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Abstract

People with complex and chronic conditions require multidisciplinary care but often experience fragmented care and higher levels of avoidable hospitalisations. In this paper, we evaluate *Right Care, Better Health* (RCBH) – a program that embeds community-health nurse care coordinators within general practices to deliver tailored self-management support, shared care planning, case conferencing, and referral navigation for adults with cardiovascular disease, chronic respiratory disease, or considered frail and/or at high risk of falls. Using linked general practice electronic health records, we implement an event-study difference-in-differences design to investigate how RCBH enrolment impacts patient health service utilization, using not yet enrolled patients as controls. We find that RCBH enrolment leads to a 42% increase in general practitioner (GP) visits, a 78% increase in multidisciplinary chronic disease services, a 15% increase in the number of medicines prescribed, and 69% more referrals in the quarter of RCBH enrolment. With the exception of referrals, service utilisation declines thereafter, reverting toward original levels within one to two years after enrolment. Effects were generally more pronounced for people living in more socioeconomically disadvantaged areas. These results suggest that practice-embedded, nurse-led care coordination can increase access to team-based primary and secondary care in the short term; however, analyses with longer follow-up and appraisal of downstream welfare implications are needed.

Introduction

Equitable and timely access to healthcare is a defining feature of many systems with universal health insurance yet improving outcomes for people with complex and chronic conditions remains a persistent challenge. These challenges span multiple domains including fragmented care pathways and siloed, single-discipline models of care, and funding models designed for episodic, acute presentations rather than the longitudinal, coordinated care required for multimorbidity (Spinks et al., 2024). These factors limit capacity for coordinated disease management and can lead to avoidable or duplicative service use, unplanned and potentially preventable hospitalisations, and poorer health outcomes (Swerissen et al., 2016, Dantas et al., 2016, Ju, 2022).

In response to these challenges, and an increasing share of the population living with chronic conditions or multi-morbidity, several countries have introduced policy measures or targeted regional strategies to improve team-based care, care coordination, and continuity of health service utilisation. These efforts include implementing financial incentives for general practitioners (GPs) to develop multidisciplinary treatment plans for chronic conditions, incentivising collaboration between providers across traditional organisational boundaries (e.g. hospital catchment regions), or co-locating providers (Ju, 2022, Spinks et al., 2024, Dantas et al., 2016, Reiss-Brennan et al., 2016, Wagner et al., 2017).

Previous empirical studies have documented mixed evidence on the effects of care coordination on healthcare utilisation, with effects varying significantly across program types, population groups studied, and by context (Baxter et al., 2018). Existing analyses have relied on bespoke surveys with relatively short, cross-sectional follow-up, or been prone to other selection biases or sample size limitations which limit generalisability or constrain subgroup analyses. Further, these approaches are often slow to yield insights on longer-term changes in service delivery or

outcomes. Indeed, recent work argues that integrated care interventions should be evaluated as a dynamic intervention within a complex health system, tracking healthcare use and patient journeys over time, preferably using experimental or quasi-experimental methods that leverage robust datasets (Ling et al., 2025). Recent advancements in routine data collection may offer a novel approach to address some of these challenges.

To support this research direction, this study uses routinely collected, general practice electronic health records (EHRs) to evaluate the impacts of an integrated care program within the Eastern Melbourne Primary Health Network (PHN). Introduced in 2024, the Right Care Better Health (RCBH) program co-locates community-health-employed nurse care coordinators (NCCs) within general practices with the aim of coordinating care and uplifting patient activation for patients with cardiovascular disease, respiratory disease, considered frail and/or at high risk of falls (Stott et al., 2024). The NCCs aim to provide complete wrap-around services, including tailored health coaching and strategies for self-management; coordinating and expediting referrals; multidisciplinary case conferencing with the patient's GP and external health providers; assisting to understand medical results, procedures, and medications; conducting in-home health checkups; and assisting with general on and off-site service navigation such as booking appointments and making travel arrangements to facilitate attending these appointments.

To evaluate the RCBH program impacts on primary healthcare utilisation, including team-based care and referrals, we use the variation in the time in which patients were enrolled into RCBH through an event-study difference-in-differences framework (De Chaisemartin and d'Haultfoeuille, 2020). Specifically, we compare outcomes among RCBH-enrolled patients before and after enrolment to similar patients that are eligible and enroll, or are likely to be enrolled, in the future. Primary outcomes pertain to the care-coordination objectives of RCBH, including total GP consultations, prescriptions prescribed, multidisciplinary chronic disease

management services, and referrals to secondary and tertiary care. We also explore heterogeneity in the RCBH program effects across key patient characteristics including sex, age, duration of program participation, and residential area-level disadvantage.

We find short-run increases in healthcare utilisation in the quarter of RCBH enrolment; GP consultations rise by 1.38 (95%CI 1.14;1.61), prescriptions by 0.67 (95%CI 0.36;0.99), multidisciplinary chronic disease services by 0.58 (95%CI 0.48; 0.68), and referrals by 1.02 (95%CI 0.84;1.20) relative to five quarters pre-enrolment. These effects attenuate within one to three quarters for GP visits, prescriptions, and multidisciplinary items, while referrals remain above baseline for up to four quarters [e.g., 0.45 (95%CI 0.11;0.78) more per person at four quarters after enrolment]. Heterogeneity analyses show similar effects by sex but more pronounced primary healthcare utilisation after enrolment for patients living in areas with higher socioeconomic disadvantage and those who were enrolled in the program for longer, potentially suggesting that individuals with more NCC contacts received additional practice-level support after enrolment.

These results echo findings in previous studies which indicate that care coordination can increase short-term (<6 months) engagement with primary healthcare services (Bakshi et al., 2022, Capp et al., 2017), albeit extends this literature by demonstrating the substantial heterogeneity in effects across patient groups. We also show that these effects can persist even for up to one year after being enrolled into care coordination, particularly for patients living in more socioeconomically disadvantaged regions.

Given the extensive policy focus on uplifting primary and preventative healthcare utilisation in socioeconomically disadvantaged population as a means to reduce health inequalities, not only in Australia but in many other countries (Windle et al., 2023, Saxby and Zhang, 2025, Saxby et al., 2023, Aitken et al., 2025, Sommers et al., 2016), these findings suggest that targeted, place-based commissioning of coordination programs may be an effective strategy.

However, further research is needed to assess the welfare implications of the program, including its effects on acute care utilisation such as emergency department visits, potentially preventable hospitalisations, quality of life measures, and mortality. Future work should also investigate the total costs associated with the program, as well as the long-term program effectiveness. Embedding wellbeing and quality of life measures routinely into EHRs would support this goal.

More broadly, these results highlight the utility of using routinely collected practice level data to evaluate policies and programs in near real-time. Supporting practices, community health providers, hospitals, and PHNs to maintain and harmonize data infrastructure, including investing into secondary data linkage such as hospital data, will enable robust evaluation of similar programs into the future.

The remainder of the paper is structured as follows. Section 2 reviews related evaluations of integrated-care programs in Australia and internationally. Section 3 describes the Institutional setting and the RCBH program. Section 4 describes the POLAR data. Section 5 and 6 outline the hypothesised effects of the program and the empirical approach. Section 7 presents the results and Section 8 discusses their implications.

Related Literature

In Australia, integrated-care programs are most often evaluated with descriptive and formative methods centred on implementation and stakeholder experience, rather than on causal or quasi-experimental designs (Trankle et al., 2019, Dalton et al., 2019, Tennant et al., 2020). A recent comparator program to RCBH is the Western Sydney Integrated Care Program (WSICP), which implemented shared-care arrangements, care facilitators, and rapid-access clinics for patients with diabetes, chronic obstructive pulmonary disease (COPD), and heart failure. A qualitative evaluation of the Integrated Care Program, comprising interviews with 12 patients,

11 carers and 50 healthcare providers (e.g., GPs, care facilitators, hospital specialists, and allied-health practitioners), reported improved service linkage and overall patient experience, alongside information-sharing barriers due to no access to shared patient records across healthcare providers (Trankle et al., 2019). Another evaluation of a similar, albeit 'virtual' integrated care program in Western Sydney found that providers reported improved coordination of services and reduced ED utilisation in the 12 months after enrolment compared with the 12 months prior (McNab and Gillespie, 2015). Most clinicians also agreed that the virtual NCCs enhanced communication and information sharing between patients and providers (McNab and Gillespie, 2015).

Quantitative Australian evidence exists but remains limited and mixed. First, the OPEN ARCH trial in Far North Queensland (a stepped-wedge cluster randomized trial comprising 14 GP clusters and 80 older adults with complex health needs) found no statistically significant change in ED presentations or hospital admissions (Mann et al., 2021). It did find that acute healthcare utilisation displayed a downward trend over time, noting that limited power due to a small sample size made it difficult to detect statistically significant treatment effects. Second, the Gold Coast Integrated Care program, likewise targeting patients with complex and chronic conditions, was evaluated using a mixed cost-consequences and difference-in-differences framework with a non-randomised design and a matched control group (Ward et al., 2021). It found higher hospital service use and higher total costs for the treatment group (n=1,549) relative to the control group (n=3,042); approximately $6400 AUD higher hospital costs and $8700 AUD program costs per person per year, with no statistically significant quality-of-life gains over the study period. An earlier Victorian study of integrated-care facilitation for older patients reported post-enrolment reductions of 20.8% in ED presentations, 27.9% in hospital admissions, and 19.2% in bed-days in the treatment group (n=231) and compared these changes to a control group of patients who were eligible but declined participation (n=85) (Bird et al.,

2007). However, as no confidence intervals were provided in these analyses, it is unclear whether these differences were statistically significant.

Internationally, evaluations of integrated care program have also displayed mixed results, although empirical evaluation methodologies tend to be advanced relative to Australia. A comprehensive systematic review conducted by Baxter et al. (2018) reviewed 167 documents across 153 unique studies on integrated care programs published between 2006 and March 2017, including 54 evaluations from the United Kingdom (UK), 43 systematic reviews, 49 international (non-UK) evaluations deemed high quality due to possessing comparator-group designs, and 21 international low-quality studies without comparator group designs. Of the 49 international comparator studies, 19 used random treatment assignment (only nine concealed assignment) and the remaining 30 were non-randomised, quasi-experimental designs. Of the 54 UK studies, 16 reported comparator designs and only two possessed random treatment assignment. Limitations across both UK and international studies included inability to blind participants to treatment assignment and small sample sizes limiting statistical power. A third of the international studies also presented poor (potentially selective) reporting. Overall, none of the UK or international studies met the systematic reviews' criteria for reduction of potential bias. Evidence for changes to acute healthcare utilisation and cost reduction was likewise inconsistent. The stronger and more consistent signals were higher patient satisfaction, better perceived quality of care, and improved access to services.

A recent study not covered by the review (Ress and Wild, 2024), evaluated an integrated-care initiative in a socioeconomically disadvantaged urban district in Germany. Using propensity-score matching and an event-study difference-in-differences design, they found increases in emergency and inpatient admissions, non-hospital outpatient visits, and total costs, with no reduction in ambulatory-care-sensitive admissions. Some outcomes showed pre-trend sensitivity; the authors interpret higher utilisation as improved access or previously unmet

need. Another recent study, (Goldzahl et al., 2022) examined multidisciplinary group (MDG) meetings for high-risk older adults (65 years old and over) in socioeconomically disadvantaged UK areas using propensity-score matching and triple-difference estimates with GP Patient Survey and Hospital Episode Statistics data. MDGs reduced the probability of a primary-care nurse visit by about three percentage points and shortened length of stay after emergency admission by one day. Planned care use increased however, leaving overall costs unchanged and health status unaffected.

Altogether, there is mixed evidence on the effects of care coordination on healthcare utilisation and the relative effects on acute vs primary healthcare utilisation vary significantly across program types, population groups studied, and by context.

Institutional setting and program overview

In 2022, around half of Australians had at least one chronic condition and 22% had two or more conditions (ABS, 2021). Alongside an ageing population, this figure has been steadily increasing (up from 42% in 2007–08 and 47% in 2017–18) (ABS, 2021). Cardiovascular disease, chronic respiratory conditions, and frailty are among the most prevalent chronic conditions in Australia, and they are major drivers of potentially preventable hospitalisations and ED presentations (Caughey et al., 2017, Dang et al., 2024, Wilson et al., 2007).

All Australian citizens and permanent residents are eligible for free or subsidised healthcare under Australia's universal health insurance scheme, Medicare, which provides comprehensive coverage for inpatient and outpatient care and prescription medications. However, Medicare's fee-for-service structure does not, on its own, address local variation in need or the coordination required for people with chronic and complex conditions. To bridge this gap, the federal government also funds Primary Health Networks (PHNs) to plan and commission services at a regional level (Australian Government, 2021). These regions signify regional healthcare

markets centred around hospital networks and are analogous to hospital referral regions used in other countries (Finkelstein et al., 2016, Godøy and Huitfeldt, 2020). There are 31 PHNs across Australia, with population sizes ranging from 62,000 to 1,900,000 (AIHW, 2022, Douglas et al., 2023). Most patients receive the majority of their care within the PHN region in which they reside, with approximately four-fifths of total healthcare expenditures falling within a patient's PHN (Saxby et al., 2025).

Each PHN commissions programs in priority areas such as chronic disease management, mental health, Aboriginal and Torres Strait Islander health, and health workforce development. By tailoring interventions to local contexts, PHNs act as an interface between national policy objectives and regional service delivery. Their commissioning role involves identifying local health needs, funding preventive health programs, and supporting integration across general practice, hospitals, and community services.

In this study, we focus on the Eastern Melbourne PHN which covers around 1.62 million people (about 24% of the Victorian population) across 12 government areas; the catchment is socio-economically mixed, with pockets of higher disadvantage in the outer north and east (e.g., Mitchell, Murrindindi, Whittlesea, Yarra Ranges), and about one-third of residents are overseas-born (Eastern Melbourne PHN, 2025).

Within this context, the RCBH program has been operating since 2021 and has undergone several iterations by Eastern Melbourne PHN in response to previous qualitative findings and continuous improvement opportunities. This paper focuses on evaluating the current model, which commenced in April 2024, and is currently actively recruiting patients with cardiovascular disease, chronic respiratory disease, and considered frail and/or at high risk of falls.

Eastern Melbourne PHN commissions the RCBH program through two provider organisations, each of which employs NCCs to deliver the program across participating general practices. The program objectives of RCBH are as follows:

1. Reduce unplanned hospital admissions and avoidable emergency department presentations;
2. Improve patients' quality of life;
3. Increase practice nurse confidence in care coordination;
4. Promote a positive experience of care for patients and clinicians;
5. Improve patients' ability, understanding, and involvement in managing their condition; and
6. Embed team-based, nurse-supported care coordination as an integrated and sustainable feature of general practice.

To achieve these objectives, RCBH currently employs a model of care where community health NCCs are integrated into participating general practices, working on-site at least one day per week to support referred patients. Each participating practice has established systems for service integration, including processes for patient identification, referral, assessment, service delivery, and care transitions.

Consistent with the embedded-in-practice design, NCCs are on-site at the practice at least one day a week. The NCCs collaborate with patients to develop personalised care plans and facilitate referrals to relevant services. The NCCs provide health education and support to enhance patients' self-management skills, knowledge, and engagement in their care, including care navigation. Care navigation tasks include services such as booking health appointments with GPs or specialists, planning the transportation journey of patients, applications for services and packages, and assessments and referrals to external services. The NCCs work

closely with the general practice team, transferring care responsibilities back to practice staff once the patient has been discharged from RCBH.

In order for practices to deliver the program they must have accreditation against the Royal Australian College of General Practitioner Standards, a minimum of 0.6 full-time-equivalent registered nurse on staff, provision of clinical space and clinical-system access for the co-located NCC (typically up to one day per week), and appropriate medical insurances and privacy arrangements. NCCs are also responsible for identifying patients eligible within their practices using the POLAR data platform. The vast majority of RCBH referrals come from GPs, suggesting that a program feature is that NCCs are not actively reviewing and reaching out to patients who could potentially benefit from the program.

Eligible patients are adults (aged 18 years and over) who have cardiovascular disease, a chronic respiratory condition, or who are considered frail and/or at high risk of falls. There is no set time for RCBH program duration and the service is provided to patients at no additional cost (i.e., zero out-of-pocket). Upon registration, patients are contacted by the NCC to provide consent for enrolment, complete intake assessments, and develop a tailored care plan. They then meet with the NCC at an agreed frequency and through preferred modes (in-person, home visits, or remote), and graduate from the program once their care goals are achieved. Surveys of patients who have participated in RCBH have reported positive experiences and improved understanding around strategies to manage their condition (Fisher et al., 2025).

While data limitations dictate that we cannot observe the impact of the RCBH on all of the program objectives, here we aim to 1) describe the characteristics of the sample who have been enrolled and yet to be enrolled into RCBH and 2) investigate the program's impact on primary healthcare use and referrals.

Data

The data used in this paper come from the Population Level Analysis & Reporting (POLAR) platform, developed and deployed by Outcome Health. POLAR is an electronic medical record extraction and reporting system used by general practices in the Eastern Melbourn PHN.[1] POLAR captures the patient's complete health-record and journey from the point of general practice care with comprehensive coverage across the Eastern Melbourne PHN catchment (estimated <1% opt out) (Pearce et al., 2019b, Pearce et al., 2019a). POLAR performs automated, incremental extracts of patient data from practice clinical information systems in real-time (approximately every five minutes) across all practices in the Eastern Melbourne PHN catchment and provides longitudinal, structured information such as patient demographics, diagnoses, practice services provided, prescription medications prescribed, and referrals to secondary and tertiary care.[2]

The extract used in the present study spans from January 2022 to September 2025 (the most recently available and complete extract at the time of writing). This includes patient demographics, all services rendered by a general practitioner or practice nurse in an in-person or telehealth consultation, referrals to secondary and tertiary care, standardised diagnosis lists of chronic and complex conditions, and prescribed medicines. Practices participating in RCBH retrospectively flag enrolled and eligible patients within POLAR, enabling longitudinal

[1] Eastern Melbourne PHN is the custodian of the de-identified general practice data collected from participating practices.

[2] Unfortunately, a large number of referrals noted within POLAR are unmapped or not classified (38%). Referrals mapped are extremely varied; Throughout the observation period. the top 10 referrals for RCBH enrolees are podiatry (8%), dermatology (6%), cardiology (4%), physiotherapy (4%), ophthalmology (4%), neurosurgery (4%), administration (4%), urology (3%), psychology (2%), and endocrinology (2%). The corresponding top 10 referrals for RCBH control patients who were eligible but yet to be enrolled are podiatry (4%), cardiology (4%), gastroenterology (4%), physiotherapy (3%), ophthalmology (3%), hospital/emergency (3%), dermatology (3%), administration (3%), psychiatry (2%), and urology (2%).

tracking before and after enrolment. For patients who have graduated from the program within the observation period, the date of graduation is also provided.

For this analysis, we focus on several primary outcome variables pertaining to patient healthcare utilisation and care coordination, namely GP visits, multidisciplinary chronic disease services, prescription medicines prescribed, and referrals to secondary and tertiary care. We consider multidisciplinary chronic disease services as a pooled index of GP health management plans, including health assessments, case conferencing arrangements, practice nurse services to chronic disease patients, and team care arrangements. The item codes are outlined in the Supplementary Material SM1**.** For each individual, all outcomes are aggregated at the quarterly level.

We retain all individuals that were 53 years and above at the time of data entry and flagged as either RCBH enrolled or eligible in POLAR.[3] This includes all people who fit the eligibility criteria of having cardiovascular disease, respiratory disease, or are considered frail and/or at high risk of falls (defined as 'musculoskeletal problems' within POLAR and, for brevity, referred to as 'frailty' hereafter).

The descriptive statistics of the summary sample are presented in Table 1. The data contains 954 patients who were enrolled into RCBH during the study period and 17,534 patients who were flagged as RCBH eligible, but were not yet enrolled.

Descriptive statistics somewhat suggest that enrolled patients may have been prioritised because of need or healthcare engagement. RCBH participants were older than not yet enrolled, or 'RCBH eligible' patients (80 vs 71 years), were more likely to be female (0.58 vs 0.54), and

[3] We restricted the analysis to individuals aged ≥53 years, based on a three-standard deviation criterion applied to the highly skewed age distribution of RCBH enrollees (11 RCBH enrollees dropped). Because almost all enrollees were older adults, excluding younger individuals reduced outliers and ensured comparability with the program's service population. RCBH eligible also includes all people who will enrol into RCBH during our study period.

live in areas with higher socioeconomic disadvantage (0.57 vs 0.49). Cardiovascular disease and frailty were more common in enrolled relative to eligible patients (0.84 vs 0.77 and 0.52 vs 0.38, respectively). Among enrolled patients who graduated during our observation window (n=612), the average duration of 'treatment' was 119 days (~4 months).

A slightly larger share of the RCBH enrolled patients died during the study period relative to flagged patients (4% vs 2%) and healthcare utilisation was also higher for GP visits, prescription medicines, chronic disease services and referrals. This indicates that on average patients enrolled into RCBH may have been sicker and, potentially as a result, more engaged with healthcare than eligible patients. This selection into treatment, and particularly, differences in outcome 'levels' across eligible and enrolled patients, suggests that there is a need to control for unobserved individual-level confounders. However, conditional on controlling for these unobserved time-invariant factors, the main identification assumption will be that differences in outcomes evolve in parallel over time. This will be discussed in the empirical strategy section.

Hypothesis

There are likely to be multifaceted and dynamic healthcare utilisation responses associated with RCBH enrolment. First, we anticipate that although many patients will be flagged as eligible to participate in RCBH – i.e., meet the eligibility criteria – patients who engage regularly with the practice will be more likely to be enrolled relative to someone who is eligible but visits the practice at a later date. From an implementation perspective, we also anticipate that each RCBH enrollee should use more practice services at the time of their enrolment. Consistent with previous research, we anticipate that RCBH would increase GP consultations, referrals and multidisciplinary services in the short-term as the program and coordination activities commence. Moreover, we may observe a larger increase in utilisation for patients who were

enrolled into the program for a longer period. In the medium to-long term, we anticipate that GP consultations and referrals would decline and then stabilise as self-management improves, specialist/allied-health pathways are established, and contacts consolidate into planned reviews.

Empirical strategy

To empirically estimate the effects of RCBH on healthcare utilisation outcomes, we exploit the variation in the time in which individuals first enroll into RCBH. The key identification assumption for this approach is the parallel trends assumption: that outcomes for individuals enrolling into RCBH earlier would have, in the absence of RCBH, evolved in parallel to those who enroll later. While this counterfactual cannot be directly observed after enrolment, using an event study approach, we do test whether the outcomes between these groups moved in parallel prior to enrolment.

To estimate the healthcare effects of RCBH, we conduct a dynamic difference-in-difference event study of the following form:

$$Y_{it} = \alpha + \sum_{k=-8, k\neq -5}^{N} \beta_l D_{k,it} + \mu_i + \tau_y + X_{it} + \in_{it} \quad (1)$$

where Y denotes the outcome of interest for individual i in quarter t, D_k are event time indicators (leads and lags) for time relative to RCBH enrolment ($k = t - R_i$, where R is the RCBH enrolment period for individual i)[4], μ_i are individual fixed effects (which accounts for all observed and unobserved time-invariant confounders), τ_y are quarter-year fixed effects, α is the grand intercept, and $\in_{it}$ is the error term. All event-time coefficients (β_l) are referenced to five quarters before RCBH enrolment (i.e., event time$= -5$). This reference period was

[4] People who are registered but not yet treated also serve as controls.

specifically chosen to avoid potential confounding with any upticks in healthcare use that may have preceded RCBH enrolment, ensuring that we do not use anyone in the immediate periods before RCBH enrolment as controls. All individuals are censored at death and standard errors are clustered at the individual level, the level at which the treatment occurs.

We report point estimates and 95% confidence intervals from these models. We additionally estimate the robustness of the results to specifying a log model (*ln(outcome+0.1)*) and using Coarsened Exact Matching (CEM), proposed by Iacus et al. (2012), to make RCBH enrollees more similar to not yet enrolled RCBH patients based on patient age (bins in groups of 5), sex, postcode, and type health conditions (cardiovascular disease, respiratory disease, or frailty). Descriptive statistics of the matched sample are provided in Supplementary Material SM2.

Following the main analyses, we conduct several heterogeneity analyses. First, we stratify the results by sex as females live longer than males and report multimorbidity at a higher rate among females relative to males and females may be more likely to engage in health seeking behavior (MacRae et al., 2023). We additionally stratify by age (above or below RCBH participant median age, 81 years) as it may be that older populations are more responsive to the program and, given higher comorbidity, may have higher need for multidisciplinary care.

We stratify by program duration (above or below sample median). We anticipate that individuals with longer duration of contact with the program might require more services and care coordination and thus experience higher utilisation levels.

Finally, we explore how effects vary by patient area-level socioeconomic disadvantage (above or below sample median Index of Relative Socio-economic Disadvantage (IRSD) score based on patient's postcode (Australian Bureau of Statistics, 2021)). In particular, there is a strong socioeconomic gradient in health literacy, preventative healthcare seeking, and poorer health outcomes for patients with lower income and education levels (Willems and Bracke, 2018).

Lower income patients are more likely to delay or forego care due to costs (Callander et al., 2017). It is therefore possible that this free care coordination program and empowering patients to be more engaged with their care would be particularly beneficial for enhancing healthcare engagement for those from lower socioeconomic backgrounds.

All analyses were conducted in Stata version 17.

Results

Main results

The main estimation results are presented in Figure 1 (full regression results are available in Supplementary Material SM3). These figures show the changes in GP visits, prescriptions prescribed, multidisciplinary chronic disease services, and referrals per person-quarter relative to five quarters before being enrolled into RCBH (i.e., the baseline / reference period).

For all outcomes, there is evidence of increasing healthcare utilisation in the year prior to RCBH enrolment, aligning with increased healthcare engagement prompting enrolment. For all outcomes, utilisation levels peak in the quarter of RCBH enrolment and reduce thereafter. In the quarter of enrolment, RCBH patients use 1.38 (95%CI 1.14;1.61) more GP services, are prescribed 0.67 (95%CI 0.36;0.99) more prescription medicines, receive 0.58 (95%CI 0.48; 0.68) more multidisciplinary chronic disease services; and are referred to 1.02 (95%CI 0.84;1.20) more services. This corresponds to an approximate 42% increase in GP visits, a 15% increase in prescription medicines prescribed, a 78% increase in multidisciplinary chronic disease services, and 69% more referrals, relative to the baseline.[5]

Utilisation of this care remains significantly higher relative to the baseline for up to two quarters for GP visits and prescribed medicines and for one additional quarter for

[5] The mean outcomes for RCBH enrolees at the reference period (i.e., event time=-5) are 3.27 for GP visits, 4.51 for prescription medicines, 0.75 for multidisciplinary chronic disease services, and 1.47 for referrals.

multidisciplinary chronic disease services. In contrast, the number of referrals was elevated relative to baseline for up to four quarters after enrolment (+0.45 (95%CI 0.11;0.78) more referrals).

Results were largely unchanged when estimating a log transformation for outcomes (Supplementary Material SM4). Similarly, when matching RCBH eligible patients to be more similar in observable characteristics to RCBH enrolled patients, results were largely unchanged, with the estimated confidence intervals overlapping for all outcomes relative to the baseline model (+1.39 (95%CI 1.15;1.64) for GP visits, +0.71 (95%CI 0.38;1.04) for prescription medicines, +0.57 (95%CI 0.42;0.67) for multidisciplinary chronic disease services, and +0.98 (95% CI 0.79;1.12) for referrals in the enrolment quarter) (Supplementary Material SM5, SM6).

Heterogeneity

The outcomes stratified by age, sex, length of RCBH program duration, and patients' area-level socioeconomic disadvantage are presented in Figure 2. These results suggest that spikes in healthcare utilisation in the quarter of enrolment were generally more pronounced for patients living in areas with higher socioeconomic disadvantage, particularly for multidisciplinary chronic disease services and referrals. Individuals who participated in the program for longer appear to have slightly larger effects for practice services (multidisciplinary care services), whereas the opposite was true for referrals. This potentially suggests that those who participated in the program for longer were engaged in more practice-level, rather than secondary, care. However, effects are uncertain.

Individuals who were 81 years and above were prescribed a larger number of prescription medicines than those under 81 years and were referred to fewer services than the younger

group. There was also suggestive evidence that effects on multidisciplinary services were more pronounced for females relative to males.

Discussion

In this paper, we estimated how healthcare utilisation changed for patients with complex health conditions enrolled into a care coordination program. We find that enrolment has dynamic and heterogenous impacts on utilisation. RCBH enrolment increases healthcare utilisation, particularly in the quarter of enrolment and then reverts to baseline levels after 1-2 years. We also document substantive heterogeneous effects by patient characteristics, in particular finding that patients living in more socioeconomically disadvantaged areas receive more referrals and multidisciplinary healthcare services after enrolment.

These results are consistent with other empirical studies which reported an increase in primary healthcare utilisation following the introduction of integrated care initiatives (Goldzahl et al., 2022, Ress and Wild, 2024), albeit extend this literature by showing there is significant heterogeneity in the effects over time and across different patient groups.

These results should be considered within the context of several limitations. First, while the practice level data provides comprehensive information on all services provided at the practice level and reasons for provider interactions, we cannot observe whether patients receive recommended care. Thus, while prescriptions are prescribed, we cannot observe whether patients fill these scripts nor whether patients subsequently attend their secondary care referrals. We also note that differences in the selection into the timing RCBH enrolment may bias our results, particularly if there were capacity constraints and 'sicker' individuals were enrolled earlier. However, when we conducted matching based on recorded conditions, age, sex, and other observable factors, results were largely unchanged. Finally, as the RCBH program commenced in April 2024, and our data spans until September 2025, we could only

follow patients post-enrolment for a maximum of six complete quarters. Thus, we cannot observe whether there were longer term changes in healthcare utilisation. However, with the exception of referrals, which still seemed to be somewhat elevated even one year after RCBH enrolment, levels of healthcare utilisation were approaching baseline after approximately one year post-enrolment. This indicates that further changes would be unlikely in the absence of continued nurse interactions. This hypothesis is supported by stronger effects on practice-level care for patients who participated in the program for longer. Finally, this data does not contain information on costs incurred by providers nor patients. More research is therefore needed to understand the welfare effects of the program, including the overall cost-effectiveness and the spillovers on high-cost service utilisation, like hospitals and emergency department visits.

Despite these limitations, this study has several strengths and provides a unique contribution to the literature. To our knowledge, this is the first Australian evaluation of an integrated-care program to use practice-level data collected in real-time to measure the effects of care-coordination processes and healthcare utilisation among patients with complex and chronic conditions. This study is also among the first internationally to evaluate the impacts of a co-located NCC model for adults with cardiovascular disease, respiratory disease, or frailty (Baxter et al., 2018). The rich information on patient health conditions and demographic characteristics also enabled us to conduct robust subgroup analyses and understand for which patients these care-coordination programs are likely to deliver the most benefit. Indeed, we find that this program's impact on healthcare utilisation was particularly pronounced for individuals in more socioeconomically disadvantaged regions.

These results have important policy implications. First, should we assume that the RCBH initiative identified unmet medical, psychosocial, or social needs, the observed increases in utilisation may be considered a positive outcome from this program. This explanation is quite plausible and was also confirmed in qualitative interviews with RCBH patients, who reported

satisfaction with the care they received and improved understanding of managing their condition (Fisher et al., 2025).

Second, these results suggest that sustained engagement in the program may be important to support continued contact with practices and longer-term engagement with healthcare services. Indeed, as we noted the median program duration was four months, potentially this is too short a time to lead to long-term sustainable changes in primary care utilisation. However, as referrals do appear to remain somewhat elevated even up to two years after enrolment, this suggests that even short-term coordination programs may help individuals engage in secondary care in the longer term. Future research should examine longer observation periods to test this hypothesis.

Given the strong socioeconomic gradient in health (Rodda et al., 2025) and extensive policy focus on uplifting preventative healthcare utilisation in these populations (Saxby, 2022, Rosenberg and Hickie, 2025, Saxby and Zhang, 2024), future refinements to the program could consider prioritised targeting based on patients' socioeconomic background and collecting longitudinal quality of life or other clinical measures for both treated and eligible cohorts. Future work should consider downstream effects, such as hospitalisations and mortality, and consider the broader welfare implications through detailed assessment of costs and quality of life impacts.

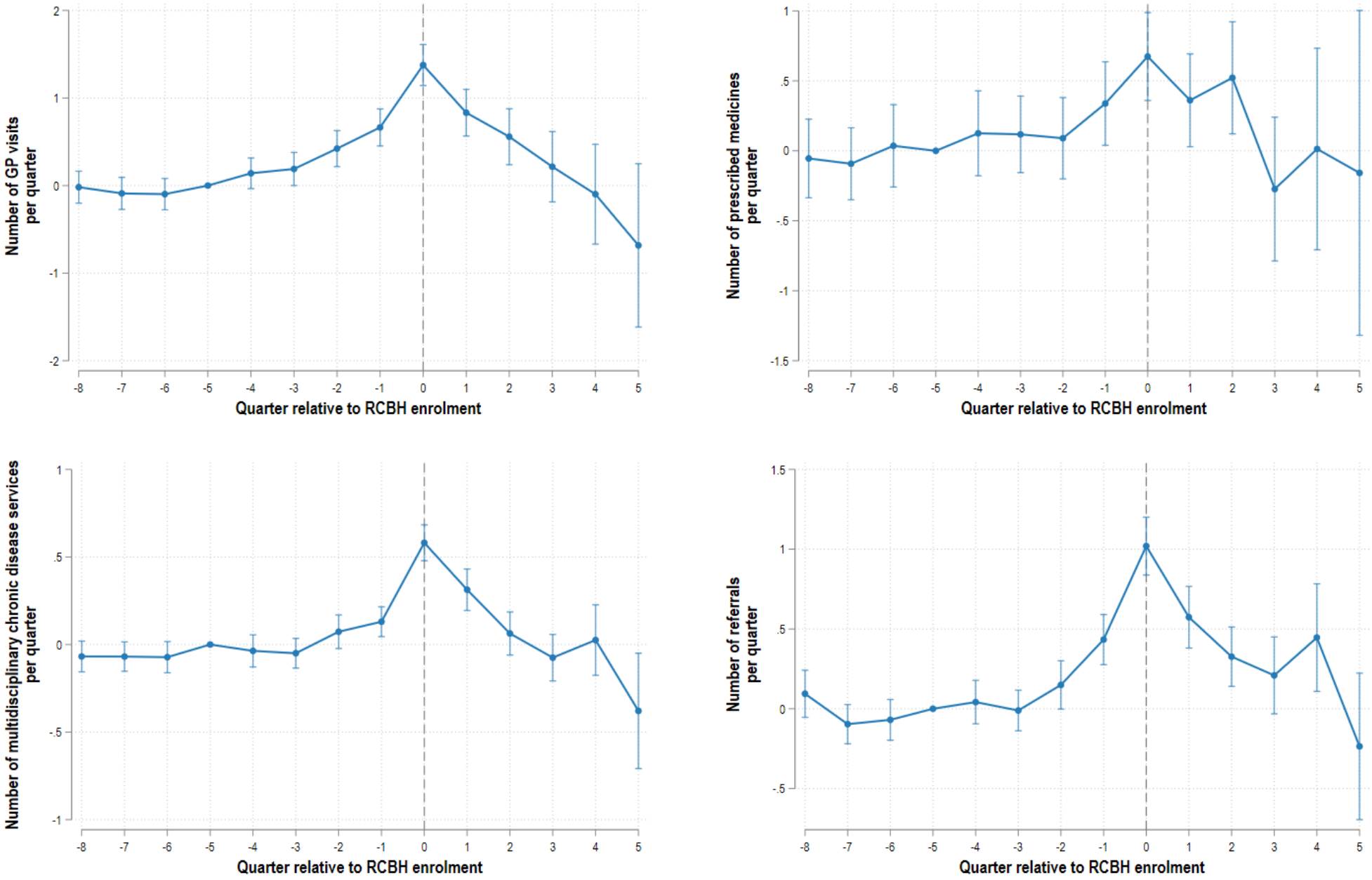
Tables and figures

Table 1 – Descriptive statistics

	RCBH Enrolled (n = 954) Mean/Prop.	Not yet enrolled (n=17,534) Mean/Prop.
Age[A]	80.21	70.74
Age group[A]		
Greater than 81 years	0.51	0.21
Female[B]	0.58	0.54
Above median level socioeconomic disadvantage[A]	0.57	0.49
Health conditions[A,C]		
Cardiovascular disease	0.84	0.77
Chronic respiratory disease	0.27	0.24
Frailty	0.52	0.38
Died during study period	0.04	0.02
Duration in RCBH program (days)[D]	118.9	-
Outcomes (per person-quarter before enrolment) [D]		
GP visits	3.27	2.35
Prescription medicines	4.46	2.99
Chronic disease services	0.54	0.27
Referrals	1.49	1.19

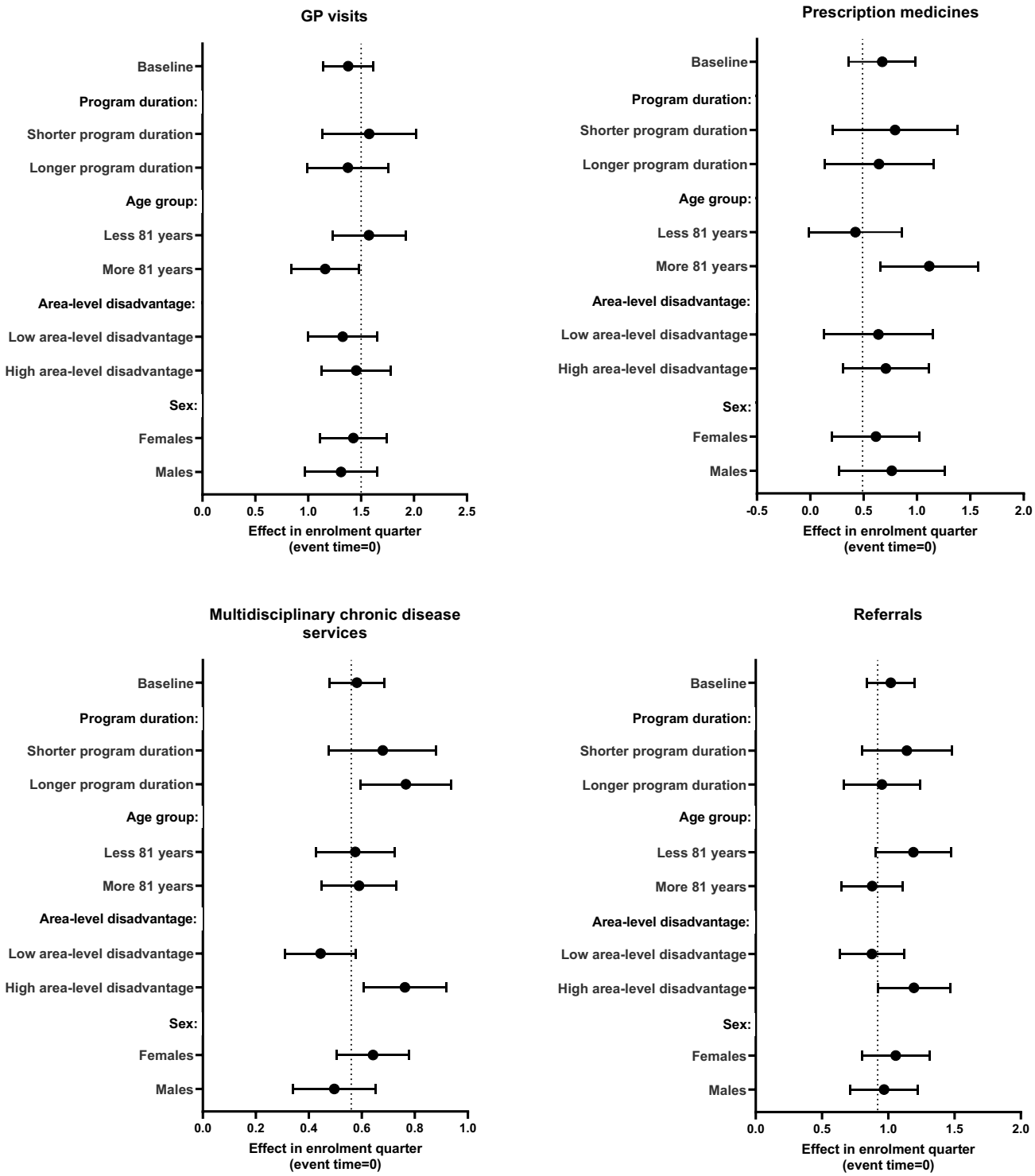
Notes: A) characteristics based on the date of latest data extract (September 2025). B) Refers to sex at birth, individuals with innate variations of sex characteristics are censored due to low numbers. C) Individuals may have multiple conditions; these are based on the entire extract period. D) Duration for graduated patients only (n=612); median duration of participation was 118 days. E) Mean of outcomes for RCBH but not yet treated are from whole sample period.

Figure 1 – GP visits, prescription medicines, chronic disease management, and referrals relative to RCBH enrolment



Notes: All coefficients relative to five quarters before RCBH enrolment (i.e., event time=−5).

Figure 2 – Heterogeneity analyses



Notes: Dashed line presents results from baseline estimation 'full' sample. Point estimate shown is quarter of enrolment (i.e., event time=0), with all coefficients referenced to the baseline (i.e., event time=-5).

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Supplementary material

SM1. MBS item numbers

Outcome	Sub-category	Micro-category	Item numbers
Total GP Visits	Face-to-face	General attendance in consulting rooms	3, 23, 36, 44, 123
		General attendance outside consulting rooms	4, 24, 37, 47, 124,
		General attendance in residential-aged care facilities	90020, 90035, 90043, 90051, 90054
		After hours	5000, 5020, 5040, 5060, 5071, 5003, 5023, 5043, 5063, 5076, 5010, 5028, 5049, 5067, 5077
	Telehealth	General attendance	91790, 91800, 91801, 91802, 91920, 91890, 91891, 91900, 91910, 91920
Multidisciplinary Chronic Disease Management	Face-to-face	GP Chronic Condition Management Plans and reviews	721, 965, 732, 967
		Team Care Arrangements	723
		GP Multidisciplinary Management Plans	729, 731
		GP health assessments	701, 703, 705, 707, 715
		Medication reviews	900
		Multidisciplinary Case Conferencing	735, 739, 743, 747, 750, 758
		Practice nurse services to chronic disease patients	10997
		Mental health plans and reviews	2700,2701,2712,2713,2715,2717
	Telehealth	GP Chronic Condition Management Plans and reviews	92024, 92029, 92028, 92030

Outcome	Sub-category	Micro-category	Item numbers
		Team Care Arrangements	92025
		GP Multidisciplinary Management Plans and review	92026, 92027
		Practice nurse services to chronic disease patients	93201, 93203

Notes: Items 965 and 967 only activate post 1st July 2025 and replace the previous chronic disease items. Items 91900 and 91910 are longer subsidised telehealth consultations active from October 2023 for patients who register in MyMedicare.

SM2. Descriptive characteristics when matching RCBH enrollees and RCBH eligible (not yet treated) patients

	RCBH Enrolled (n = 894) Mean/Prop.	Not yet enrolled (n=11,775) Mean/Prop.
Age	80.12	74.49
Age group		
Greater than 81 years	0.5	0.28
Female	0.58	0.55
Above median level socioeconomic disadvantage	0.49	0.47
Health conditions		
Cardiovascular disease	0.88	0.82
Chronic respiratory disease	0.28	0.19
Frailty	0.55	0.37
Died during study period	0.04	0.02
Outcomes (per person-quarter before enrolment)		
GP visits	3.3	2.46
Prescription medicines	4.51	3.14
Chronic disease services	0.54	0.30
Referrals	1.48	1.25

SM3. Full results from event-study difference-in-difference model

GP visits

Event time	Beta	Standard error	Lower limit	Upper limit
-10	0.202	0.105	-0.004	0.407
-9	0.008	0.097	-0.182	0.199
-8	-0.018	0.093	-0.201	0.164
-7	-0.089	0.094	-0.273	0.094
-6	-0.097	0.091	-0.277	0.082
-5	ref	ref	ref	ref
-4	0.140	0.089	-0.035	0.315
-3	0.190	0.096	0.001	0.379
-2	0.422	0.105	0.217	0.628
-1	0.664	0.108	0.453	0.876
0	1.377	0.119	1.143	1.611
1	0.833	0.136	0.566	1.099
2	0.558	0.163	0.239	0.878
3	0.215	0.205	-0.186	0.617
4	-0.098	0.290	-0.667	0.471
5	-0.683	0.476	-1.616	0.251

Notes: All coefficients are calculated relative to the reference mean at five quarters prior to RCBH enrolment (i.e., event time=-5). The lower and upper limits represent the bounds of the 95% confidence interval.

Prescription medicines

Event time	Beta	Standard error	Lower limit	Upper limit
-10	0.101	0.147	-0.188	0.390
-9	-0.002	0.135	-0.266	0.263
-8	-0.055	0.143	-0.336	0.226
-7	-0.092	0.131	-0.350	0.165
-6	0.036	0.150	-0.258	0.330
-5	ref	ref	ref	ref
-4	0.125	0.155	-0.178	0.429
-3	0.118	0.139	-0.156	0.391
-2	0.090	0.148	-0.200	0.380
-1	0.338	0.152	0.040	0.636
0	0.674	0.160	0.360	0.988
1	0.361	0.169	0.030	0.693
2	0.522	0.204	0.122	0.922
3	-0.273	0.262	-0.787	0.240
4	0.013	0.367	-0.707	0.733
5	-0.158	0.592	-1.319	1.003

Notes: All coefficients are calculated relative to the reference mean at five quarters prior to RCBH enrolment (i.e., event time=-5). The lower and upper limits represent the bounds of the 95% confidence interval.

Multidisciplinary chronic disease management services

Event time	Beta	Standard error	Lower limit	Upper limit
-10	0.004	0.045	-0.085	0.093
-9	0.016	0.042	-0.066	0.098
-8	-0.068	0.045	-0.156	0.020
-7	-0.069	0.043	-0.152	0.015
-6	-0.072	0.045	-0.161	0.017
-5	ref	ref	ref	ref
-4	-0.036	0.047	-0.128	0.055
-3	-0.050	0.043	-0.135	0.035
-2	0.073	0.049	-0.023	0.169
-1	0.130	0.044	0.045	0.215
0	0.581	0.052	0.479	0.684
1	0.313	0.060	0.194	0.431
2	0.063	0.063	-0.060	0.186
3	-0.075	0.068	-0.208	0.058
4	0.025	0.103	-0.176	0.227
5	-0.379	0.168	-0.708	-0.049

Notes: All coefficients are calculated relative to the reference mean at five quarters prior to RCBH enrolment (i.e., event time=-5). The lower and upper limits represent the bounds of the 95% confidence interval.

Referrals

Event time	Beta	Standard error	Lower limit	Upper limit
-10	0.144	0.077	-0.007	0.295
-9	0.187	0.074	0.041	0.333
-8	0.094	0.075	-0.054	0.242
-7	-0.096	0.063	-0.219	0.027
-6	-0.069	0.065	-0.197	0.058
-5	ref	ref	ref	ref
-4	0.042	0.069	-0.094	0.178
-3	-0.011	0.065	-0.138	0.116
-2	0.150	0.077	-0.002	0.301
-1	0.434	0.080	0.276	0.591
0	1.020	0.093	0.838	1.201
1	0.574	0.099	0.381	0.767
2	0.327	0.095	0.141	0.513
3	0.209	0.123	-0.032	0.450
4	0.446	0.172	0.109	0.783
5	-0.236	0.234	-0.695	0.223

Notes: All coefficients are calculated relative to the reference mean at five quarters prior to RCBH enrolment (i.e., event time=-5). The lower and upper limits represent the bounds of the 95% confidence interval.

SM4. Full results from event-study difference-in-difference model with log transformation of dependent variable

GP visits

Event time	Beta	Standard error	Lower limit	Upper limit
-10	0.133	0.049	0.037	0.230
-9	0.043	0.047	-0.049	0.136
-8	0.049	0.046	-0.041	0.139
-7	0.020	0.044	-0.066	0.107
-6	-0.043	0.044	-0.129	0.044
-5	ref	ref	ref	ref
-4	0.099	0.043	0.014	0.185
-3	0.141	0.044	0.055	0.228
-2	0.272	0.051	0.173	0.372
-1	0.357	0.052	0.256	0.459
0	0.757	0.052	0.654	0.860
1	0.536	0.065	0.408	0.664
2	0.421	0.079	0.266	0.576
3	0.197	0.098	0.006	0.389
4	0.092	0.130	-0.163	0.347
5	-0.152	0.219	-0.582	0.278

Notes: All coefficients are calculated relative to the reference mean at five quarters prior to RCBH enrolment (i.e., event time=-5). The lower and upper limits represent the bounds of the 95% confidence interval.

Prescription medicines

Event time	Beta	Standard error	Lower limit	Upper limit
-10	0.025	0.060	-0.092	0.143
-9	-0.026	0.056	-0.135	0.083
-8	-0.023	0.057	-0.135	0.089
-7	-0.088	0.055	-0.195	0.020
-6	-0.035	0.062	-0.156	0.086
-5	ref	ref	ref	ref
-4	0.003	0.063	-0.120	0.126
-3	-0.005	0.055	-0.113	0.104
-2	0.108	0.059	-0.008	0.224
-1	0.112	0.055	0.005	0.220
0	0.404	0.058	0.290	0.517
1	0.151	0.067	0.020	0.282
2	0.259	0.084	0.096	0.423
3	-0.084	0.104	-0.288	0.120
4	-0.048	0.136	-0.314	0.217
5	-0.099	0.232	-0.552	0.355

Notes: All coefficients are calculated relative to the reference mean at five quarters prior to RCBH enrolment (i.e., event time=-5). The lower and upper limits represent the bounds of the 95% confidence interval.

Multidisciplinary chronic disease management services

Event time	Beta	Standard error	Lower limit	Upper limit
-10	-0.051	0.058	-0.165	0.062
-9	-0.031	0.054	-0.137	0.075
-8	-0.113	0.058	-0.227	0.001
-7	-0.164	0.055	-0.270	-0.057
-6	-0.122	0.060	-0.239	-0.004
-5	ref	ref	ref	ref
-4	-0.082	0.061	-0.200	0.037
-3	-0.092	0.055	-0.200	0.016
-2	0.050	0.061	-0.069	0.168
-1	0.128	0.056	0.018	0.237
0	0.655	0.062	0.533	0.777
1	0.407	0.073	0.263	0.551
2	0.058	0.079	-0.096	0.213
3	-0.039	0.096	-0.228	0.150
4	0.017	0.134	-0.246	0.281
5	-0.613	0.220	-1.045	-0.181

Notes: All coefficients are calculated relative to the reference mean at five quarters prior to RCBH enrolment (i.e., event time=-5). The lower and upper limits represent the bounds of the 95% confidence interval.

Referrals

Event time	Beta	Standard error	Lower limit	Upper limit
-10	0.100	0.058	-0.014	0.214
-9	0.047	0.057	-0.065	0.158
-8	0.015	0.056	-0.094	0.124
-7	-0.096	0.054	-0.202	0.009
-6	-0.041	0.055	-0.149	0.068
-5	ref	ref	ref	ref
-4	-0.042	0.057	-0.153	0.070
-3	-0.025	0.055	-0.133	0.084
-2	0.076	0.059	-0.039	0.191
-1	0.263	0.057	0.152	0.375
0	0.618	0.060	0.499	0.736
1	0.288	0.071	0.149	0.427
2	0.223	0.077	0.071	0.374
3	0.115	0.099	-0.080	0.309
4	0.308	0.133	0.048	0.568
5	-0.202	0.194	-0.583	0.179

Notes: All coefficients are calculated relative to the reference mean at five quarters prior to RCBH enrolment (i.e., event time=-5). The lower and upper limits represent the bounds of the 95% confidence interval.

SM5. Full results from event-study difference-in-difference model when matching RCBH enrollees and RCBH eligible (not yet treated) patients

GP visits

Event time	Beta	Standard error	Lower limit	Upper limit
-10	0.216	0.109	0.002	0.429
-9	0.011	0.102	-0.188	0.210
-8	0.039	0.097	-0.152	0.229
-7	-0.061	0.098	-0.252	0.130
-6	-0.081	0.095	-0.268	0.105
-5	ref	ref	ref	ref
-4	0.122	0.091	-0.056	0.300
-3	0.193	0.101	-0.004	0.391
-2	0.418	0.109	0.206	0.631
-1	0.650	0.112	0.429	0.870
0	1.391	0.125	1.146	1.635
1	0.857	0.142	0.578	1.136
2	0.604	0.171	0.269	0.940
3	0.259	0.219	-0.170	0.688
4	-0.064	0.313	-0.678	0.549
5	-0.748	0.480	-1.689	0.193

Notes: All coefficients are calculated relative to the reference mean at five quarters prior to RCBH enrolment (i.e., event time=-5). The lower and upper limits represent the bounds of the 95% confidence interval.

Prescription medicines

Event time	Beta	Standard error	Lower limit	Upper limit
-10	0.147	0.155	-0.157	0.450
-9	-0.022	0.141	-0.299	0.255
-8	-0.019	0.149	-0.311	0.273
-7	-0.107	0.137	-0.377	0.162
-6	0.068	0.158	-0.242	0.377
-5	ref	ref	ref	ref
-4	0.130	0.162	-0.187	0.447
-3	0.100	0.146	-0.185	0.386
-2	0.093	0.155	-0.211	0.397
-1	0.328	0.158	0.018	0.638
0	0.708	0.167	0.380	1.036
1	0.363	0.176	0.018	0.708
2	0.626	0.218	0.198	1.053
3	-0.303	0.276	-0.844	0.239
4	0.062	0.394	-0.710	0.835
5	-0.208	0.597	-1.377	0.962

Notes: All coefficients are calculated relative to the reference mean at five quarters prior to RCBH enrolment (i.e., event time=-5). The lower and upper limits represent the bounds of the 95% confidence interval.

Multidisciplinary chronic disease management services

Event time	Beta	Standard error	Lower limit	Upper limit
-10	0.001	0.048	-0.092	0.095
-9	0.008	0.043	-0.077	0.094
-8	-0.061	0.046	-0.152	0.030
-7	-0.087	0.044	-0.174	0.000
-6	-0.073	0.047	-0.165	0.020
-5	ref	ref	ref	ref
-4	-0.047	0.048	-0.142	0.047
-3	-0.051	0.045	-0.139	0.037
-2	0.076	0.051	-0.023	0.175
-1	0.131	0.045	0.043	0.220
0	0.567	0.054	0.462	0.672
1	0.296	0.063	0.173	0.418
2	0.048	0.064	-0.077	0.174
3	-0.066	0.071	-0.206	0.074
4	0.056	0.111	-0.162	0.274
5	-0.377	0.169	-0.708	-0.045

Notes: All coefficients are calculated relative to the reference mean at five quarters prior to RCBH enrolment (i.e., event time=-5). The lower and upper limits represent the bounds of the 95% confidence interval.

Referrals

Event time	Beta	Standard error	Lower limit	Upper limit
-10	0.156	0.081	-0.002	0.315
-9	0.181	0.077	0.029	0.333
-8	0.097	0.078	-0.057	0.250
-7	-0.091	0.065	-0.219	0.037
-6	-0.082	0.068	-0.215	0.051
-5	ref	ref	ref	ref
-4	0.054	0.072	-0.087	0.194
-3	-0.006	0.067	-0.137	0.126
-2	0.102	0.077	-0.048	0.253
-1	0.417	0.082	0.257	0.577
0	0.977	0.096	0.788	1.166
1	0.541	0.102	0.342	0.741
2	0.281	0.098	0.088	0.473
3	0.193	0.124	-0.049	0.436
4	0.370	0.179	0.020	0.720
5	-0.226	0.237	-0.690	0.239

Notes: All coefficients are calculated relative to the reference mean at five quarters prior to RCBH enrolment (i.e., event time=-5). The lower and upper limits represent the bounds of the 95% confidence interval.

SM6. Graphs of event-study difference-in-difference model when matching RCBH enrollees and RCBH eligible (not yet treated) patients