A pilot study of spatial patterns in referrals to a multicentre cancer genetics service

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The demand for cancer genetics services, such as risk assessment, genetic testing and counselling, has risen exponentially in recent years. It is known that 5% to 10% of all cancers, including breast, ovarian, and colorectal cancer, are the result of an inherited gene or genes. There has been little consensus about the delivery of cancer genetics services, and differing geographical arrangements and referral patterns exist in the UK, with wide variations in access. As Fly and colleagues (p. 408) argue, the "increasing demand for cancer genetics services has meant an urgent review of how these services are organised." Many regional centres have been instituted within academic institutions, funded from research grants and have developed essentially in an ad hoc basis. Given that demand for cancer genetics services is likely to increase as more cancer genes are identified, there is an urgent need to study current referral patterns to these services. An examination of the spatial and temporal referral patterns to the Cancer Genetics Service for Wales (CGSW) will elucidate the extent of variation.

Following the Callain-Allan Report and a Department of Health report on cancer genetics and cancer services, CGSW was established in July 1998. CGSW delivers cancer risk assessment to clinics in Cardiff, Swansea and Bridgend, and Dinas, following a distributed network model. Referrals are received from other primary care services (especially GP surgery) and secondary care services, for example, for amniocentesis or surgery. CGSW covers a population of 2.9 million, many of whom live in rural areas with poor travel links. This distance describes a pilot analysis of primary care referrals to CGSW and outlines a future study.

Several studies have examined factors influencing GP referral patterns; indeed a number of studies have focused on geographical variations in referral rates. It has been shown previously, in an ad-hoc survey, that there is an inverse relationship between distance between the centre and the referral rate. Boyle and colleagues (1998) examining geographical variations in the referral of patients with chronic and stage renal failure for renal replacement therapy performed a linear regression analysis as the primary care referral rates for patients over 60 years of age, socio-economic status and ethnic minorities showed a positive correlation with distance from the renal centre controlling for potential confounders (such as health need). Other studies have noted differences in referral patterns between "urban" and "rural" practices.

Geographical Information Systems (GIS) have been used in a number of studies to investigate spatial patterns in access to both primary and secondary health care services and to examine spatial inequalities in health care delivery. This has often involved using spatially disaggregated data on the provision of primary care to examine distance to the nearest health facility. More recent studies have incorporated travel times (computed from national road data) which are likely to be more useful when we have the types of topographical variations that exist in Wales.

Gatrell and Senior (1999) point out that last few years have been made of GIS in examining patterns of health care utilisation. In a later paper, Gatrell and colleagues examined the spatial patterns of breast cancer in South Lancashire using postcode GIS information. Specifically, they used postcode class and a range of census-derived variables as well as distance to GP surgery, and the geographical characteristics, to identify the factors that predict uptake rates. In their study, regression analysis revealed that postcode for seeing were related to practice deprivation scores and the number of female doctors. In addition, residuals from these models could be used to identify practices performing well or poorly after controlling for deprivation and the availability of female doctors.

CGSW defines a clinical contact - Information System for Clinical Organizations (ISCO) - to manage clinical and administrative information. This database was interrogated to determine if there were any spatial or temporal patterns in referrals to CGSW from Wales and specifically to identify how any further referrals originating from investigations into the initially referred party were disseminated. Referral rates per 10,000 head of population were calculated using the postcode of the referring practice. The referral rates for each of the 20 geographical units in Wales for the first 3 months of referral to CGSW were calculated, divided into four 12-month segments, starting from July 1998. The anonymised data were then mapped using MapInfo software to examine further the spatial and temporal referral patterns.

Results

In Wales, cancer referrals as a proportion of all genetic referrals have risen from 11% (1994/95 vs 1995/96) to 30%. There was a significant increase in the number of cancer referrals to CGSW from 129 (198 patients-based) in the 12 months July 1998 to June 1999 to 1418 (712 practice-based) for July 2001 to June 2002. The table shows the variation in referral rates with the two other years covered by 25% each.

Table 1: Annual first order referrals to CGSW

<table>
<thead>
<tr>
<th>Year</th>
<th>All referrals</th>
<th>Referrals from primary care</th>
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<tbody>
<tr>
<td>1998</td>
<td>129</td>
<td>115</td>
</tr>
<tr>
<td>1999</td>
<td>1418</td>
<td>136</td>
</tr>
<tr>
<td>2001</td>
<td>1418</td>
<td>134</td>
</tr>
<tr>
<td>2002</td>
<td>1418</td>
<td>134</td>
</tr>
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A comparison of referral rates by % was done using geographic data in service areas across Wales, ranging from 2.5 (Merthyr Tydfil) to 15.5 (Vale of Glamorgan)/100,000 head of population, over the four years, as shown by the chisquare map. In Figure 1 are mapped the geographical variations in the rate of referral per 100,000 head of population. The larger areas are in rural parts of the country and the smaller areas are in the urban centres. Large differences for the rates of referral per 100,000 head of population in 1998/99, and the least in 2001/02. Gwynedd and Bridgend have the greatest annual variations in referral rates. Figure 2 maps the changes of distances, with darker shading meaning more variations.

Conclusions

While preliminary analyses do not offer any evidence for a linear distance decay relationship between point of referral and proximity to nearest clinic, there appear to be spatial and temporal variations in referrals from primary care practices to CGSW. Our future research aims to explore other potential influences such as socio-economic status of referrals, referral decision making and the influence of referral guidelines distributed in July 2000. Further investigation to determine the causes of these variations in referral patterns to new cancer genetics clinics is vital, as such information would be a valuable resource for policy makers concerned with the development of new specialist services generally.

References