

Is spending on proton beam therapy for cancer going too far, too fast?

Both the US and UK are pouring money into proton accelerators, which have been described as the world's "most costly medical devices."

Keith Epstein asks if the investment is premature

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"Is spending on proton beam therapy going too far too fast?"

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You might think that this week's study of 12 000 patient records showing that men with prostate cancer treated with expensive proton beam therapy had more complications than patients given conventional radiotherapy would dent some people's faith in the newer treatment.¹ No clear evidence of better effectiveness exists, and it now appears that the treatment may have a downside.

But the spread of proton beam therapy for cancer has such momentum it now seems unstoppable. Millions of dollars have been invested in building the particle accelerators necessary to deliver it.

Globally, 39 facilities are in use. The US has 10 proton beam centres, and 19 more are being built. More than \$370m (£230m; €277m) are being spent on a project to bring accelerators to centres in Minnesota and Arizona. And the UK's health secretary, Andrew Lansley, announced this month that up to £250m is to be put into delivering such treatment in the NHS.²

Some people have recognised the rashness of the dash to introduce these machines, which have been described as the world's "most costly and complicated medical devices."

Proton beam therapy was described earlier this year as "crazy medicine and unsustainable public policy," by Ezekiel Emanuel, a professor at the University of Pennsylvania, oncologist, and

former adviser to President Obama. "If the United States is ever going to control its healthcare costs, we have to demand better evidence of effectiveness and stop handing out taxpayer dollars with no questions asked."

The cost of proton therapy for prostate cancer is typically about twice as much as conventional radiation, three times as much as surgery, and four or five times as much as brachytherapy.

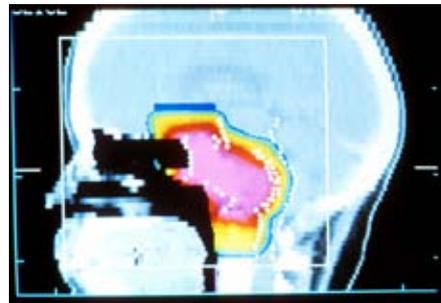
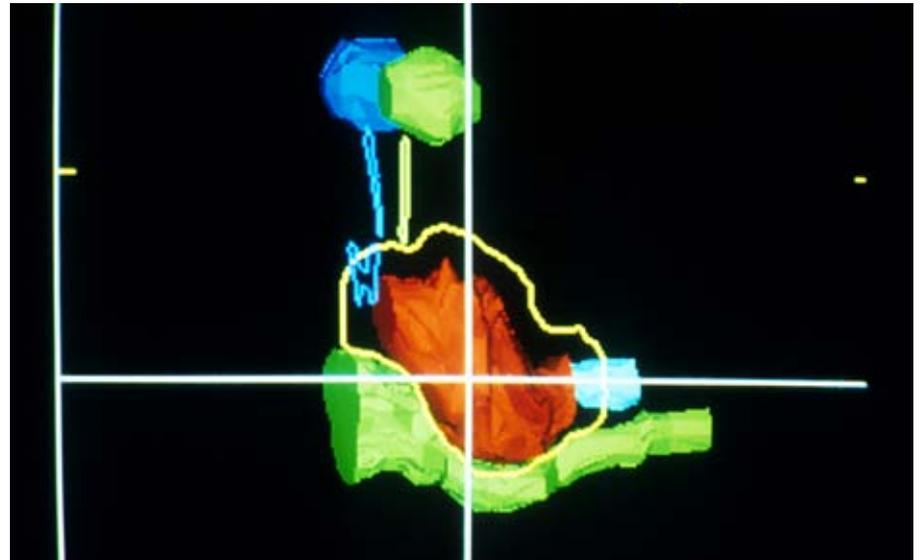
Who benefits?

So what is the evidence for and against the treatment? The theory is that proton beams target cancerous tissue more exactly. By accelerating subatomic particles towards the speed of light and concentrating them in a beam, proton treatment is thought to target cancerous tissue more precisely, minimising harm to healthy tissue while reducing side effects and increasing cure rates.

It has been shown to be beneficial and cost effective for treating children, whose tissue can be highly sensitive to stray radiation, and for certain uncommon brain cancers.

Using protons on childhood medulloblastoma may save €23 600 per patient, causing less damage to the brain and to growth hormone production.³ Benefits have also been found for skull base chordoma.⁴

But proton accelerators, especially in the US, are being marketed as treatment for prostate



Main picture: A lung cancer patient prepares for therapy in Houston, Texas

PAT SULLIVAN/PA

Top: Proton beams are focused only in the area of the tumour, reducing harm to surrounding tissue

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Left: Proton beam therapy uses protons to destroy cancer cells, rather than electrons, which are used in traditional radiation therapy

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cancer rather than just childhood cancers, partly because the greater numbers of patients makes the financial returns better.

Not only is the benefit unclear in prostate cancer, but the side effects appear, in some cases, to be no better than for conventional radiotherapy, which undermines one of proton therapy’s selling points. In June 2011, a study of radiation therapy for prostate cancer found that patients receiving conventional radiation experienced fewer gastrointestinal problems than a similar group exposed to proton beams.⁵

“Somewhat surprisingly, proton therapy had the highest GI toxicity of the radiation modalities,” the authors noted.

Signs that proton beam therapy is less cost effective than conventional radiation for prostate cancer have been increasingly evident since 2007. In a study funded by the National Institutes of Health researchers calculated mean costs of around \$64 000 for men in their 60s and 70s—significantly higher than the \$39 000 for intensity modulated radiation therapy.⁶

“New treatments are introduced routinely into clinical practice without rigorous economic analysis,” noted the study’s authors. They urged “limiting the number of proton facilities” before more comprehensive analyses are done.

Despite the huge amount of money sunk into building accelerators, the first randomised controlled trial comparing x rays with proton beams is only just about to begin. That research, involving 400 patients and sponsored by the US National Cancer Institute at Massachusetts General in Boston and the University of Pennsylvania in Philadelphia, won’t be completed for seven years.

Harvard Medical School radiation oncologist Anthony Zietman told the *BMJ*: “We rush into treatments before they are proved. Sometimes people are later found to have been harmed.” Zietman, who is involved in the Massachusetts General trial, added: “I don’t think we’re doing harm (with proton therapy), but we don’t know. In some instances, proton therapy might be inferior to existing treatments, and the quality of life might not be as good.

Robert Foote, a radiation oncologist at the Mayo Clinic who is overseeing a \$370m project that will bring accelerators to new centres in Minnesota and Arizona within the next four years, is also worried that some centres are adopting the proton beam therapy before enough research has been done and, possibly, for the wrong indications.

He worries that some centres with big commercial investors will be keen to recoup their investment fast by putting through a large volume of patients, especially with prostate cancer, rather than using the technology for those most likely to benefit, such as children, a focus at the non-profit Mayo Clinic. Foote says that two models of proton care have emerged in the US: “one to make money—the other to provide the best care possible for the people who need it.”

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Competing interests: None declared.

Provenance and peer review: Commissioned; externally peer reviewed.

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Cite this as: *BMJ* 2012;344:e2488

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- ▶ Higher taxes on alcohol are the best way to reduce harm, analysis concludes (*BMJ* 2011;343:d7758)
- ▶ Minister admits government has not convinced public of the harms of excessive drinking (*BMJ* 2011;343:d6999)
- ▶ Safe drinking campaigns run by alcohol industry do not reduce consumption (*BMJ* 2011;343:d6634)
- ▶ British public is sceptical about minimum price on alcohol (*BMJ* 2011;343:d5871)

DRINKING NATION: HAVE WE HAD ENOUGH?

The government’s plan to introduce a minimum price of 40p per unit of alcohol in England could see a reduction in 1149 annual deaths and 38 900 hospital admissions, finds **John Appleby**

For economists, alcohol is a normal good; a put-the-price-up-and-demand-goes-down type of good.¹ But for many people (too many?) alcohol is “normal” and “good” in the more colloquial sense. In his introduction to the UK government’s latest alcohol strategy, Prime Minister David Cameron focused on erratic and excessive imbibing: “Binge drinking isn’t some fringe issue, it accounts for half of all alcohol consumed in this country. The crime and violence it causes drains resources in our hospitals, generates mayhem on our streets, and spreads fear in our communities.”² So, have we had enough, and is the government’s adoption of the economist’s solution—raising the (minimum) price of alcohol¹—the answer?

In 2010, UK households spent around £42.1bn (€50.9bn, \$66.6bn) on alcohol through off-sales (£15.2bn) and in restaurants and hotels (£26.9bn). This is equivalent to around 3% of the gross domestic product or, more dramatically perhaps, around a third of the UK’s annual spend on the NHS. On

average, everyone aged 18 and over spends around £17 a week on alcohol. Is this a lot? One answer—to adapt an old joke—is that it depends if it’s more than your GP spends.

With GPs’ average incomes touching £110 000,³ they may well spend more than their patients (median income before tax £19 600⁴) but might drink less (as they are likely to buy more expensive alcohol). These two factors, price—in particular, price relative to other goods and services—and disposable income, are not only two key factors determining the demand for alcohol; they also form the basis for calculating an alcohol affordability index. Apart from brief periods since 1980, generally coinciding with economic recessions and lower disposable incomes, alcohol is much more affordable now than it was 30 years ago (fig 1).

Over nearly half a century, spending on alcohol in the UK has increased in real terms, more than doubling between 1964 and 2004. But, as figure 2 shows, spending flattens or, more often, dips in times of economic

recession, as personal incomes are depressed. Over the past five years spending has fallen by 17% in real terms—back to 1996 levels; in part associated with the recent recession, but in part preceding it. This pattern is reflected in similar sharp reductions in binge drinking among young men too, accelerating a generally downward trend since 1998.⁵

Although spending in 2010 has increased, albeit marginally, do these figures suggest a problem with drinking in the UK? Another set of data—hospital admissions associated with alcohol—suggest that a big problem exists, with admissions wholly attributable to alcohol doubling between 2002 and 2010 to around 265 000 in England (fig 3). Alcohol related deaths follow a similar pattern of constant increase between 2001 and 2008, although they fell slightly in 2009 (to 6584 in England).

Whether or not these observations constitute a substantial problem now—given the lags in health and other effects of drinking and recent falls in consumption—the impacts of various price and non-price interventions to reduce drinking have been extensively modelled, and they show significant results. For the government’s proposed minimum price tactic of 40 pence per unit of alcohol the impacts include a reduction in the mean annual consumption per drinker of 2.4%, in deaths of 1149 annually, and in hospital admissions of 38 900 annually.⁶ A 50 pence minimum price would more than double all these effects. Neither, however, rivals the sobering effects of a good (sic) economic recession.

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Competing interests: The author has completed the ICJME unified disclosure form at www.icjme.org/coi_disclosure.pdf (available on request from the corresponding author) and declares no support from any organisation for the submitted work; no financial relationships with any organisation that might have an interest in the submitted work in the previous three years; and no other relationships or activities that could appear to have influenced the submitted work.

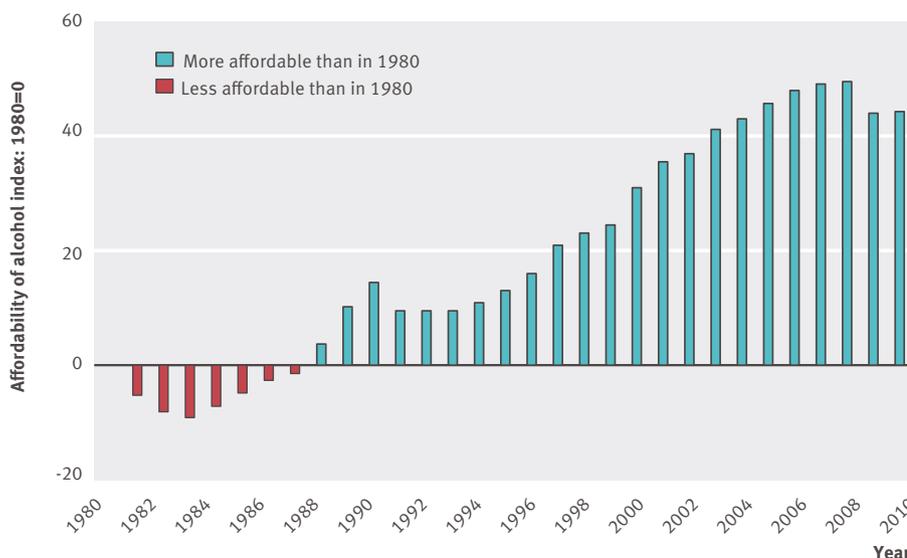


Fig 1 | Alcohol affordability index, 1980-2010

Source: NHS Information Centre. www.ic.nhs.uk/statistics-and-data-collections/health-and-lifestyles/alcohol/statistics-on-alcohol-england-2011-ns

BMJ BLOGS **Domhnall Macauley**

Cycling spo(o)ked

At the Commonwealth Games I met the cyclists. At the end of each day we grouped together in the television room to watch the edited highlights of the Tour de France.

Towards the end, I went to watch the road race and was hooked. I took up bike racing. It was fantastic. My learning curve climbed faster than my physiological decline and the racing was superb.

Later, a club mate training in the springtime evening was struck by a car blinded by the low sun. His x rays were a radio-opaque Meccano set, but when he was off crutches, we planned his comeback.

One summer evening, two friends were riding side by side on the hard shoulder of a wide open road. The guy on the inside turned his head to say something to his pal, only to see him catapulted 100 metres up the road on the bonnet of a passing car. He had a long and difficult recovery but is doing well now.

Another friend, a former international cyclist and one of riders I first met at the Commonwealth Games, was struck by a car during a club race. The driver was rushing to the airport. The cyclist is dead.

Cycling is on the front page of the papers again. British cycling is on a high. A superb world cup season, medals at the world championships, and high expectations for the Olympics.

But it's not all fun. *The Times* is running a campaign on cycling safety after a cycling accident left one of its journalists in London in a coma. The newspaper has done a lot to highlight the risks and how we need to change the culture of driving. Cyclists deserve our support; we need to address the risks of riding on the road and make cycling safer.

Still, every time I see a group of cyclists, I look over enviously, jealous of their camaraderie, chat, and banter on the training runs and the buzz of racing. My heart aches. But my head rules.

Domhnall Macauley is primary care editor, *BMJ*

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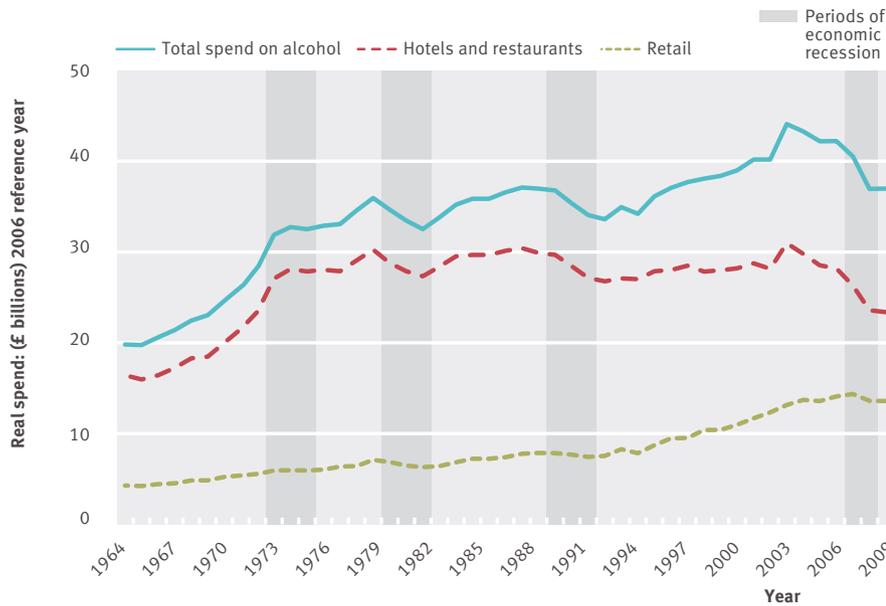


Fig 2 | Real spending on alcohol in UK, 1964-2010

Source: Office for National Statistics, Blue Book, 2010, www.ons.gov.uk/ons/rel/naa1-rd/united-kingdom-national-accounts/2010-edition/blue-book.html

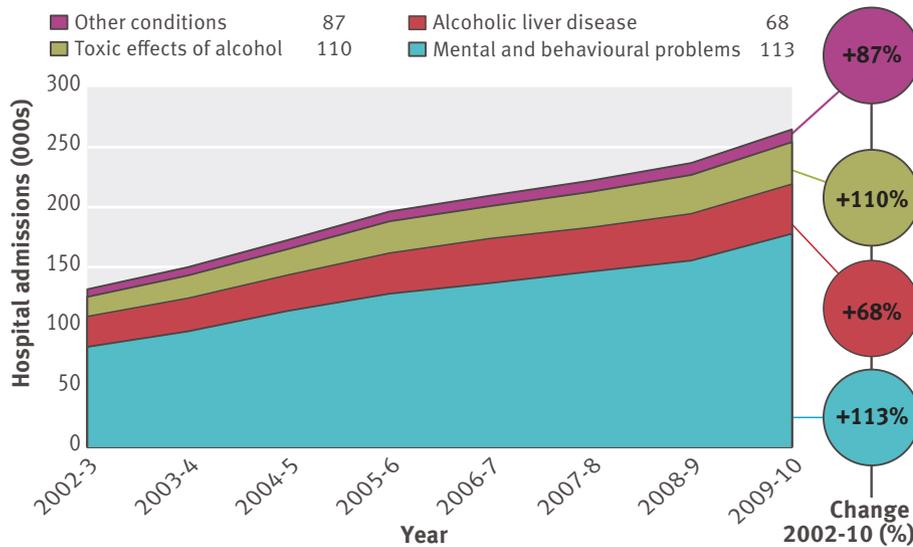


Fig 3 | Hospital admissions wholly attributable to alcohol in England, 2002-3 to 2009-10

Source: NHS Information Centre, [www.ic.nhs.uk/statistics-and-data-collections/health-and-lifestyles/alcohol/statistics-on-alcohol-england-2011-\[ns\]](http://www.ic.nhs.uk/statistics-and-data-collections/health-and-lifestyles/alcohol/statistics-on-alcohol-england-2011-[ns])

Provenance and peer review: Commissioned; not externally peer reviewed.

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Cite this as: *BMJ* 2012;344:e2634



Pathfinders in shaping local health services

Sophie Arie introduces the shortlist in a new award that is designed to spot potential in emerging commissioning teams

In 2010, the government announced that general practitioners would take over commissioning health and care services in England. The idea was that GPs are best placed to design care that is more suited to the needs of patients. GPs will work with nurses, secondary care doctors, patients, local authorities, and local communities to shape local health services across wide areas spanning, in some cases, several local authority areas.

The big change is set to take place in April 2013 and in 2011 the first “pathfinder” clinical commissioning groups began working alongside primary care trusts, which have done this work until now. They are testing the possibilities of the new model and some are already showing results.

Clinical commissioning team of the year is a new award designed to spot, in these early days, the group that best demonstrates the potential of these emerging teams. Four commissioning teams have been shortlisted and will be assessed on four criteria—maturity of the organisation, de-commissioning/commissioning activity, strong leadership, and patient and public engagement.

Durham Dales Clinical Commissioning Group



The Durham Dales Commissioning Team brings together 12 practices serving 90 500 people in a diverse geographical area, which includes many rural areas where there are problems of isolation because of lack of transport. The 12 practices have worked together for a long time already and had been ahead of the game in terms of building collaboration between primary and secondary care clinicians, working closely with community carers and patients, and creating systems to prevent secondary care referrals, according to project lead Clair White. In its ongoing efforts to develop better patient experience and reduce costs of secondary care, the group has developed new community services for problems such as diabetes and mental health. More than 20 different projects have helped to reduce referrals to secondary care by more than 5%, early indicators show.

Health Works Clinical Commissioning Group



This group involves 22 GP practices and serves a population of over 150 000 with a strong ethnic mix and a high poverty index in two local authority areas, Birmingham and the Black Country. The group has worked to bring about change and improve quality of care with a particular focus on improving end of life care by “listening to people and letting them choose their story and how their end of life experience will be,” says Georgina Craig, who ran the group’s commissioning programme. At the heart of their success, she says, was the use of an innovative experience-led commissioning approach that engages and involves the local community and frontline staff and “removes anecdote from decision-making,” instead basing commissioning decisions on research that involved thousands of interviews with people about the end of life experience. “Rather than discussion with its strategic partners commissioning in theory,” says Craig, “Health Works has learnt by doing end of life commissioning.” Between March and November 2011, it completed a commissioning strategy involving more than 100 stakeholders, which has now received £500 000 funding (€605 000; \$795 000).

Dudley Clinical Commissioning Group

Dudley Clinical Commissioning Group serves around 315 000 patients in an area with extremes of poverty and affluence, and its key commissioning priorities aim to address these inequalities and provide equal access to services across the whole borough. The group has worked hard on improving the quality and



outcome of GP-led services but also on improving communication within the community to promote care closer to home. Several GP practices previously regarded as poor performers have made dramatic improvements in prescribing and referral records as a result of a new emphasis on using local, practice specific data. “Understanding the needs of our population and then taking innovative approaches to commissioning the required services has achieved huge improvements in quality and saved patients’ lives,” says David Hegarty, chair of the group.

NHS Nottingham City Clinical Commissioning Group



NHS Nottingham City Clinical Commissioning Group is responsible for a population of 342 000 with high levels of deprivation, low levels of education, and unhealthy lifestyles. Some 32% of the population smoke, 27% are obese, and life expectancy is three years below the national average. The group, led by nine GPs, focused its work on improving basic health in the population and developing systems to avoid unnecessary hospital admission for conditions such as back pain that can be managed in the community. A new clinical assessment service and other efforts to collaborate between primary and secondary care should help save £100 000 per year in costs for unnecessary spinal appointments alone, says Sarah Hewitt, head of commissioning development for the group. A pilot project for responding to health crises with more support in the community and less hospital treatment is estimated to have saved £1.5m.

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 The clinical commissioning team of the year award is sponsored by the Medical and Dental Defence Union of Scotland.



For more information about the BMJ Group Improving Health Awards 2012 go to <http://groupawards.bmj.com>.

Cite this as: *BMJ* 2012;344:e2678