

Elective hospital admissions: secondary data analysis and modelling with an emphasis on policies to moderate growth

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Scientific summary

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Scientific summary

Background

The English NHS faces increasing demands for elective hospital care – between 2001/2 and 2011/12, admissions increased by 35.4% – but such growth is no longer thought to be affordable. If admissions growth is to be moderated to have the least impact on patients, a better understanding of admissions and related policy measures is crucial for policy-making. Our project contributes to this understanding. In addition to examining the influences on elective admissions of ageing and system reform, this work includes a consideration of variation in activity, referrals guidance and patient prioritisation. Some Clinical Commissioning Groups (CCGs) have introduced guidance to moderate referrals but little is known about the effects of such policy. We suggest that this guidance can have adverse effects on equality of access for patients and propose modifications that can minimise this problem.

Recent patient-reported outcome data suggest that not all patients benefit from elective care, and it may now be time to consider new approaches to prioritising patients.

Objectives

Our aim is to obtain a better understanding of the determinants of elective activity and to study policy and guidelines for moderating growth at minimum loss of health gain for patients.

Specific objectives are:

1. to study the roles of system reform and ageing in explaining elective admissions growth, and thus the scope for a policy to reduce growth (see *Chapters 2–4*)
2. to better understand the rates of referrals by gatekeeper general practitioners (GPs), to study the effect of increasing the number of GPs and the size of practices on local referrals and admissions (see *Chapter 5*)
3. to study the relationship between GP first referrals and subsequent elective admissions at practice level, integrating lower-layer super output area-level data and practice-level data in order to clarify the impact of referrals on admission levels, and to estimate the impact of a policy to ameliorate referrals, across heterogeneous practices, on practice elective admission rates (see *Chapter 6*)
4. to use patient-reported outcomes from selected elective procedures to predict those patients whose treatment is unlikely to be cost-effective, and to examine variation in the performance of Clinical Commissioning Groups, hospitals and surgical teams in delivering health gain (see *Chapters 7 and 8*)
5. to study how far a policy to reduce elective admission may shift the burden of care towards emergency care (see *Chapter 9*).

Methods

Chapters 2 and 3

NHS system reform comprises policies and structural change introduced from 2002 to 2009, notably Payment by Results (PbR) and patient choice. As Scotland did not introduce these reforms, it provides a suitable study control group. The standard methodology of difference-in-differences is employed. Dummy variables are constructed for the introduction of system reform and for units of observation. Regression analyses include these dummy variables and their interactions. Coefficient estimates of the interaction terms identify the effect of system reform.

To characterise system reform we generalise the standard difference-in-differences method, which considers the levels of an observed variable, and allow for policy interventions to impact on the estimated trend rate of growth of such variables.

Chapter 4

The impact of ageing on elective admissions is studied using age–period–cohort (APC) methods. We identify the specific effects on elective admissions over time caused by changes to the age distribution of the population, the year of birth distribution and the year of admission.

Chapter 5

We develop a model of referrals by a gatekeeper GP. A fixed-effects panel data model is estimated controlling for area-specific characteristics and primary care variables, including the density of both GPs and practices. We use instrumental variables to address the potential endogeneity of GP location.

Chapter 6

In order to estimate the effect of restricting referrals on treatment, we estimate a model of treatment rates, conditional on referral rates and patient and practice variables, using practice-level data. The dependent variable is the number of elective hospital admissions following first referral, per 1000 patients, from each practice in each year. Given that higher GP referrals may be correlated with unobserved demand factors that increase hospital treatments, even after controlling for the time-constant differences between practice, as well as socioeconomic factors, we estimate the model using two-stage least squares.

Quantile regression is used to ensure that estimates can reliably be used for GP practices with particularly high referral rates, as they are likely to be the focus of a policy to restrict referrals.

Chapter 7

This study uses pre- and post-treatment information from patient-reported outcome measures (PROMs) to compare the success of different selection criteria for deciding which patients are likely to experience cost-effective health gains from four elective procedures: hip replacement, knee replacement, varicose vein surgery and groin hernia surgery. The selection criteria compared are baseline condition-specific score, baseline quality-adjusted life-year (EuroQol-5 Dimensions) and a predictive model using ordinary least squares, to explain the patient gain in terms of pre-operative observed variables.

Chapter 8

We use PROMs data to compare variation across CCGs in the mean health gain achieved for patients undergoing hip replacement, knee replacement, varicose vein surgery and groin hernia surgery. The study exploits mixed-effects multilevel modelling to identify underperforming CCGs, hospitals and specialist teams.

Chapter 9

The introduction of independent sector treatment centres (ISTCs) provides a natural experiment that allows us to see what happens to emergency treatment levels after a shock to the supply of elective care. By extension, this can be used to indicate what may happen as a result of a reduction in elective provision. We estimate a fixed-effects panel data model for emergency admissions at primary care trust (PCT) level for the years 2004–12, regressing emergency admission rates at each PCT in each year on a vector of socioeconomic characteristics, and elective admissions by ISTCs for every 1000 people of the PCT in each period.

Results

Chapter 2

Scotland had less substantial reform, and, when carefully measured on a comparable basis, elective care is found to grow more slowly in Scotland. This suggests that system reforms associated with PbR and patient choice are not significant drivers of elective admissions growth in England. System reform is found to lead

to a once-and-for-all reduction of 7.7% in elective volume, without a continuing effect. Similarly, it led to a once-and-for-all reduction of 5.6% in length of stay (LOS), with no continuing effect.

Chapter 3

The evidence is consistent with PbR having been responsible for reduced dispersion of hospital lengths of stay. The standard deviation (SD) of emergency LOS declined from 1.3 to 0.70, and the SD of elective LOS declined from 0.81 to 0.69. The distribution has also shifted to the left, suggesting a greater decrease in the LOS for those patients who initially had longer LOSs.

Chapter 4

The period effect contributed 61% of the growth in overall levels of elective surgery and is the main driver of growth. Older people require additional treatment, but each birth cohort requires less treatment for a given age. The pattern is mixed for the selected specific procedures, but the period effect is always the main cause of changing levels of surgery. Whether the period effect is positive or negative varies across procedures.

Chapter 5

In the model of gatekeeping, an addition of a 0.2 full-time equivalent GP at a practice may reduce referrals by 16 per annum and ensuing elective admissions by 2–3 per annum. Using panel data from 2004 to 2012, increases in the local supply of GPs are found to modestly reduce referrals and elective admissions in deprived areas, but not emergency admissions in any area. Patient choice reforms are one possible explanation for the weaker gatekeeping role from more GPs in more affluent areas.

Chapter 6

If policy could be designed to reduce GP referrals by 50 per annum per practice, it is estimated that elective admissions would decrease by about 20%. If this policy was designed to impact on only the highest referring decile of practices, referrals would decline by nearly 280,000 and the number of admissions by nearly 17,000. This could realise savings to the NHS of £87M: £31M from referrals and £56M from admissions.

Chapter 7

We generalise previous findings, which use small samples concerning a specific condition, to show that it is not possible to identify, using pre-operative condition-specific scores, a significant proportion of patients whose benefit from treatment is not sufficient to justify the cost. However, more effective selection criteria can be found using multivariate analysis of pre-operative characteristics to forecast patient gain. The proportion of patients that can be identified as not cost-effective varies from procedure to procedure, and is small for hip and knee replacement but more significant for varicose vein and groin hernia procedures.

Chapter 8

Although CCGs differ in the needs-adjusted admission rates, they differ little in treatment thresholds or the mean gain achieved. Using multilevel modelling it is possible to identify about one in 10 hospitals, a handful of surgical teams, but no CCGs, as being below mean health gain.

Chapter 9

The evidence suggests that areas with lower elective admissions, all things being equal, do not have significantly different levels of emergency admissions. The growth of emergency activity was greater in those PCTs in which patients benefited from the additional capacity provided by ISTCs (approximately 60%, compared with 23% in England overall).

Conclusions

It would be a real challenge to health policy if the substantial elective admissions growth since 2002 is driven by either recent system reform or ageing, as neither of these factors can easily be dealt with by health policy managers. Our evidence does not suggest that these are the main drivers of activity growth.

Using the lesser-reformed Scottish system as a control, we find that, far from explaining higher relative growth of elective care in England, system reform may have produced a once-and-for-all downwards shift in hospital activity. The trend towards higher relative admissions growth in England appears to pre-date system reform to the beginning of our study period in 1997. We find evidence that one part of system reform – PbR – may have reduced the variation of lengths of stay across PCTs, the predecessors of CCGs, for a range of elective procedures, with the largest reductions among PCTs that had initially the longest lengths of stay.

We find that trends were not consistent across the country, and we offer a framework whereby CCGs can gauge the extent of the challenge they face.

Our analysis shows that the ageing population accounts for only a small proportion of the growth in elective care, and this is nearly counterbalanced by a cohort effect, whereby successive birth cohorts have lower rates of elective care at a given age. The main driver of elective admissions in our model is the period effect, whereby the rate of elective admissions is growing with each year. The trend captured may reflect a number of phenomena including improved technical capacity, a greater awareness of unmet need among GPs and patients and higher levels of expectation regarding patient health.

Considering GP supply, we find that increasing the number of GPs would reduce elective referrals and admissions in deprived, but not prosperous, areas. However, these savings are unlikely to be cost-effective, with the activity savings less than the cost of new GPs. Increasing the supply of GPs appears to have no effect on emergency admissions.

Our data suggest that single-handed practices refer at higher rates than other practices, but there is little evidence that this leads to higher admissions.

Striking differences in practice referral rates remain even when we control for observed patient morbidities. Some of these differences reflect demographic differences but other findings are less easy to understand or justify. The health status of patients does not explain the variation between practice rates of first referrals and ensuing hospital treatments: practices with high rates of elective treatment do not have higher referral rates. A policy to reduce practice referrals may reduce related hospital treatments by as much as 20% of the absolute reduction in referrals, but our model predicts that this would disproportionately reduce treatments at practices that make few referrals.

Selection criteria can be developed to forecast patient health gain using PROMs and to identify the characteristics of patients who receive procedures that are not cost-effective. Savings to the NHS could be substantial if these treatments were avoided.

Clinical Commissioning Groups do not differ a great deal in terms of the health gain they achieve for patients. There is considerable variation in procedure rates but not in any systematic way.

It is important to take account of the hierarchical structure of health care, and we discover that some providers underperform in the provision of health gain for their patients. The scale of underperformance is sufficiently large to merit further investigation. It is possible to assess the potential benefit from selected improvements but there is no information as regards the cost or effectiveness of bringing about the changes.

Cross-section analysis shows that small areas with low rates of elective care do not have a higher rate of emergency admissions. This conclusion is confirmed by analysis of a supply shock, the temporary introduction of additional elective capacity in selected small areas – both geographical and conditions – at ISTCs.

Patient and public involvement

There was a patient and public involvement representative on our advisory committee, who advised on all aspects of the project. This advisory committee met annually during the project.

During the early stages of this project, we approached several organisations that represent patient interests in the hope of engaging them in the project. This was a time-consuming process and ultimately proved unsuccessful.

In addition, we sent copies of the benchmarking information to NHS England (the CCG Commissioning Development Group) and subsequently mailed all CCG clinical leads with a brief summary and an invitation to comment, but none responded.

Study limits

This research relies on secondary data sources. This allows important issues to be studied using large data sets and robust empirical methods, but it does not easily facilitate the important input of clinical experts or service users. It would be beneficial if other research methods could be used now that we have uncovered important questions in this subject area.

Suggested research priorities

- Understanding whether or not high-volume CCGs are eliminating unmet need.
- Understanding low referral rates at practices with high rates of patient treatment.
- The APC analysis suggests that the period effect is dominant and it would be beneficial to determine why.
- Understanding better the reasons for varying referral rates for practices with different sociodemographic characteristics.
- Theoretical modelling and further empirical research is required to clarify the relationship between emergency and elective treatments, from the viewpoint of patient demand and hospital supply.

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