Comparing Radiotherapy Patient Flows in England and Italy

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Abstract

Research into radiotherapy patient flows in England and Italy investigated the degree of self-sufficiency in related service areas across each country. The respective results showed very different patterns, with there apparently being greater patient flow and less self-sufficiency for services in Italy, compared to England. However, close inspection suggested the results were not strictly comparable, despite the data, methodology and analyses being similar and entirely fitting in both cases. The respective studies were consequently compared for a range of criteria: how radiotherapy services are commissioned and provided; cultural expectations; base area definitions; data used; analyses undertaken; and research results. It was found that direct comparisons could not necessarily be drawn because cultural, conceptual, organisational and systemic factors in the delivery of services within each country influenced the results. Therefore, such factors should be taken into account when comparing health services in different countries, particularly in respect of patient flows and service self-sufficiency.

Keywords:

Catchment Areas; Cultural Expectations; International Comparisons; Nomogramma di Gandy; Radiotherapy; Self Sufficiency

Key Phrases:

1. Research studies on patient flows and the self-sufficiency of radiotherapy services in England and Italy yielded very different patterns
2. Close inspection suggested the results were not strictly comparable, despite the data, methodology and analyses being similar and entirely fitting in both studies
3. Different paradigms apply in the two countries and so the studies were analysed against several criteria to establish how related factors impacted on the results
4. It was found that direct comparisons could not necessarily be drawn because cultural, conceptual, organisational and systemic factors were influential
5. Comparisons of health services in different countries must take such factors into account

Introduction

Research into patient flows and self-sufficiency of radiotherapy services was undertaken separately in England (Gandy, 2014) and Italy (Franci et al, 2015). Patient flow volatility was considered key to risk analysis when considering trends in services and referral patterns. The English study, covering all 50 English cancer centres' published "natural" catchment areas for 2011/12, found differential patterns: the greatest self-sufficiency was in the north of England and the least in London. The Italian study used the same methodology for the 20 statutory Italian regions, using data for the first six months of 2014. This showed substantial patient mobility with far less self-sufficiency than England. However, close inspection suggested the results were not strictly comparable, despite the data, methodology and analyses being similar and entirely fitting in both studies. It was perceived that this could be because although both countries operate commissioner-based healthcare models, with commissioners paying service providers for care, different paradigms were in play. This article examines how applying the same methodology to the same topic in different countries yielded different results, and highlights the lessons learnt.

Coverage and Methodology

The studies covered all radiotherapy centres in England and Italy respectively.

Methodology

The *Nomogramma di Gandy (NdiG)* (Gandy et al, 2011) is an established graphical method which measures self-sufficiency in the delivery of specified (public) services. In the context of the English study there were three key pieces of data:

R - Number of patients treated at centre who were from that centre's "natural" catchment area

I - Number of patients treated at centre who were from outside that centre's "natural" catchment area

E - Number of patients from a centre's "natural" catchment area who were treated elsewhere

The resulting axes of the *NdiG* were:

X axis = Percentage of patients treated by centre that were from within its "natural" radiotherapy catchment area

= (Rx100)/(R+I)

Y axis = Percentage of all patients from within a centre's "natural" radiotherapy catchment area that were treated by the centre

= (Rx100)/(R+E)

The data items and formulae for the Italian study were exactly the same, but with "region" replacing ""natural" radiotherapy catchment area", and data for all centres within a given region being aggregated.

Areas/regions that are net importers of patients are seen above the 45° diagonal, with net exporters of patients seen below (areas A and B respectively in Figure 1). In the context of the research "self-sufficiency" was the degree to which radiotherapy services operated independently of one another for the areas under consideration; complete independence would be if services treated 100% of patients from within their "natural" catchment area (England) or region (Italy), and 100% of patients from within these areas were treated by the services (Gandy et al, 2011).

Comparative Criteria

To investigate whether the application of the methodology, the underlying assumptions and the service delivery models had impacted upon the analyses and results, comparisons were made using the following criteria:

1. How radiotherapy services are commissioned and provided;
2. Cultural expectations;
3. Base area definitions;
4. Data used;
5. Analyses undertaken;
6. Research Results

Results

Comparisons were made between the studies for the specified criteria, as set out below, and summarised in Table 1.

[INSERT TABLE 1]

How radiotherapy services are commissioned and provided

Both England and Italy have systems whereby health services are commissioned from service providers, with funding following patients, but there are major differences. In England funding is allocated to Clinical Commissioning Groups (CCGs) led by primary care doctors. Although the median population size of England's 211 CCGs in 2012 was 221,000 patients, they ranged in size from 63,100 patients to 869,400 patients (Office for National Statistics (ONS), 2013a). Given the sizes of CCGs, and radiotherapy services' specialist nature, service provider contracts are usually undertaken through specialist collective, commissioning arrangements. In 2011/12 50 cancer centres delivered radiotherapy across England. The range in numbers of radiotherapy patients treated by individual centres was from 697 to 7,545, with a mean of 2,450.

Italy commissions its health services through its 20 statutory regions, which ranged in population size from 127,329 to 10,008,349 people in 2015, with a median of 1,814,330 people. There were 197 radiotherapy

centres across the Italian statutory regions, as at October 2016 (Italian Association of Radiotherapy and Oncology, 2017).

Clearly the relationships between commissioning structures and provider services are very different in each country. England's distribution of centres evolved with large centres serving large areas. In Italy there was a much wider distribution of services, with centres being smaller accordingly. The ratio of provider centres to commissioning bodies in England was 0.24 whilst the ratio in Italy was 9.85.

In principle, it was inferred that arrangements in Italy were more likely to engender increased patient mobility because of more choice for patients; thereby suggesting less self-sufficiency for both its radiotherapy centres and regions.

Cultural expectations

Service quality will inevitably vary between radiotherapy centres in any individual country. In England, the setting and evaluation of quality standards are comparatively centralised, such roles and responsibilities being led by the National Institute for Health and Care Excellence (2017) and the Care Quality Commission (2017) respectively. The latter produces inspection reports, which rate organisations and/or services as "Outstanding", "Good", "Requires Improvement" or "Inadequate".

The Organisation for Economic Co-operation and Development (OECD) (2015) found a very different approach in Italy, where, despite significant progress in improving the quality of health care, quality monitoring and improvement had taken a back-seat, with profound regional differences. These in part reflected variations in regions' infrastructure and capacity to deliver care of equal quality: "a more consolidated and ambitious approach to quality monitoring and improvement at a system level (is) needed".

Established in 1978, the Italian National Health Service grants universal access to a uniform level of care throughout Italy, free at the point of use, financed by general taxation (Doetter and Götze, 2011). However, constitutional reforms of 2001 led to the creation of distinct regional health systems with substantial differences between them (Enrici and De Sanctis, 2015). Unfortunately the heterogeneity of Italian regions in social and economic terms was reflected in federalised regional health systems exhibiting markedly divergent patterns of care and outcomes. Such variation in activity and outcomes across regions is both inefficient and inequitable, a reality not lost on the public given the large numbers of patients crossing regions in search of health care (OECD, 2015).

Consequently comparing the quality of health services between the two countries is not straightforward, or necessarily practicable, and some of the following comments include anecdotal elements. It is believed the overall level of quality in radiotherapy services in England and Italy is broadly similar. However, it is perceived there is greater consistency between services delivered by centres in England than those in Italy,

where there can be wide variations. Arguably the top centres in Italy are (much) better than those in England, but some Italian centres are far inferior to their English counterparts. English patients can feel reassured their treatment at their local centre will be on a par with elsewhere. Italian patients may avoid local centres with poor reputations to travel to ones with good reputations; a seeming geographical divide exists in Italy, with very good services in the north compared to poorer services in the south (Associazione Italiana dei Registri Tumori e Associazione Italiana di Oncologia Medica, 2015; Da Rold, 2016).

Radiotherapy is only one, albeit key, service in the range of cancer services. Accordingly Italian patients will be influenced by the reputation, or prestige, associated with *all* of a hospital's cancer services, including the standing of its surgeons. Given the critical nature of cancer, patients will be prepared to travel to receive the best surgery, particularly if the progression of the cancer is significant. Also, some larger centres have minimal waiting lists and can provide treatment quickly, and referrals for post-operative radiotherapy will be made by the surgeon, who will normally refer to his or her hospital's services. All centres can deliver standard radiotherapy treatment, but some special types of irradiation (e.g. proton beam therapy) and skills for certain special techniques, are only available in certain centres, thereby further influencing patient flows. In England there are close links between surgeons and their local radiotherapy centre, which supports most hospitals in a given area. Choose and Book was introduced in 2005 in England to enable greater choice for patients, and maybe influence patient mobility. However, whereas patients in Italy can travel and be treated anywhere across the country, in England choice is primarily limited to providers with which the CCG has a contract, which tend to be fairly local anyway (King's Fund, 2010). Consequently greater patient mobility in Italy is likely, compared to England.

Other factors can influence patients travelling far for radiotherapy treatment in Italy: although a centre might be further away, it might involve less travel time because of, for example, a direct train or a better motorway; and, patients might choose to be treated near their adult children for family support when undergoing surgery, chemotherapy or radiotherapy. The same can apply in England but is believed to be less the case because of the aforementioned limitations on choice of providers.

Base area definitions

The base areas used were very different. Those used in England were the "natural" catchment areas published by the National Clinical Analysis and Specialised Applications Team (NatCanSAT). NatCanSAT determines "natural" catchment areas and calculates catchment populations for all English cancer centres using its methodology which allocates each census ward's total population to the cancer centre with the greatest number of episodes within that ward for the time period in question. The ward populations allocated to each centre are summated to determine its total catchment population, with the wards plotted on a map to

show its catchment area (NatCanSAT, 2010). These “natural” catchment areas and their populations are calculated/ updated and published regularly (NatCanSAT, 2017a; NatCanSAT, 2017b), and will reflect developments such as new centres or satellite facilities.

Importantly, the process of allocating census wards to the centre which serves the majority of its patients in itself should maximise self-sufficiency. Therefore, ignoring those few wards with major splits in patient flows between three or more centres, it is virtually impossible that a centre’s Y axis value will ever be below 50%. Indeed, England had 30 centres with a Y value greater than 90%, with none having a Y value less than 57%. Italian regions also aggregate to the whole country, but they are fixed and unlikely to change. Therefore local cross-border patient flows, because centres are more convenient to towns or cities in neighbouring regions, may continue indefinitely. It is notable that no region had a Y axis value exceeding 90%, with seven having Y values less than 50% (and four in single figures).

Data used

The English data was extracted from radiotherapy datasets which were established in 2009 to collect data centrally on every patient treated with radiotherapy in, or funded by, the NHS in England (NatCanSAT, 2017c). The 50 cancer centres in England delivering radiotherapy services in 2011/12 treated 122,552 patients in total. The data included: number of patients treated by each centre from within its published “natural” catchment area; number treated from outside this area; and number of patients from within the area treated elsewhere.

The total annual number of radiotherapy treatments for Italy has been estimated as 212,375 (Rosenblatt et al, 2013) and 228,000 (Enrici and De Sanctis, 2015). The Italian data covered radiotherapy centres operating across the 20 Italian statutory regions, for the first six months of 2014. They were the numbers of patients resident in and treated in each region, aggregated from all the centres in each region. They related to the 6,964 inpatients and 1,373 day case patients who underwent radiotherapy treatments during this period. This is accepted as a minority of all radiotherapy patients (representing approximately 7.5% based on the aforementioned figures), because in Italy most patients receive radiotherapy treatments on an outpatient basis. However, whilst inpatient data is centrally collected, each region has its own outpatient database, with some different codes used for different treatments and procedures. Therefore it was not practicable to utilise outpatient data for research analyses across Italy.

The Italian analyses showed the numbers of inpatients and day cases separately, but for the purposes of this comparison the two sets of figures were combined.

Analyses undertaken

In both papers the mechanics of the analyses were identical: the three data values R, I and E were calculated or extracted from the data, with the values of X, Y and X/Y calculated accordingly, before being applied to the *NdiG* diagram.

Research Results

Table 2 shows the results from both papers alongside one another, whilst Figure 1 combines the results with one standard symbol for the English centres and a different standard symbol for the Italian regions. The English figures in Table 1 are much greater than the Italian figures for the reasons described in Section 3.4. Nevertheless, the *NdiG* values remain entirely valid, and it is seen that there is much greater diversity for the Italian regions than for the English cancer centres' catchment areas; or conversely English cancer centres' catchment areas are much more self-sufficient than Italian regions. This is emphasised by the mean *NdiG* values for each country: the co-ordinates for England were (90.0,90.8) and for Italy they were (72.8,72.9). The ranges for the X and Y values in England were 28.3%-99.1% and 57.9%-99.0% respectively, whilst the ranges for the X and Y values in Italy were 18.2%-100.0% and 0.8%-89.1% respectively.

The Italian analyses were not sufficiently detailed to enable the identification of localised cross-border relationships. However, taking on board the comments about the cultural aspects of demand in that country, it is possible to gauge the degree to which patients are prepared to travel for treatment by looking at the number and proportion of patients who crossed more than one regional boundary for their radiotherapy treatment, i.e. their care was *not* delivered in a neighbouring region. If patients travelling for radiotherapy treatment between the islands of Sardinia and Sicily and the mainland are included, then 1,522 (18.4%) inpatients and day cases crossed more than one regional boundary, i.e. between one in five and one in six patients. (The data used for the England did not enable similar analyses for comparison).

[INSERT TABLE 2]

[INSERT FIGURE 1]

Discussion

Underpinning assumptions

The approach and methods adopted were entirely appropriate in each country's context, and gave important insights into patient flows for radiotherapy services. The underpinning assumptions were necessarily different to reflect the respective commissioning and provider service arrangements, and influenced the results: that published catchment areas used in England are themselves a creation of observed patient flows led to their exhibiting greater self-sufficiency than the historically-fixed Italian regions; the latter potentially influenced by local cross-border situations.

The creation of “natural” catchment areas for each of the 172 Italian radiotherapy centres would have been difficult, given aforementioned data constraints. The mean population served by each Italian centre was 352,700 people in 2015 (City Population, 2017), compared with 1,070,000 for English centres in 2012 (ONS, 2014). Critically, the base areas used were those relevant to each country’s target audience.

Base areas

Different ways of calculating catchment areas exist, according to whether the context is market analysis or establishing areas served by institutions (Baker, 2001; Gilmour, 2010), which are still applied today. They divide countries or regions into mutually exclusive areas which aggregate to the whole, and determine their resident populations (NatCanSAT, 2010). The different options involve different dynamics which can directly impact upon the results of any *NdiG* calculations.

The NatCanSAT (2010) method described above can involve substantial self-sufficiency because the patient flows themselves determine the catchment areas. They are always established retrospectively, and the situation may have changed since the period covered by the data. Therefore it might be best to “fix” them, by agreement, at a given point in time for planning purposes, only recalculating them periodically; any marginal annual fluctuations being accepted and ignored.

Fixed catchment areas have patients referred to and treated by the service provider within whose designated catchment area they reside (excepting special circumstances). Policy dictates referrals and therefore self-sufficiency should be maximised. This situation existed historically, but would be unacceptable nowadays; an example was the East Liverpool Psychiatric Overlap Zone which was served by one health authority for mental health and a neighbouring health authority for geriatric services, which anecdotally caused problems. The situation was addressed by making the catchment areas coterminous (Liverpool Health Authority, 1986).

Statutory areas often form the basis of a commissioning model for care delivery, with self-sufficiency influenced by choice policies for service users: complete freedom or some “gatekeeper” process. The latter is likely to show greater self sufficiency than the former.

There is no doubt the base areas used in the English and Italian studies, and their related populations, influenced their results. Therefore, it is essential for the nature of base areas to be explicit.

Cultural and organisational issues

Italian patients are more prepared to travel for cancer-related care, particularly given perceived variations in care quality between different providers in different regions, ever since funding arrangements, initiated in 1978 (Doetter and Götze, 2011), enabled them to receive care anywhere in Italy. By contrast English patients have general practitioners acting as gatekeepers to services, and their choice of provider (via

Choose and Book arrangements introduced in 2005) is generally restricted to service providers where contracts exist, which will primarily be local providers (King's Fund, 2010).

There is an apparent paradox: the distribution of radiotherapy facilities in the two countries is such that Italians have more radiotherapy centres within travelling distance to choose from, but many prefer to seek care in further placed facilities; whilst in England, the centralisation of services means that in the more geographically remote areas, some patients will have long distances to travel to their most local service.

Key lessons

At face value, there are apparent variations between the two countries, with greater self-sufficiency in radiotherapy services in England compared to Italy. Nevertheless, there may possibly have been greater similarity between the patterns *if* the English analyses had used statutory English regions (ONS, 2013b), or Italy had developed and used "natural" catchment areas for its centres. But the methodology and approach was entirely valid in both studies. This highlights the need to always take into account the context of service delivery and patient culture when evaluating and analysing patient flows.

Conclusions

The comparative analyses confirm the methodological approaches in both the English and Italian studies were appropriate; their analytical interpretations being consistent with the national paradigms. However, cultural, conceptual, organisational and systemic factors in the delivery of services within each country greatly influenced the results. Such factors should be taken into account when considering and interpreting patient flows and service self-sufficiency in and between different countries.

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