Radiotherapy report sets new targets for Europe

➜ Anna Wagstaff

Radiotherapy is the most cost-effective treatment for many cancers. Now radiation oncologists have adopted an evidence-based approach to assessing need throughout Europe. And the league table for meeting that need reveals some surprising results…

Radiotherapy is involved in the treatment of an estimated 40% of all patients who are cured of cancer. As well as being effective, it is less expensive than both surgery and chemotherapy. However, the latest linear accelerators (linacs) cost millions of euros each and require skilled staff, so countries need to plan ahead if they are to acquire and maintain sufficient capacity to meet demand.

In an effort to promote such forward planning, the European Society for Therapeutic Radiology and Radiation Oncology (ESTRO) has taken it upon itself to establish, on a country-by-country basis, the level of radiotherapy need in Europe and how it matches up with capacity. This is the purpose of the QUARTS project – Quantification of Radiation Therapy Infrastructure and Staffing Needs – which has been funded by the European Union.

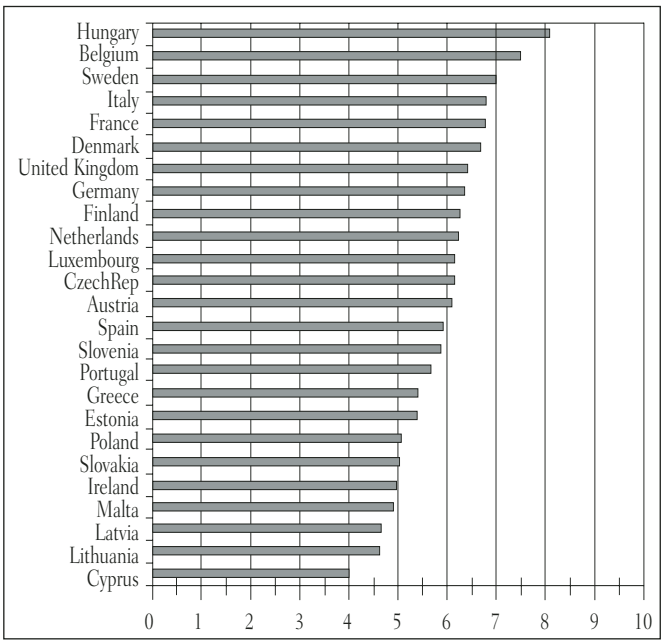
In June 2005, QUARTS published some fascinating figures (*Radiother Oncol* 75:355–365) comparing the need for linacs in each European country with existing supply. QUARTS calculated need by looking at the incidence rate for different cancers in each country, and using the best available evidence about the proportion of patients with each type of cancer who need radiotherapy. By estimating the number of treatments that each unit can deliver, the authors reached an evidence-based estimate for the number of linacs per capita needed by each country.

QUARTS then mapped this estimate of need against existing capacity, enabling health ministers, clinicians and patients to see at a glance how adequate (or inadequate) the provision of radiotherapy is in their country.

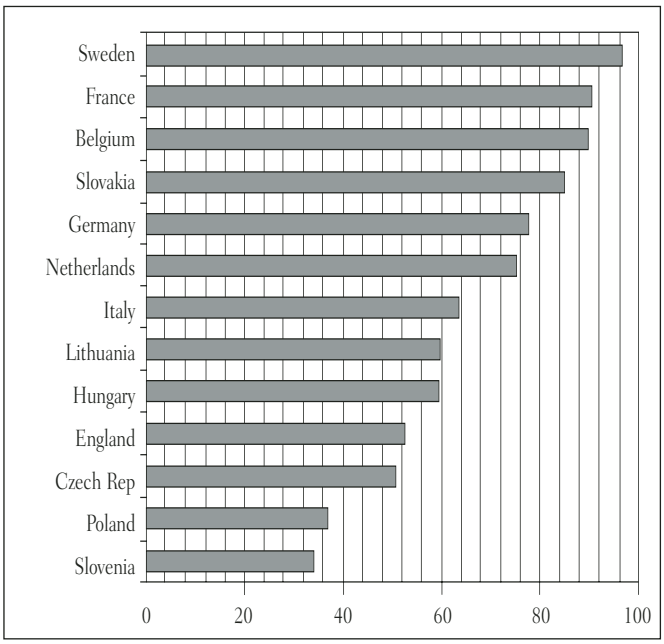
The result is displayed in two league tables – one showing the need for linacs; the other showing the percentage of need that is met by each country.

Some of the findings come as a surprise. Hungary tops the 'need' league, requiring twice as many linacs per head of population as Cyprus, reflecting a combination of lifestyle, environmental factors, and the population age profile. Hungary's high level of need can partly be explained by its particularly high incidence of head and neck cancers, which require a

THE EUROPEAN LEAGUE TABLES



QUARTS estimates of the number of linacs (megavoltage radiotherapy units) needed per 1 million people in the 25 EU states, based on incidence rates and the appropriate rate of radiotherapy for each type of cancer



The ratio of actual number of megavoltage radiotherapy units (linacs and Cobalt units) to the evidence-based required numbers derived by the QUARTS study in 13 European countries where reliable data were available

Source: The above figures and the figure on p35 are reprinted from Radiotherapy and Oncology, *vol 75, pp355-365. Søren M. Bentzen et al.* Towards evidence-based guidelines for radiotherapy infrastructure and staffing needs in Europe: the ESTRO QUARTS project. *© 2005, with permission from Elsevier*

relatively high number of treatment episodes; Cyprus's low level is largely a factor of its young population profile. In general, it is age profile that accounts for the greatest variation in need across Europe: with the exception of Hungary, it is the wealthier countries with the older populations that have the greatest need.

The important question for policy makers is how far their current capacity matches the evidence of need. Unfortunately, information about capacity is only available for 13 of the 25 countries. Sweden, which increased its radiotherapy capacity following a domestic survey in the 1990s, does best in this league table, meeting more than 95% of estimated need. France and Belgium are not far behind, and Slovakia also makes a strong showing, providing around 85% of estimated required capacity. The Czech Republic, however, once part of the same country as Slovakia, is now limping along at 50%, but is still ahead of Poland (38%) and Slovenia (34%). England, despite having increased capacity by 20% between 2002 and 2004, meets little more than 50% of the demand indicated by the QUARTS estimates.

Behind the statistics

So what lies behind these apparent variations in radiotherapy provision? Are the differences in capacity really as bad as they look, and if so, are the Swedes and the French, who top the provision table, overtreating, or are patients in Poland and Slovenia really being denied the treatment they need?

Brian Cottier, one of the authors of the QUARTS report, believes some of the differences in the figures for capacity may be

"Some countries have a lot of equipment, some of which is probably used below maximum efficiency"

overstated, because there may be significant differences between countries in how intensively the equipment is used. The study assumed that each linac is used at a uniform rate of 450 treatments a year. (This is high compared with the actual rate achieved in Sweden of 338 treatments per machine per year, or in the Netherlands, at 410 treatments a year.)

But Cottier says that not enough work has been done to establish an evidence-based figure. "It is not yet clear how many people you can treat on a linear accelerator per day, while maintaining professional and safety standards. Some of the countries have a lot of equipment, some of which is probably used below maximum efficiency, while others have very little, which are probably utilised beyond reasonable use."

He adds that some private sector units in some countries appear to be financially viable with extremely low throughput, while publicly funded units give more priority to a high throughput. This means that the difference between the capacity gap in England and that in Germany or France may not be as great as it appears. Linacs in France are distributed between 179 centres, and in Germany 210, many of which are private practices with a relatively low throughput. Radiotherapy units in England, by contrast, are concentrated in only 53 centres, only two of them in the private sector.

Another possible source of bias is that the older cobalt machines were assumed to be equal to the more modern (and expensive) linacs, which the authors justified on the basis that, with appropriate streaming, a cobalt machine could achieve similar throughput. However, Hana Stankušová, head of brachytherapy at Motol teaching hospital in Prague, thinks this assumption is unrealistic. Cobalt machines still form the bulk of capacity in the Czech Republic, and she says one linac is effectively worth two cobalts. If this is the case, then the variations in provision across Europe may be even wider than the QUARTS figures suggest.

If defining capacity was a challenge, defining radiotherapy need was no less so, as there are no universally agreed guidelines about which cancer patients should be treated with radiotherapy and how. Since Leopold Freund began therapeutic irradiation in November 1896, in Vienna, and wrote the first textbook about radiotherapy in 1903, different protocols have been established by different units and modified in the light of new knowledge and technology. There have been sporadic randomised clinical trials, which have resulted in new patterns of treatment for certain indications. QUARTS gives examples of the introduction of preoperative radiotherapy for rectal cancer, and the switch to single rather than fractionated doses for painful bone metastases. Developments in surgery and medical oncology, and the focus on multidisciplinary approaches have also influenced the use of radiotherapy.

However, a number of attempts have been made in recent years to establish evidence-based indications for radiotherapy. QUARTS studied two literature surveys by the Swedish Council on Technology Assessment in Health Care (1996 and 2003) and drew on studies from Canada and Australia. These are in the form of decision trees indicating whether or not radiotherapy is required for each type of cancer patient.

The results determine an "appropriate rate of radiotherapy" (ARR), which can then be used, together with incidence rates, to calculate overall need. The QUARTS estimates of need are largely based on the Australian study, which itself uses guidelines taken from "reputed national and international institutions" and cross-checked its results against the guidelines used by the Canadian study.

To be on the safe side, however, the QUARTS authors also looked at what would have happened to their estimates had they used

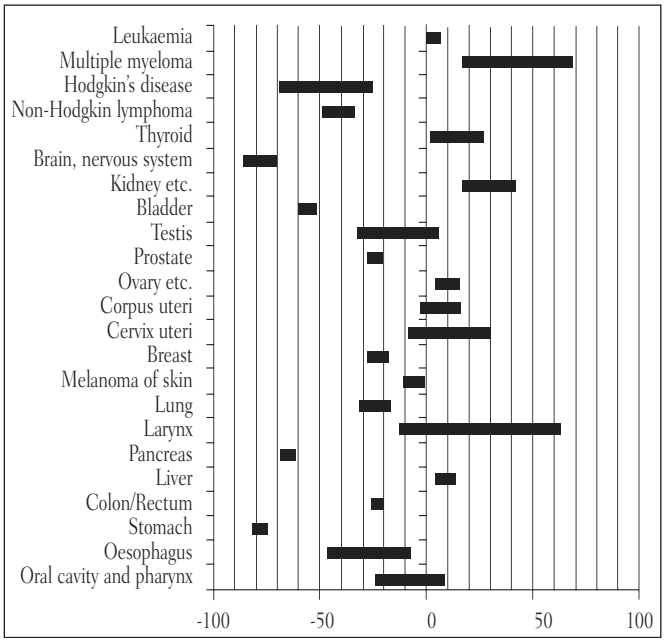
the slightly lower Canadian rates for colorectal, breast, lung and prostate cancer. The effect was to reduce average per capita requirement for the 25 EU countries by 10%, still leaving all but three countries short of required capacity.

The QUARTS study also compared the Australian ARRs to the actual use of radiotherapy recorded in Sweden – the country that topped the league for radiotherapy provision. The results, illustrated in the figure opposite, indicated that far from doing too much, Sweden tends to use less than the estimated appropriate rate for many cancers; there are 11 cancers for which the usage rate is clearly below the ARR (the zero line) and only five that are clearly above. There are also seven where the 95% confidence interval line touches zero (meaning that they might be in line with the ARR).

Hey, Minister!

Taken as a whole, the QUARTS project falls only just short of a complete customised proposal to bring Europe's radiotherapy capacity up to the required level, and it makes its sales pitch well. It addresses the question of value for money, a central concern for Health Departments as cancer incidence rates head relentlessly upwards. QUARTS cites estimates indicating that, of cancer patients who are cured, 49% are cured by surgery, 40% by radiotherapy (alone or combined with other treatments), and 11% by chemotherapy alone or in combination.

European figures from the 1990s show the average cost of a course of radiotherapy among EU Member States to be 3,000 euros, compared with 7,000 euros for cancer surgery and 17,000 euros for chemotherapy. Seen in this light, and given the way the price of cancer drugs has been rising, radiotherapy looks like a bargain. Indeed, recent figures from Sweden, the country with the highest radiotherapy capacity, indicate that radiotherapy accounts for less than 6% of the total cost of oncology.



Difference between the estimated appropriate rate of radiotherapy and the estimates of actual utilisation in Sweden. The horizontal black bars indicate the 95% confidence limits of the actual utilisation estimate

But with a squeeze on health budgets all over Europe, will this be enough to persuade governments to provide the necessary funding? Stankušová, in Prague, certainly hopes so. Many patients in the Czech Republic wait four to five weeks before starting radiotherapy, because there are not enough linacs. Worse still, some patients don't even make it to the waiting lists because their clinician avoids referring them for treatment for which there is a long delay.

"It depends very much on where they are treated," says Stankušová. "A responsible radiation oncologist will refer the patient to radiotherapy even if the waiting list is long. But if the patient goes through a clinical oncologist, who is not a radiotherapist, but maybe a urologist or

Given the way the price of cancer drugs is rising, radiotherapy looks like a bargain

ROYAL MARSDEN

London's Royal Marsden Hospital bids farewell to its first SL25 linac, which had been state-of-the-art when it started service 20 years ago. The machine was pensioned off this June as part of a major revamp of the UK's radiotherapy services

a gynaecologist, they may simply give the patient additional chemotherapy, even though this is not the best treatment."

The Czech Society of Radiation Oncologists has been trying for years to persuade the Ministry of Public Health to invest in more linacs. Stankušová believes the QUARTS study will strengthen their hand. "For us, it is an important tool to be able to say that, now we are in the European Union, we should be able to provide our patients with a radiotherapy service that is comparable to other European countries."

Cottier, from the QUARTS team, who was formerly a clinical oncologist and is now head of Cancer Services Analysis for England at the Department of Health, is also hopeful that the study will have an impact. QUARTS, he says, is the first attempt to quantify variations in radiotherapy services between and within European countries, and gives countries the potential to plan future spending objectively rather than responding only when demand becomes obvious and overwhelming. "Many countries have now adopted an evidence-based approach to clinical practice within medicine. A logical extension to the process is to adopt an evidence-based approach to service planning."

In the short term, he argues, QUARTS data can be used to analyse gaps in provision within each country and formulate an investment strategy to eradicate variations across Europe. In the medium term, an investment strategy should include a programme to replace equipment with up-to-date technology, as each machine comes to the end of its working life.

Cottier hopes the project will now go one step further and become a sort of annual report card to check on whether and how fast the capacity gaps are being filled. "What I'd like to see is an annual web-based census of all equipment in Europe, to monitor whether we are moving towards and maintaining an equitable provision of services."

"Now we are in the EU, our radiotherapy service should be comparable to other European countries"