



How Web 2.0 is changing medicine

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Scrooge and intellectual property rights

A medical prize fund could improve the financing of drug innovations



At Christmas, we traditionally retell Dickens's story of Scrooge, who cared more for money than for his fellow human beings. What would we think of a Scrooge who could cure diseases that blighted thousands of people's lives but did not do so? Clearly, we would be horrified. But this has increasingly been happening in the name of economics, under the innocent sounding guise of "intellectual property rights."

Intellectual property differs from other property—restricting its use is inefficient as it costs nothing for another person to use it. Thomas Jefferson, America's third president, put it more poetically than modern economists (who refer to "zero marginal costs" and "non-rivalrous consumption") when he said that knowledge is like a candle, when one candle lights another it does not diminish from the light of the first. Using knowledge to help someone does not prevent that knowledge from helping others. Intellectual property rights, however, enable one person or company to have exclusive control of the use of a particular piece of knowledge, thereby creating monopoly power. Monopolies distort the economy. Restricting the use of medical knowledge not only affects economic efficiency, but also life itself.

We tolerate such restrictions in the belief that they might spur innovation, balancing costs against benefits. But the costs of restrictions can outweigh the benefits. It is hard to see how the patent issued by the US government for the healing properties of turmeric, which had been known for hundreds of years, stimulated research. Had the patent been enforced in India, poor people who wanted to use this compound would have had to pay royalties to the United States.

In 1995 the Uruguay round trade negotiations concluded in the establishment of the World Trade Organization, which imposed US style intellectual property rights around the world. These rights were intended to reduce access to generic medicines and they succeeded. As generic medicines cost a fraction of their brand name counterparts, billions could no longer afford the drugs they needed. For example, a year's treatment with a generic cocktail of AIDS drugs might cost \$130 (£65; €170) compared with \$10 000 for the brand name version.¹ Billions of people living on \$2-3 a day cannot afford \$10 000, though they might be able to scrape together enough for the generic drugs. And matters are getting worse. New drug regimens recommended by the World Health

Organization and second line defences that need to be used as resistance to standard treatments develops can cost much more.

Developing countries paid a high price for this agreement. But what have they received in return? Drug companies spend more on advertising and marketing than on research, more on research on life-style drugs than on life saving drugs, and almost nothing on diseases that affect developing countries only. This is not surprising. Poor people cannot afford drugs, and drug companies make investments that yield the highest returns. The chief executive of Novartis, a drug company with a history of social responsibility, said "We have no model which would [meet] the need for new drugs in a sustainable way . . . You can't expect for-profit organizations to do this on a large scale."²

Research needs money, but the current system results in limited funds being spent in the wrong way. For instance, the human genome project decoded the human genome within the target timeframe, but a few scientists managed to beat the project so they could patent genes related to breast cancer. The social value of gaining this knowledge slightly earlier was small, but the cost was enormous. Consequently the cost of testing for breast cancer vulnerability genes is high. In countries with no national health service many women with these genes will fail to be tested. In countries where governments will pay for these tests less money will be available for other public health needs.

A medical prize fund provides an alternative. Such a fund would give large rewards for cures or vaccines for diseases like malaria that affect millions, and smaller rewards for drugs that are similar to existing ones, with perhaps slightly different side effects. The intellectual property would be available to generic drug companies. The power of competitive markets would ensure a wide distribution at the lowest possible price, unlike the current system, which uses monopoly power, with its high prices and limited usage.

The prizes could be funded by governments in advanced industrial countries. For diseases that affect the developed world, governments are already paying as part of the health care they provide for their citizens. For diseases that affect developing countries, the funding could be part of development assistance. Money spent in this way might do as much to improve the wellbeing of people in the developing world—and even their productivity—as any other that they are given.

The medical prize fund could be one of several ways to promote innovation in crucial diseases. The most important ideas that emerge from basic science have never been protected by patents and never should be. Most researchers are motivated by the desire to enhance understanding and help humankind. Of course money is needed, and governments must continue to provide money through research grants along with support for government research laboratories and research universities. The patent system would continue to play a part for applications for which no one offers a prize. The prize fund should complement these other methods of funding; it at least holds the promise that in the future more money will be spent on research than on advertising and marketing of drugs, and that research concentrates on diseases that matter. Importantly, the medical prize fund would ensure that we make the best possible use of whatever knowledge we acquire, rather than hoarding it and limiting usage to those who can afford it, as

Scrooge might have done. It is a thought we should keep in mind this Christmas.³⁻⁶

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Shooting down the NHS reform track

Why ministers cannot pull the brake even if they want to

Anyone who wants to understand the process of change in England's National Health Service could do worse than to summon up memories of watching the bobsleigh events in the winter Olympics. The bobsleigh riders hurtle down the icy track at great speed. There is nothing they can do to change direction. Their course and goal is determined for them, and there is little they can do apart from keeping their balance and their nerve as they round the terrifying bends. If they were to brake suddenly, regretting that they had ever got themselves involved in such a high risk sport, disaster would strike.

The policy makers engaged in transforming the NHS are in a similar position to those bobsleigh riders. Once the government had decided on the new three part model for the NHS, the course was set. In turn, the logic of the model—competing providers, active purchasers, and money following the patient—drives policy, and allows for no deviation or delay. Moreover, just like the bobsleigh riders, ministers are racing against the clock. For the time being, extra billions are flowing into the NHS at an unprecedented rate.

But the government's commitment to this increased rate of spending ends in 2008. Thereafter, the annual increment in expenditure may be less generous, especially if the extra investment does not produce commensurate improvements. So, in effect, a deadline exists for the new model to show that it is working—that ministerial rhetoric about greater efficiency, improved responsiveness, and rising quality is being turned into reality—and for the NHS to turn into a political asset, not a political liability, for the government.

The government may well have stumbled into devising the new model incrementally.¹ But once adopted, the model drives the adopters. Success for the government depends on combining the elements of

competition, purchasing, and payment by results; delay in introducing any element puts the whole model at risk. This interdependence of the various strands of policy explains the relentless pace of change, with ministers deaf to all pleas for adopting a less hectic pace for fear of derailing the whole exercise. If competition is to exist, private providers must be tempted to enter the market, even if they have to be paid over the odds. For active purchasing to occur, primary care trusts must be strengthened through amalgamation, even if this means adding to organisational disruption in the NHS. If payment by results is to provide the dynamic for greater efficiency and responsiveness, providers and purchaser trusts must balance their books, even if this leads to staffing cuts and painful service reconfigurations.

The point about fiscal balance helps to explain the past and has implications for the future. The NHS has always been the envy of the world for its ability to contain spending within the annual budgetary limits set by the Treasury. But collective discipline went hand in hand with individual indulgence. An opaque system of loans and brokerage allowed some trusts to accumulate large year-on-year deficits, so smoothing out turbulence and avoiding the political embarrassment of painful cutbacks.

However, this system is incompatible with the new model. If trusts are not required to stay within budget, if they can be rescued when needed, where is the incentive to be efficient and responsive? Which is why a minor financial blip in 2005-6—which turned out to be a deficit of £500m (£743m; \$989m), the loose change in a £75bn budget—produced disproportionate shock waves and pain in the NHS as ministers cranked up the pressure on trusts to balance their books. Moreover, this will be the story of the NHS in 2007, even though its budget is rising to £82bn; the



BMJ 2006;333:1280-1

century. In other words, the art of medicine is not about appearance at the expense of substance, but rather the way in which knowledge is related to advice and treatment. It was in this sense that art was used in book titles of the 17th and 18th centuries; for example, *The Art of Curing Diseases* (Gideon Harvey, 1689) and *A Plain Introduction to the Art of Physick* (John Peachey, 1697). Such titles indicate that when dealing with patients doctors do not simply apply knowledge but also engage the art of medicine.

The problem might be reformulated in this way: medicine requires knowledge of universals and of the application of them to particular instances, as embodied in individual patients. Or as it was put a millennium ago by the famed Avicenna, "When we say that practice proceeds from theory, we do not mean that there is one division of medicine by which we know, and another, distinct there from, by which we act—as many, examining this problem suppose. We mean instead that these two aspects are both sciences—but one dealing with the basic problems of knowledge, the other with the mode of operation of these principles." The first aspect was called science proper, the second art.¹

Medical art may be a form of knowledge that is more probabilistic than the demonstrative certainty of science, but it is crucially important knowledge nevertheless. Moreover, all commentators on this art emphasise that its exercise requires not only knowledge of content, but something called "judgment."

Philosophically speaking, the importance of judgment is today highlighted in phenomenology, aesthetics, "virtue ethics," and "emotional intelligence." Judgment is downplayed in instrumentalist and functionalist reasoning, where pride of place is given to the rationality of calculation, impartiality, and disinterestedness. On their own, attributes of disinterestedness can lead to coldly experimenting with cases; clinical judgment, on the other hand, requires attending to a patient.

While the science of medicine continues to be advanced by laboratory research and the statistical investigations of evidence based medicine, the parts of it termed "the art" are developing too, and remain a source of resistance to bureaucratic assessment and benchmarking. For thousands of years, the question of how best to associate the universal and the particular has always been the real doctor's dilemma. No formulae, however good, can ever obscure the second part of medical knowledge, which comes from the exercise of clinical judgment.

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Mistletoe as a treatment for cancer

Has no proved benefit, and can cause harm

Most doctors in the United Kingdom will be surprised to learn from a case reported in this week's *BMJ* of a use for mistletoe (*Viscum album*) that has nothing to do with Christmas.¹ Some patients with cancer inject themselves with extract of mistletoe in the hope of improving their condition. In continental Europe, at least 30 different mistletoe preparations are available. In Europe, most cancer patients use such extracts, at a total expense of about £30m (€45m; \$59m) each year,² and in Germany the insurance system pays for this treatment.

A Google search (20 November 2006) showed that 145 000 websites promote or mention mistletoe as a treatment for cancer. This much publicity may mean that many cancer patients in the UK will try mistletoe in the future or ask their doctor about it. It is therefore timely to discuss the value of mistletoe as an anticancer drug.

A century ago, Rudolf Steiner developed anthroposophy, a school of thought that led to innovations such as the Waldorf schools, biodynamic farming, and anthroposophic medicine. This approach to health-care is based on intuitive thinking about assumed associations between four postulated dimensions of the human body (physical body, etheric body, astral body, and ego), plants, minerals, and the cosmos.³

Anthroposophic medicine includes drugs, art therapy, rhythmic massages, special exercises, external

applications, counselling, and anthroposophic nursing. These treatments are used "partly as adjuncts to and partly as substitutes for conventional medicine."⁴ Anthroposophic drugs are based on ancient alchemistic and homeopathic notions, far removed from the concepts of pharmacology. Many of these drugs are produced in unusual ways—some mistletoe preparations are fermented while other anthroposophic drugs are highly diluted according to homeopathic principles.

Steiner's intuition that mistletoe might help treat cancer is based on the fact that, like cancer, mistletoe is a parasitic growth that eventually kills its host. Inspired by Hahnemann's "like cures like" principle, he believed that an extract of mistletoe would cure cancer. Despite the implausibility of this idea, about 1000 in vitro studies have shown that mistletoe or its main constituents (alkaloids, lectins, and viscotoxins) do have anticancer activity.²⁻⁵ However, many plants have some sort of anticancer activity.⁶ Occasionally, this is useful therapeutically—vinblastine and vincristine are derived from the common periwinkle, and Taxol comes from the yew tree. In most cases though, toxicity or lack of bioavailability prohibit the use of these compounds.

Proponents of anthroposophic medicine make two claims about mistletoe. Firstly, they claim that regular injections of mistletoe extract improve the natural course of cancer by slowing down or stopping tumour



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Web 2.0 examples in medicine

Application	Website	Purpose
Bloglines	www.bloglines.com	RSS reader
Citizendium	www.citizendium.org	Expert wiki
Connotea	www.connotea.org	Online reference organiser
Del.icio.us	http://del.icio.us	Website tagging
Flickr	www.flickr.com	Photo sharing
Ganfyd	www.ganfyd.org	Medical wiki
Google blogsearch	http://blogsearch.google.ca	Blog searches
Google health	www.google.com/coop/topics/Health	Create your own search tool
MedWorm	http://medworm.com	RSS aggregator
SlideShare	http://slideshare.net	Slide sharing
Wikipedia	http://en.wikipedia.org/wiki	All purpose wiki
YouTube	www.youtube.com	Video snippets

more dynamic and permit bloggers to write articles and engage in “one to many” conversations with readers. Political bloggers are said even to have influenced the outcome of elections.⁵

One of the best blogs in medicine is Ves Dimov's *Clinical Cases and Images*. It contains a rich collection of “presurfed” material for busy clinicians and features interactivity and timely discussion. Dimov is also a supporter of medical librarian bloggers.⁶ Why waste time fumbling with search engines when you can consult this blog for timely updates? As well as case discussions, Ves provides links to today's medical headlines from Reuters and clinical images via a dynamic, free photo sharing tool called Flickr. One of his slide presentations “Web 2.0 in medicine”⁷ is available on Slideshare (itself a fantastic new 2.0 tool). *Clinical Cases and Images* is a virtual laboratory for doctors and medical librarians interested in Web 2.0.

In the past year, several doctors and medical librarians have put Web 2.0 in the spotlight⁸; one excellent article even discusses its impact in clinical practice.⁹ What is obvious is that doctors are seeking new methods of information discovery because of the limitations of search engines. Even Medline, for all its benefits, is no longer a sufficiently detailed map of the medical literature. Busy but organised doctors need a variety of evidence sent to them in a single organising interface—easily accomplished using an RSS reader (ask your favourite medical librarian to show you how to use aggregators like Bloglines and MedWorm).

RSS may be a useful way to fight information overload. RSS feeds help to organise new web content sent to you in real time by the best medical blogs, evidence based sites like the Cochrane Library, and newly published video and audio from major medical journals. In fact, technology savvy doctors are keen to use RSS feeds on mobile devices, iPods, and Blackberries and scan research on their way to ward rounds. For those who prefer to play in the digital sandbox while on-call, try photo sharing software like Flickr and medical video sharing at YouTube,¹⁰ two of the more popular multimedia sites. By searching YouTube (bought by Google for £1bn (£1.5bn; \$2.0bn) in 2006), you can dazzle your family during the holidays.

Over the past year, as a medical librarian, I have watched the impact of Web 2.0 tools on access to information. A highlight for me was a recent *BMJ* article,¹¹ which concluded that Google—the quintessential Web 2.0 company—is a useful diagnostic aid. Google is a

useful tool if you know what to search for. Doctors can retrieve lots of evidence and open access material via search tools, and they need to learn how to use these tools responsibly. With its many multilingual editions, Google is a boon for developing countries with few information retrieval alternatives.

This tour through Web 2.0 ultimately returns to the idea of using software to create optimal knowledge building opportunities for doctors. The rise of wikis as a publishing medium—especially Wikipedia—holds some unexamined pearls for the advancement of medicine. The notion of a medical wikipedia—freely accessible and continually updated by doctors—is worthy of further exploration. Could wikis be used, for example, as a low cost alternative to commercial point of care tools like UpToDate? To a certain extent, this is happening now as the search portal Trip already indexes Ganfyd, one of a handful of medical wikis being developed.

Web 2.0's push for openness has resulted in the expectation of equal amounts of transparency and openness in medical publishing. The collapse of *CMAJ*, the journal of the Canadian Medical Association, this past year¹² was, in a sense, due to the opposing tensions of openness exemplified by Web 2.0 and the monolithic lack of openness in old forms of media like *CMAJ*.

The web is a reflection of who we are as human beings—but it also reflects who we aspire to be. In that sense, Web 2.0 may be one of the most influential technologies in the history of publishing, as old proprietary notions of control and ownership fall away. An expert (that is, doctor) moderated repository of the knowledge base, in the form of a medical wiki, may be the answer to the world's inequities of information access in medicine if we have the will to create one.

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