Effect of patient choice and hospital competition on service configuration and technology adoption within cancer surgery: a national, population-based study

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Summary

Background There is a scarcity of evidence about the role of patient choice and hospital competition policies on surgical cancer services. Previous evidence has shown that patients are prepared to bypass their nearest cancer centre to receive surgery at more distant centres that better meet their needs. In this national, population-based study we investigated the effect of patient mobility and hospital competition on service configuration and technology adoption in the National Health Service (NHS) in England, using prostate cancer surgery as a model.

Methods We mapped all patients in England who underwent radical prostatectomy between Jan 1, 2010, and Dec 31, 2014, according to place of residence and treatment location. For each radical prostatectomy centre we analysed the effect of hospital competition (measured by use of a spatial competition index [SCI], with a score of 0 indicating weakest competition and 1 indicating strongest competition) and the effect of being an established robotic radical prostatectomy centre at the start of 2010 on net gains or losses of patients (difference between number of patients treated in a centre and number expected based on their residence), and the likelihood of closing their radical prostatectomy service.

Findings Between Jan 1, 2010, and Dec 31, 2014, 19 256 patients underwent radical prostatectomy at an NHS provider in England. Of the 65 radical prostatectomy centres open at the start of the study period, 23 (35%) had a statistically significant net gain of patients during 2010–14. Ten (40%) of these 23 were established robotic centres. 37 (57%) of the 65 centres had a significant net loss of patients, of which two (5%) were established robotic centres and ten (27%) closed their radical prostatectomy service during the study period. Radical prostatectomy centres that closed were more likely to be located in areas with stronger competition (highest SCI quartile [0·87–0·92]; p=0·0081) than in areas with weaker competition. No robotic surgery centre closed irrespective of the size of net losses of patients. The number of centres performing robotic surgery increased from 12 (18%) of the 65 centres at the beginning of 2010 to 39 (71%) of 55 centres open at the end of 2014.

Interpretation Competitive factors, in addition to policies advocating centralisation and the requirement to do minimum numbers of surgical procedures, have contributed to large-scale investment in equipment for robotic surgery without evidence of superior outcomes and contributed to the closure of cancer surgery units. If quality performance and outcome indicators are not available to guide patient choice, these policies could threaten health services’ ability to deliver equitable and affordable cancer care.

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Introduction

The centralisation of complex cancer surgery into fewer, high-volume units is occurring across Europe, the USA, and Canada, guided by evidence that centres that carry out a high volume of surgical procedures have better outcomes of care for patients than do centres that carry out a low volume of surgical procedures.1–3 At the same time, patient choice and hospital competition policies have been introduced in several countries4—–7—and are under consideration in others8—with the aim of improving the responsiveness and efficiency of health services delivered. In health-care systems where hospitals compete on quality and not on price, competition is also expected to incentivise improvements in the quality of hospital services to attract patients.9 Choice and competition, as well as centralisation, attempt to achieve improvements in patient outcomes, but they require different health-system configurations and provider incentives to operate effectively. Finding the right balance between choice and competition on the one hand and centralisation on the other is therefore key, but there is little evidence to guide how best to achieve this.10 The UK National Health Service (NHS) is an example of a health system that remains committed to choice and competition as a health-care reform model since the inception of this model in 2006.11 The cost of providing
services is fixed under a national rate tariff scheme and hospitals are expected to compete for patients on the basis of quality. Receiving care incurs no additional user charges at the point of access and patients have the right to choose and travel to any hospital that best meets their needs.

Additionally, national policy in the UK continues to advocate centralisation of specialist cancer services such as prostate and oesophagogastric surgery. Not only does this serve to reduce the number of hospitals that patients with cancer can choose from, but it is also expected that patients will receive care at their nearest (local) centre on the basis of established secondary care referral pathways for specialist cancer surgery.

However, our 2017 analysis found that not all patients are following the expected referral patterns for specialised cancer surgery. One in three men who had a radical prostatectomy for prostate cancer between 2010 and 2014 in the NHS travelled beyond or bypassed their nearest prostate cancer surgery centre, in many cases across regional boundaries. This observation especially applied to younger, fitter, and more affluent men than to older, less fit, and less affluent counterparts. In the absence of indicators that accurately reflect the quality of prostate cancer surgery, men were attracted to centres offering robot-assisted radical prostatectomy or centres that employed surgeons with a national reputation for prostate cancer surgery.

There is little evidence about what effect patient mobility and hospital competition have had on the configuration of specialist cancer services and the introduction of new surgical technologies into clinical practice. We used patient-level data and geographical information system modelling to analyse the effect of patient mobility for cancer surgery and hospital competition. Centres that lost local patients to other centres resulted in substantial changes in market share for individual centres, which were most marked in areas of highest competition. Centres that lost local patients to other centres were at risk of closure. Patients were attracted to centres offering robotic surgery, and other centres adopted this technology to preserve their market share. We found that, between 2010 and 2017, there has been large-scale adoption of robot-assisted radical prostatectomy, increasing by three times, from 12 centres at the start of 2010 to 42 by 2017. During the same period, 16 of the 65 NHS radical prostatectomy centres in England closed their prostate cancer surgery unit.

**Implications of all the available evidence**

Patients with cancer respond to policies that enable them to choose a surgical provider of their choice. In the absence of appropriate information about quality of care, policies based on patient choice and hospital competition could create incentives for adoption of new technologies without evidence of superior outcomes as hospitals look to retain and attract new patients. The resulting changes in market share for individual hospitals could threaten the viability of their surgical services.

**Methods**

**Patient population**

For this national, population-based study we obtained individual patient-level data from the National Cancer Registration and Analysis Service (NCRAS) for all men who were diagnosed with prostate cancer and underwent a radical prostatectomy in the NHS in England between Jan 1, 2010, and Dec 31, 2014. These data were linked at the individual patient level to Hospital Episode Statistics (HES), the administrative database of all hospital episodes in NHS hospitals in England.

The study was exempt from NHS Research Ethics Committee approval because it involved analysis of an existing dataset of anonymised data for service evaluation.
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