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Geographic disparities in the utilisation of computed tomography scanning services in southern New Zealand

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ABSTRACT

Most secondary care health services in New Zealand, including computed tomography (CT) scanners, are concentrated in urban centres. Little is known about the access rural patients have to these services. The aim of this research was to determine whether there was geographic variation in the utilisation of CT across the southern part of the South Island and if present to measure the magnitude.

Quantitative analysis of public hospital data for CTs over two twelve month periods (2007/08 and 2010) showed that residents of urban base hospital catchment areas were 1.6 times more likely to access CT services than residents of the catchment areas of remote rural hospitals. Similar disparities were present when the analysis was limited to the ≥70 yrs age group. The disparities were present regardless of the referral source or the type of scan but were greatest for emergency department referrals, head scans and CT pulmonary angiograms.

Further research is needed to determine the causes of these differences and whether they result in differences in health outcomes.

1. Introduction

In New Zealand the utilisation of complex health services is routinely compared across the large regions that are used to manage public health funding [1,2]. Little analysis is undertaken of variation within these regions. In particular there is little information on the impact of distance on the utilisation of urban based secondary services. This is in contrast to primary care where inequalities are acknowledged and there is both research and policy aimed at improving access for rural communities [3].

In this paper the utilisation of one secondary service, publicly funded computed tomography scanning (CT), is compared across different geographic areas in the southern end of New Zealand's South Island. Otago and Southland are New Zealand's two most southern provinces. The Otago District Health Board and the Southland District Health Board were amalgamated in May 2010 to form the Southern District Health Board (SDHB). The total population of the SDHB region is 305,000 [4]. The region includes two urban centres, Dunedin (population 127,300) and Invercargill (population 51,600) [5]. Almost all of the medical specialists in this region are based in one of these two centres. Invercargill and Dunedin Public Hospitals provide base

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hospital services for Southland and Otago respectively and Dunedin Public Hospital also provides some tertiary services for the whole region.

There are five hospitals in the region that are defined as rural by the New Zealand Medical Council; Oamaru, Dunstan (near Alexandra), Queenstown, Gore and Balclutha. The New Zealand Medical Council defines a rural hospital as "a hospital staffed by suitably trained and experienced generalists, who take full clinical responsibility for a wide range of clinical presentations. While resident specialists may also work in these hospitals, cover is limited in scope or less than full time."

At the time of this study there were three public diagnostic CT scanners in the SDHB region. The urban centres, Dunedin and Invercargill, each had one. The third was located in Oamaru and was the region's only rural CT. All scanners have similar capabilities but because there is no resident radiologist in Oamaru, the Oamaru scanner is not used for invasive CT guided procedures. The region's only private CT scanner is in Dunedin. Data for this scanner was not available and is not included in this study. CT scanners are still uncommon outside urban centres in New Zealand. In 2010 only two New Zealand rural hospitals had on site CT; Oamaru was the smaller of these.

Access to CT for rural patients is currently a topical issue in southern New Zealand. A CT scanner was recently installed at Dunstan Hospital (April 2013) and other rural hospitals may follow suit.

The aim of this study was to determine whether there was significant geographic variation in the utilisation of CT scanning in the SDHB region; then, if geographic variation was identified, to measure its magnitude across different referral and procedure subgroups.

2. Methods

We obtained data from the radiology departments at Dunedin, Invercargill and Oamaru hospitals, for all the publicly funded CT scans performed in the region from April 2007 to March 2008, and from January to December 2010. These two periods were chosen because they straddle the commissioning of the CT scanner in Oamaru (April 2008). Data collected included domicile (normal residential address of scanned patients), demographic data (age and ethnicity), procedure(s), date of referral and scan (so waiting times could be analysed) and referral source (inpatient, specialist outpatient clinic or emergency department). Scan refers to a single CT scan appointment. Procedure refers to the region or organ system being scanned. More than one procedure is often included in a single scan. Resident population statistics in Otago-Southland during 2007, 2008 and 2010 were obtained from Statistics New Zealand.

Emergency department (ED) referrals are acute referrals requested for patients who have not yet been admitted to hospital. ED referrals for CT scans can be made by doctors working in either base hospital or rural hospital EDs. Doctors working in rural hospitals can organise an urgent base hospital CT on an ED patient under their care. Patients are then transferred to the base hospital for the scan and, depending on the result, discharged, admitted to the base hospital or transferred back to the rural hospital for admission. It is however more common, and often simpler, for patients to be transferred to base hospital EDs, who will then take over responsibility for their care, including arranging CTs.

The analysis is based on the rural hospital catchments shown in Fig. 1. Each of the SDHB rural hospitals has a defined catchment area based on census mesh blocks (groupings of domiciles used by Statistics New Zealand). These catchments reflect the dominant model of secondary healthcare. Patients resident within the catchment of rural hospitals who present with an acute medical problem are managed, at least initially, by generalist doctors at their local rural hospital. Patients seldom travel to health facilities in another rural hospital catchment for treatment because of the mountainous terrain and limited roading in the region. However travel to Dunedin or Invercargill for base hospital care is a common occurrence. These hospital based catchments are used by the SDHB for organising and contracting secondary health services throughout the region.

The Dunedin and Invercargill base hospital catchments are defined by the boundaries of the neighbouring rural hospital catchments and not by territorial authority city boundaries. They are the geographic areas with resident populations that would normally present directly to an urban base hospital, rather than to one of the region's rural health services, for the initial management of urgent or acute medical problems.

Western Southland has no rural hospital but it has many of the features of the other rural catchments. When patients become acutely unwell they do not routinely travel to the Invercargill hospital emergency department but instead visit local general practitioners who maintain a comprehensive 24 h acute service similar to that provided by a rural hospital ED. The boundaries of the Western Southland catchment were similarly based on census mesh blocks and drawn up after talking to local general practitioners about the effective geographic limits of their practice catchments.

In a single year there were insufficient numbers of scans in many of the procedure and referral source subgroups to allow comparison at these levels between catchments. To overcome this problem, data from the two study periods were combined and catchments were grouped into urban base hospitals (Invercargill and Dunedin), rural hospitals (Balcutha, Gore and Western Southland) and remote rural hospitals (Queenstown and Dunstan). Queenstown and Dunstan rural hospitals are 190 km from Invercargill and Dunedin, respectively. Oamaru is 112 km, Balcutha is 80 km and Gore is 65 km away from their nearest base hospital. Although the largest town in Western Southland, Te Anau, is located 157 km from Invercargill, the majority of residents in this catchment live within a 90 km radius of Invercargill. The Oamaru catchment was excluded from the procedure and subgroup analyses because Oamaru changed from a catchment without a CT to one with a CT between the study periods, with a consequent major change in its CT utilisation.

Scans performed on patients normally resident outside the SDHB region were excluded.

Crude scanning rates were calculated for each catchment population. Rates were also calculated by referral