Schmit N, Christen P, et al. Adapting hospital capacity to meet changing demands during the COVID-19 pandemic. BMJ Med 2020; 18(1): 1–12.

4. King’s Fund. What’s going on with A&E waiting times? 2020. https://www.kingsfund.org.uk/projects/urgent-emergency-care/urgent-and-emergency-care-mythbusters#ae-performance-measurement (accessed 26 Apr 2022).

5. Cook LJ, Knight S, Junkins Jr EP, et al. Repeat patients to the emergency department is indicative of high use of other health care services. Ann Emerg Med 2001; 37(6): 561–567.

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): 550–561.

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, Rashd A, et al. Characteristics of general practices associated with emergency-department attendance rates: a cross-sectional study. BMJ Qual Saf 2011; 20(11): 953–958.

11. Brun ML, Mammi I, Ugolini C. Does the extension of primary care practice opening hours reduce the use of emergency services? J Health Econ 2016; 56: 144–155.

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, DOI: 10.3399/bjgp13X610202.

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(9): e004746.

14. Deeny S, Thorlby R, Stevenson A. Briefing: reducing emergency admissions: unlocking the potential of people to better manage their long-term conditions. 2018. https://www.who.int/health-topics/Reducing-Emergency-Admissions-long-term-conditions-briefing.pdf (accessed 13 Apr 2022).

15. Case Management Society of America. What is a case manager? https://cmsa.org/who-we-are/what-is-a-case-manager (accessed 13 Apr 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): 155–159.

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): 717–729.

18. Eidgren 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): 344–350.

19. Reinus P, Johansson M, Fjeliner A, et al. A telephone-based case-management intervention reduces healthcare utilization for frequent emergency department visitors. Eur J Emerg Med 2013; 20(5): 327–334.

20. Sjöborn P, Philips A, Bell F, et al. Transferability of innovative care models: results from a large scale telephone based health coaching RCT. Int J Integr Care 2017; 17(1): A465.

21. British Medical Association. Pressures in general practice data analysis. https://www.bma.org.uk/advice-and-support/nhs-delivery-and-workforce/pressures/pressures-in-general-practice (accessed 13 Apr 2022).

22. Baird B. Is general practice in crisis? Big election questions. 2017. https://www.kingsfund.org.uk/publications/articles/big-election-questions-gp-crisis (accessed 13 Apr 2022).

23. NHS Digital. Appointments in general practice: comparing 2018 to 2019. In: Appointments in general practice December 2019. 2020. https://digital.nhs.uk/data-and-information/publications/statistical/appointments-in-general-practice-december-2019/page1 (accessed 13 Apr 2022).

24. Miller WR, Rolnick S. Motivational interviewing: preparing people for change. New York, NY: Guilford Press, 2002.

25. Rolnick S, Miller WR, Butler CC. Motivational interviewing in health care: helping patients change behavior. New York, NY: Guilford Press, 2008.

26. Adair JG. The Hawthorne effect: a reconsideration of the methodological artifact. J Appl Psychol 1994; 69(2): 334–345.

27. Skinner J, Carter L, Haxton C. Case management of patients who frequently present to a Scottish emergency department. Emerg Med J 2009; 26(5): 103–105.

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): 1017–1020.

29. Shah R, Chen C, O’Rourke S, et al. Evaluation of care management for the uninsured. Med Care 2011; 49(2): 166–171.

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. National Institute for Health and Care Excellence. Social care of older people with complex care needs and multiple long-term conditions. 2015. 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 13 Apr 2022).

34. NHS Digital. Quality and Outcomes Framework (QOF). 2022. https://digital.nhs.uk/data-and-information/data-tools-and-services/data-services/general-practice-data-hub/quality-outcomes-framework-qof (accessed 13 Apr 2022).