EDITOR'S CHOICE: Medics as inventors

My introduction to Medical Futures was at a glittering awards ceremony a few years back. Before the awards were handed out, guests had an opportunity to look at shortlisted designs and talk to people who had found new ways of helping patients. Among the bright ideas were a pair of inflatable trousers that paramedics could put on a traumatised patient to prevent hypotension. And there was a device to improve the efficiency of the collection of urine.

Medical Futures continues to help people convert their ideas into prototypes and bring these inspired inventions to the marketplace. Geoff Watts takes up the story below.

Sometimes we have to lose pages for commercial reasons. It's always a painful decision especially on this occasion when we have had to drop my interview with GP and humorist Phil Hammond. I would urge you to read it on-line by going to our stunning website, bmjcareers.com.

Visitors to the BMJ Careers Fair in Scotland on 13 October maybe interested to learn that the NES/Scotland Executive will be addressing the eagerly awaited Tooke report on the future of MTAS which is published on 8 October.

• To book a place: bmjcareersfair.com/scotland

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Brainwave to brilliant innovation

Geoff Watts enthuses about the work of Medical Futures

It was in the 1950s that Roger Armour, then a medical student in Lahore, began thinking about ophthalmoscopes. Why, he wondered, were they so complicated and so expensive? Couldn't these useful instruments be simpler and cheaper? Fast forward half a century and the answer is "yes." A Cambridge company, Ophthalmos (www.ophthalmos.co.uk), now makes a pocket-sized, lens-free ophthalmoscope that sells for half the price of a conventional instrument. It's a direct descendant of Armour's original idea (box 1)—and the man himself, now in his 70s, is one of the company's directors.

Not all such innovative ideas take quite so long to reach maturity. But set against that is another sorry observation: many ideas, probably most, go nowhere at all. Doctors who might have done a service to themselves and to medicine—who might even have developed what could prove to be a second or a parallel career—abandon their idea. Overwhelmed by the obstacles that confront the fledgling innovator, they give up.

It was this dismal prospect that prompted a surgeon at the Royal National Orthopaedic Hospital in Stanmore to devise one means of facilitating the process: oiling the wheels of innovation. Some years ago, along with a fellow doctor, he put his hand in his pocket to set up a body called Medical Futures (www.medicalfutures.co.uk).

Andy Goldberg speaks of his brainchild with a bubbling enthusiasm. "The idea came as I was sitting in a lab 10 years ago, playing with stem cells, trying to convert blood into cartilage! I thought, 'Here's a cure for arthritis.' But it was so far distant from patients. Being relatively entrepreneurial I explored the option of taking it forward. I pretty soon realised that the best was option D, which was do nothing." Why? Because the hurdles facing anyone thinking of turning an idea into practical reality, never mind commercial viability, are fearsome.

"It's particularly difficult for doctors," Goldberg adds. "They've got a day job. They're vocationally trained, and their aspiration is to look after patients." Not many have the urge to set up and run a commercial organisation. And, without help, the minority who do so may be too intimidated.

He decided to look for successful doctor-innovators, and learn from their experience. Thomas Fogarty who invented the balloon catheter, was one. Another was Archie Brain who devised the laryngeal mask. Goldberg also consulted the inventors of various hip replacements.

"A common theme emerged. Almost all of them had conceived their idea 10 or 15 years before they did anything about it."

The intervening period was not time spent finding backers, writing business plans, or working up the idea into a commercially viable product. It was time spent simply in deciding to embark on the process.

Some people, according to Goldberg, are natural entrepreneurs. Others, including many doctors, can come up with ideas but, unaided, have no urge to take them forward: "idea-preneurs" he calls them. The neologism may be ungainly, but it serves its purpose.

He offers the example of the balloon catheter. Fogarty had his core idea in the 1950s while working as a theatre technician. Seeing a narrowed coronary artery being surgically opened and unblocked prompted him to envisage a less drastic procedure—such as inflating a balloon inside it. The suggestion provoked laughter. "So he became a medical student thinking that being a doctor would help. But they just laughed even more. He tried to publish it in the journals but they rejected it. He went on to patent it anyway. The patent was granted in 1969. That was 19 years after he'd had the idea."

Medical Futures is one response to the predicament. Its most visible manifestation is the biannual Innovations Award: a glitzy, posh frocks affair used to publicise the winners in various categories ranging from anaesthesia and critical care to mental health and neuroscience.

It was apparent that giving awards wouldn't by itself be enough; entrants would need support to turn their ideas into marketable propositions. "We created an organisation alongside the awards that would make money from charging people delegate fees," says Goldberg. "A sort of events company. We run educational meetings for clinicians to help them understand what their options are." These seminars and other events bring the naive together with the knowledgeable. They aim to help doctors who have an idea decide if they want to pursue it, and, if so, how.

"You have to decide how to take the idea forward. Give it to someone else to do? Do it yourself? Or go into partnership with an

Box 1 | Lens-free ophthalmoscopy

ISM/SPL

Roger Armour's first thoughts about trying to develop a simpler ophthalmoscope were short lived. "I didn't think it was possible for someone like me without any engineering knowledge. But the idea stayed with me during my time in the NHS." The son of an English mother and a Pakistani father, Armour moved to the UK and worked as a general and vascular surgeon, retiring from Stevenage's Lister Hospital when he was 62.

It was then that a conversation with an ophthalmologist friend who'd been to Africa prompted him to get serious about the idea of a lens-free ophthalmoscope. "It took me six months to work out what to do. I then got some material from an art shop and made one. It looked such a mess I was certain it wouldn't work." But he tried it anyway—first on his wife. "To my amazement I could see the retinal vessels in her fundus. And then I examined the cat."

To achieve maximum simplicity and cheapness Armour has dispensed with all the non-essential parts, including the rotating set of lenses. If the user or the patient has a refractive error that might blur the image, one or other (or both) simply wear their normal glasses during the examination. "You may get some reflections, but by adjusting your position you can get a surprisingly good view."

At this point Armour was stuck. It was from Medical Futures that he eventually learnt about patents, and how to set up a company. He joined with investors to form Ophthalmos, the firm that now manufactures the device. His target purchasers are doctors in developing countries and non-specialists who might be interested in making more use of the ophthalmoscope.

Roger Armour remains an avid proselytiser. "I hardly ever go to a party or a meeting without getting people to try one."

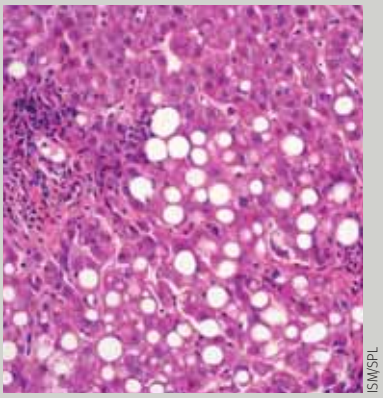
Box 2 | Diagnosing the liver

Getting the best out of the new treatments for hepatitis C that came available in the late 1990s relies on knowing which strain of virus is causing the problem, and how much of it is present. But at that time there were no readily available tests. Liver specialist Professor William Rosenberg and his group at Southampton University developed one that relies on amplifying and detecting specific signatures in the viral nucleic acid. At a time when existing labs were taking up to six months, their procedure could analyse blood samples within 48 hours.

Colleagues of Rosenberg's wanted to use the service, so he began providing it at cost. With his university actively encouraging commercial enterprise he saw an opportunity

His group was also developing tests for liver fibrosis. The university's centre for innovation was keen to exploit both developments, but pointed out that linking them to something else with therapeutic applications would make the enterprise more attractive to investors. And this is how the fledgling company—originally called HepCgen, now iQur Ltd (www.iqur.com)—subsequently evolved.

The Medical Futures award was a great help when approaching investors, Rosenberg reports. "We could say not only have we got a great idea, not only is it a good business, but we've also won this nationally prestigious award." Within six weeks iQur had raised the capital it needed.



ISM/SPL

A liver affected by Hepatitis C virus.

organisation?" There's also validation to consider. "An innovative lemon squeezer succeeds or fails by the extent to which it looks nice and does a good job of squeezing lemons. Innovative medical developments have to face scrutiny by all sorts of regulatory agencies."

If an idea is at the point of needing proper investment, Medical Futures can help by introducing its inventor to the money men. "We've had clinicians who have struggled for two or three years to get investment," says Goldberg. "Within a few weeks of winning one of our awards they've gone on to raise three or four million pounds."

Medical Futures isn't, of course, the only source of help. Many universities and research charities have their own individuals or organisations who specialise in marketing the ideas of their employees or grant holders (box 2). A handful of people manage, or find themselves obliged, to do the whole thing themselves. But except for individuals who fancy a complete change of career, it's unlikely to be the best option.

Goldberg reckons that more than 2500 ideas have so far passed through Medical Futures. Although the scheme has had its fair share of subsequent successes, publicity alone is no guarantee of success. John Petri, for example, is a disappointed man. He had hoped that the publicity generated by his 2005 award would drum up NHS interest in the dual theatre scheme (box 3). But no. "I was contacted by just three surgeons who wanted to know more about it. Otherwise there was a complete lack of interest. Why? Because there is no incentive." Indeed, because it means working harder and possibly reducing the pool of people seeking private practice, there are actually disincentives to introducing the scheme. Without performance related pay he doubts that much will change. Petri himself has had enough of the United Kingdom. He started a new job in Switzerland at the beginning of September. Innovation, it has to be said, is not always well rewarded.

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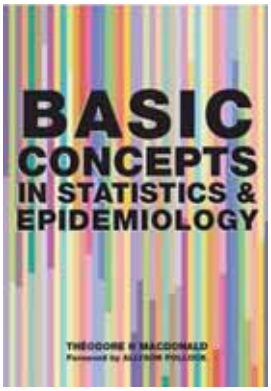
Box 3 | Two for the price of one

John Petri, until recently an orthopaedic surgeon with the James Paget NHS Foundation Trust in Great Yarmouth, is Italian by birth and has spent time working in France. When he first came to Britain he was struck by what he regards as the inefficiency of surgery in the UK. "Like many surgeons in this country I was sitting around for between a third and a half of my time waiting for patients to be made ready. I wanted to use my time in theatre more efficiently."

His idea, which won him one of the 2005 awards, was simple enough: run two operating theatres in parallel, with the surgeon moving between them. While one patient was being prepared, Petri could be operating on another. Such arrangements have, he says, been used before in this country. But with a progressive increase in the number of staff, they've been dropped.

To get the scheme up and running he wrote a paper showing how the efficiency of his British hospital compared badly with that of his previous French one, and proposed the dual theatre system. He sent it to his colleagues, to the hospital chief executive, and to the Department of Health. Of them, only his chief executive showed any enthusiasm, and he authorised Petri to try out the arrangement one day a week. The new system soon reduced his patients' waiting time from a year to three weeks. In 2005 his hospital opened a new theatre that became available for regular dual system use. Since then, says Petri, he has had virtually no waiting list.

REVIEWS



Basic Concepts in Statistics and Epidemiology
Theodore H Macdonald
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Rating: ★★★★/5

As evidence based medicine becomes more integral in everyday practice, having basic knowledge of statistics in critically appraising research and publications becomes increasingly essential.

In general, the statistics books that I've encountered have either been too simple, only providing very basic information, or too complicated, overwhelming me with numerous frightening mathematical formulas. I always felt the need for a book that focused on statistical concepts. One which could answer "why?" questions that frequently come up. There came Professor Theodore Macdonald's book.

I need to highlight an important issue. This book is not a book on critical appraisal: it only covers statistics. On first viewing the book did not look different from other statistics books, with mathematical formulas popping up on every page to remind me that statistics is still maths. But actually reading the book I found it went beneath the surface, and basic concepts are discussed in detail.

The book starts with descriptive statistics, moving on to discussing the concept of normal distribution. Inferential statistics makes up most of the book and topics such as testing small samples, parametric and non-parametric tests, and correlation are all explained in detail. A separate chapter is allocated to the analysis of variance (ANOVA) and the book ends with a brief introduction to designing a research project. In between these chapters some of the important mathematical concepts underpinning statistics are discussed in detail. I found the chapter on probability useful. It explains factorial notations, permutations and combinations and their use in calculating different probabilities. If you think you know probability well, think again. The book also contains the use of probability in epidemiology in another chapter where basic epidemiological concepts are also included. Inclusion of some basic mathematics is unavoidable but the author manages to do so skilfully. I particularly enjoyed the part on "when the infinite is finite," and "evaluating 'e'." In the latter, the origin of the "e" number, the base for natural logarithm is explained in mathematical terms.

This book couldn't be used as a quick fix for exam preparation. But for those who want to venture into the world of statistics, this book is a useful guide.

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