Inventor's inbox

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By Mark Sheahan and Patrick Andrews

Our tireless inventors *Mark Sheahan* and *Patrick Andrews* discuss hygiene, confidentiality, pill packaging and other important issues of modern healthcare.

Patrick: The field of 'medical devices' is enormous, ranging from pacemakers and brain scanners to crutches and tools that wouldn't look out of place in a blacksmith's shop. Even when you consider the constraints imposed by regulatory demands, there is great scope for inventiveness. I've worked on replacement hip joints, inhalers, optical tonometers and hospital robots (some of them are actually useful). A few more recent (and, yes, radical) ones are suggested below.

Mark: Yes, I agree, for many reasons it is a fascinating area. Get it right and the rewards can be great both financially and in saving or, at least, helping lives. A Nobel prize here and there would also not go amiss.

With such a diverse array of problems and radical solutions, it is difficult to know where to start. Out of the bunch, e.g. pain reduction, patient privacy, pill control and hygiene, my instinct is to focus on the most pressing one, 'hygiene', and help in combating superbugs, viruses and bacteria that blight our hospitals.

Patrick: The hygiene issue is serious, but there's a pain relief problem I'd like to consider first. I have been a little shaken to discover that the over-the-counter painkillers, which my family uses, have suddenly been doubled in strength with minimal changes to the packaging and the pills themselves. It's clearly a bad idea to start ingesting double the expected amount of some pharmaceutical substance.

To make the amount explicit, I suggest supplying double-strength tablets in a double-decker blister package, one layer of which would be empty. Normally, pressing the back of the pack forces a tablet through the foil. In this upgrade, each tablet would then need to be forced through the second, empty layer of blister pack (and foil), so that the idea of double strength would be embodied physically and could therefore not be ignored.

I'd also manufacture the pills themselves in an unattractive shade of green, rather than Smartie-colour, in order to minimise any possible confusion with confectionery: darker green could be used to code for the stronger type of tablet (given how reluctant children are to eat peas, this has got to be an effective safety measure).

Mark: Over-medicating can clearly be very dangerous, so your 'suddenly been doubled in strength' story surprises me, but it is an isolated case. There is much tougher legislation in place now, manufacturers and brand owners have a far greater responsibility and accountability than ever before.

Also, bear in mind that you cannot blame it totally on poor packaging, the consumer has to share some of the responsibility and must always read the instructions (however small).

The double-decker pack would never work. In doubling the size you double the cost, and would get lynched by the 'over-packaging brigade'. I also strongly disagree with your pill colour choice and idea. Green is a colour in nature that generally indicates something is OK to eat. Remember your mother saying 'eat your greens'? Blue is probably a better candidate, although now ironically re-hijacked by Smarties, as it often means something is rotten and inedible. A more practical solution is to add a figure from one to five on the pill in the manufacturing stage to indicate its strength.

Yes, there is always room for improvement, but I feel this is being addressed pretty well. Many thousands of lives have been saved over recent years, from ever improving child-resistant containers, single-pill-dispensing closures and clearer graphics. Let's move on.

Patrick: It's interesting that many of these apparently technical advances are really about controlling human behaviour. I was once shown a biofeedback computer game at the MIT lab in Dublin in which emotionally disturbed children could win points by relaxing and lowering their heart rates as they played. Similarly, some Oxford researchers have shown that pain can be decreased if patients view their injuries through inverted binoculars. The obvious suggestion here would be to allow them to use a webcam and zoom out from the resulting image. I'd further suggest viewing images of their injury processed by adding background illumination in different colours.

Mark: I kind of get it, but doubt that actual physical pain is reduced much, if at all. There is undoubtedly, though, a comfort in being

able to investigate a sore up close. It is a survival instinct, where we check ourselves out to make sure that it is nothing too serious. The means and technology are already out there. A carefully positioned mirror with some good yoga moves, and most, if not all, your body surfaces can be screened.

As for the idea of adding coloured background illuminations, you have either been watching too many reruns of Walt Disney's 'Fantasia' or perhaps, by mistake, you are taking twice your medication (remember to check the label).

Patrick: It's certainly true that medical research seems to conflict with itself on a daily basis, but I'd be surprised if it were a negligible effect given how hard it is to get anything new published in medical literature.

One particularly lamentable aspect of being stuck in hospital these days (aside from the delays in gaining access to anyone with a medical qualification – and let's not even discuss the food) is the lack of patient privacy. You can find yourself unavoidably party to conversations, behind flimsy fabric screens, that should really stay private between doctors and their patients. Certainly, there's no chance of discreetly screening one's body in a mirror, however therapeutic that may be.

My next 'medical' invention is, therefore, a double hood device, one end of which is worn by a doctor; the other by his/her patient. This could be made in the form of, for example, two polystyrene hemispheres joined by a semi-cylindrical tunnel. Medics would have to ask patients if they wanted to talk privately and, if so, both would place a hemispherical helmet on their heads and talk quietly via the tunnel. In this way, their discussion would remain confidential: both could sit comfortably and without increased risk of cross infection. Several such devices could be cheaply made available in every ward, perhaps designed to nest compactly together.

Mark: They say that laughter is a great healer, so I would really love to see this idea in action, but not for the reasons you've given. It would make doctors and patients look ridiculous, even more stupid than virtual game players – you know, where no bat, skipping rope, club or brain is needed. Just make sure you do not split your stitches laughing.

In the real world, I can never understand what doctors are saying anyway. And, on the contrary, there would be a higher risk of cross-infection from air-bound viruses 'ping ponging' through the direct tunnel. Needless to say, although undoubtedly a great tonic, doctors would never wear it.

Patrick: Virtual games? Isn't that a multi-billion dollar industry?

Anyway, another problem is that, apparently, medics just won't wash their hands enough (150 years after Joseph Lister proved the importance of doing so). My idea here is to supply their beloved white coats with two removable, disinfectant-impregnated pocket linings fitted as they leave the hospital laundry. The linings could be linked by a string running across the front of the wearer, making it impossible to remove the coat without extracting at least one of the linings and thus reminding the medics to discard them every time the coat is taken off. This would result in significantly less illness for the wearer and reduced transmission rates to his or her unfortunate patients.

Mark: There is some substance to your invention, but it is not far-reaching enough and the application is all wrong.

Sometimes, by looking at the root causes of a problem a way can be found in making it part of the solution. People, for example patients, doctors, nurses and visitors, are the root cause of contaminating surfaces. If we can sanitise their hands using antimicrobial and add a disinfecting agent over long periods, rather than contaminating surfaces that they touch, they may even help to clean them.

The idea

Create a carrier (let's call it the 'Lister', after Joseph Lister) impregnated with the sanitising and disinfecting agents that is pliable enough to be used as a towel, but still retains its shape after use (a thermoplastic elastomer polymer should do the trick). This injection-moulded carrier would take the form of a small cow's bell – bell top, flat sides (making an oblong box shape) and hollow. The hollow would have a draft angle so they fit inside and can be stacked together, saving space and facilitating the dispensing and disposing operations.

It would have a small hook attachment on the bell top to accommodate a string. The string would be used as a fastening on a pre-positioned button for hospital staff on either side of their uniform so that the 'Lister' falls freely, resting just below the hip bone on trouser pocket level. One side would be shaped to fit the hip comfortably, so it does not swing and get in the way of your work.

To clean your hands, place one hand in the hollow and the other on the outside and use the same motion you would use in rubbing soap into your hands. This action could be used time and time again over the course of the day, while moving from one patient to another, opening doors, turning taps and putting the toilet seat up or down, for example.

At entrances to each building or ward, there should be a dispensing and disposing facility for visitors, with maybe even a small charge to cover costs, and a fresh one attached to each patient's bed daily.

Because this idea is very visual, it has a good chance of working in practise (being policed and monitored by everyone – 'why are you giving us your germs by not wearing or using your Lister?').

The 'Lister' can be cleaned, re-impregnated and used many times over, making it very environmentally friendly.

Patrick: It sounds very much like a sporran – or even perhaps an udder. Is this really better than a clean hankie? It might get accepted if we could somehow make it a badge of rank, like the stethoscope has become, but it seems unlikely to be able to deal with viral particles any more effectively than that spray-on stuff the politicians use.

Anyway, if one were to trip over a dangling udder, I have a solution for the broken tibia which might occur. Think of vacuum-packed coffee – each pack is surprisingly strong, stiff and light. So, my latest idea is to create an advanced splint. A tough, foil cylinder would have its interior filled with particles, like coffee grounds, which rasp against each other when compressed and refuse to flow. A broken limb would be placed into the cylinder's core. The air between the particles in the cylinder wall would then be extracted, according to the required level of stability (a small foot pump would do).

This would allow easy, repeated access for the medics to the damage while it was healing and be entirely reusable when recovery was complete.

A search carried out by the British Library Research Service (www.bl.uk/research) on 'a hand disaffecting carrier', revealed six of them, patents US2006078484, US2005124945, JP11019193, US5683012, GB2451156 and WO2003078296 which can be viewed on Espacenet.

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