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# The Reshaping Care for Older People programme and changes in unscheduled hospital care: Analysis of routinely collected hospital data

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ABSTRACT

*Objective:* This study examines mean length of stay (LOS) and rates of emergency bed days during the course of the Reshaping Care for Older People (RCOP) programme in Glasgow City.
*Methods:* An ecological small-area study design was used. Standardised monthly rates of bed days and LOS were calculated, between April 2011 and March 2015, for residents of Glasgow City aged 65 years and over. Multilevel negative binomial models for the square root of each outcome nested by datazone were created, adjusting for sex, 5-year age group, area-level deprivation, season, month and month squared. Relative index of inequality (RII) and slope index of inequality (SII) were calculated for each year and the trend was examined.
*Results:* The rate of bed days first rose then fell during the study period, while LOS first fell then rose. Relative risk (RR) of an additional bed day was greater for males (RR = 1.14 (1.12, 1.16)) and increased with increasing age group. There was no gender difference in LOS. Bed days per head of population first increased then fell; for 12-month period RR = 1.01 (0.98, 1.05) and for 12-month period squared, RR = 0.999 (0.999, 0.999). RII and SII for rate of bed days per head of population were significant, though not for LOS. SII for bed days per head of population did not change significantly over time, while RII reduced at the 87% level of confidence.
*Conclusions:* The results suggest a reduction in secondary care use by older people during the RCOP programme, and a possible reduction in socioeconomic inequalities in bed days in the longer term.

## 1. Introduction

The Reshaping Care for Older People (RCOP) programme [1] was developed to address the projected increase in health service and social care use by older people in Scotland. An Older People's Change Fund was made available to all Health and Social Care Partnerships across Scotland in 2011–2015. The purpose of the Change Fund was to enable partnerships to test and evaluate new ways of working, to support a shift in the balance of care for older people, away from institutional services and towards being supported to stay independently for longer in the community, with the longer-term aim of reducing overall demands upon the Scottish health and social care system.

Prior to the RCOP programme, the rate of older people's emergency admission to hospital had risen for several decades [2,3], due to a combination of factors, including an ageing population, changing social factors resulting in elderly people being more likely to live alone with no nearby family, and changes within social and health care systems, including the reduction in availability of residential placements, proportional to the population [3]. It has also been suggested that the clinical threshold for acute admissions has lowered over time, due to technological advances, improving patient safety, so that people who previously would not have been admitted now are [4]. A further reason given for the increase in the rate of emergency admissions among older people is the reduction in mean length of stay [5]; although emergency admissions for older people increased over time prior to the RCOP programme, mean length of stay in hospital reduced in Scotland, and the rest of the UK [5,6]. However, opportunities to further reduce length of stay were highlighted by the King's Fund [7].

Determinants of the number of emergency bed days include rate of admissions [6] but also patient attributes such as age, socio-demographic variables, medical comorbidity and stage of disease at presentation, access to and availability of social and health services, management of hospitals and variation in hospital operating systems and governance, and the pre-admission and post-discharge health care environment [6,8–11]. Determinants can therefore be divided into 3 types:

- Pre-admission factors and those relating to admission; those which are associated with unscheduled, or emergency, admission to hospital. These include factors relating to individuals, their

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sociodemographic and geographic circumstances and their condition(s), factors relating to social and community services supporting the individual, factors relating to primary care providers and referral systems, and factors relating to secondary care systems of assessment and admission.

- Within-hospital variables; those which are associated with the number of bed days from admission to a date where the patient is ready for discharge. These include factors relating to in-hospital operating systems, such as availability of specialist input and allied health professional therapies, management of patient transfers and infection control.
- Post-discharge factors and those relating to discharge; those which are associated with delays in discharge, once the patient has been declared ready for discharge. As with pre-admission, these include factors relating to individuals' living circumstances and their condition, and social, community and housing support. Additionally, post-discharge, having inappropriate or no powers of attorney in place can result in unforeseen and sometimes lengthy delays in discharge from hospital [12].

Several projects and models of care were trialled in Glasgow City under the RCOP Change Fund. Projects were asked to identify one of three key performance indicators to evaluate their impact. These were: emergency admissions to hospital, length of stay and days lost to delayed discharge. The 34 Change Fund projects in April 2011–March 2015 in Glasgow City can therefore be grouped, as above, according to the outcome(s) that were identified as relevant, i.e. which stage of the patient journey they aimed to impact upon. The projects and their corresponding groupings can be found in Appendix A.

A previous study [13] found reductions in emergency admissions for residents of Glasgow City aged 65+ years during the RCOP period. We might therefore anticipate that emergency bed days, associated with emergency admissions [6], will also have reduced. However, rates of emergency admissions and rates of emergency bed days have shown opposing trends in England in recent years [5]. It is therefore not possible to draw conclusions regarding emergency bed days based on admissions alone. The aim of this paper is to describe changes in the numbers of emergency bed days and length of stay for older people living in Glasgow City, and treated in Glasgow City hospitals during the RCOP period, alongside changes in absolute and relative inequalities for these outcomes. Results will be discussed in the context of the RCOP projects, described in Appendix A.

## 2. Methods

### 2.1. Population data

Scotland has a population of approximately 5.3 million. The country is split into datazones, with a population of between 500 and 1000 household residents in each. These are nested within 32 Local Councils, with populations ranging between approximately 20,000 in each of Orkney, Shetland and the Western Isles and 600,000 in Glasgow City. This study used mid-year population estimates for Glasgow City's population aged 65+ years, disseminated by the National Records for Scotland for 2004–2015. Interpolation of the data produced a population dataset stratified by 5-year age-group, gender, datazone and month, for April 2011–March 2015.

### 2.2. Hospital data

Emergency admissions occur where a person attends an accident and emergency department (A&E) or a minor injury unit unplanned and the patient's condition is serious enough to warrant admission to hospital. Emergency admissions in the analyses of this study are defined as continuous spells, where if a patient is moved from one ward or site to another, technically a re-admission, this would be counted as one continuous spell, or stay. 'Bed days' (or length of stay) is the number of days spent in hospital within a continuous spell, from when the person is first admitted until they are discharged. A continuous spell in hospital can range from 0 days to in excess of 365. Annual numbers of emergency bed days for residents of Glasgow City and the rest of Scotland (RoS) between 2004/2005 and 2014/15 were analysed, aggregated by age group (0–4, 5–9, 10–14, 15–19, 20–29, 30–39, 40–49, 50–59, 60–64, 65–69, 70–74, 75–79, 80–84, 85+). Additionally, monthly bed day data were analysed for residents of Glasgow City aged 65 years and over admitted to Glasgow City hospitals as an emergency, between April 2011 and March 2015. These were aggregated by sex, 5-year age group (65–69, 70–74, 75–79, 80–84, 85–89, 90+ years), datazone, month and year. The Scottish Indicator of Multiple Deprivation (SIMD) 2012 quintile [14], assigned by datazone, was included in analyses.

### 2.3. Statistical analyses

As a preliminary analysis, age-standardised annual rates of bed days were calculated between 2004/05 and 2014/15, stratified by residence (Glasgow City and RoS) and by age group (ages 0–64 years and 65+ years). Trends for each were presented and discussed. Data before and after 2011/12 could not be compared directly as stays of over 365 days were excluded prior to 2011/12 and included thereafter. A further complication in Glasgow City was the opening of the Glasgow Royal Infirmary acute assessment unit (GRI AAU) in March 2011 which failed to record admissions until May 2013.

Monthly standardised rates (12-month rolling averages) of bed days per emergency admission and per head of population for Glasgow City hospitals between April 2011 and March 2015 were calculated, for residents of Glasgow City aged 65 years and over, using annual population and corresponding monthly estimates for the latter. These were standardised for age, using 5-year age groups, sex and area-level deprivation (SIMD quintile). Admissions to GRI AAU were omitted from the analysis to avoid potential confounding due to the change in recording.

Bed days were modelled in MLwiN 2.30 [15] using zero-inflated negative binomial methods and restricted iterative generalised least squares (RIGLS) estimation, for outcome square root of bed days, due to the data being highly dispersed [16]. Data were nested by datazone, adjusting for sex, 5-year age group, SIMD quintile, season, month and month squared. The offset term for these models was population and emergency admissions, therefore modelling bed days per head of population and length of stay respectively.

Socioeconomic inequalities in rate of bed days and length of stay were measured using the relative index of inequality (RII) and slope index of inequality (SII). RII is the rate ratio of hypothetically the most deprived compared with hypothetically the most affluent. SII is the absolute measure, equivalent to RII; it is the rate difference between hypothetically the most deprived and hypothetically the most affluent. To measure both for years 2011/12, 2012/13, 2013/14 and 2014/15, SIMD quintiles were ordered from most deprived to least deprived and the proportion of the population for each quintile at each time point was calculated. The cumulative proportion of the population for each quintile was then used to give a fractional rank (newSES), as recommended [17], for each year. The coefficient of this rank was then used to calculate the RII, using the following negative binomial model for the data stratified by year:

$$g(Y) = constant + \beta_1 newSES + \beta_2 age + \beta_3 sex + \beta_4 season + error \quad (1)$$

Eq. (1) was used to determine RII ($\beta_1$)for each year, when the link function g(Y) = log(square root of bed days/denominator). The denominator was population and admissions for outcomes bed days per population and length of stay, respectively. Trend was calculated by modelling data for all years simultaneously and including year and interaction between year and newSES in the equation above, with a significant interaction indicating a significant trend in inequality over