Accuracy of comparing bone quality to chocolate bars for patient information purposes: observational study

Phil Jones, Sarah Jones, Debbie Stone

ABSTRACT
Objective To test whether standard information for patients using Crunchie and Aero chocolate bars to explain bone health and risk of fracture is robust.
Design Observational study.
Setting Domestic kitchen in rural west Wales.
Participants 10 Crunchie bars and 10 Aero bars.
Main outcome measure Fracture after falls from varying heights.
Results Both Crunchie and Aero bars exhibited the same T and Z scores for bone density. Crunchie bars had a lower chocolate mass index than the Aero bars. Crunchie bars are more liable to fracture.
Conclusions Using Crunchie and Aero chocolate bars to explain bone structure to patients may be visually attractive but oversimplifies the situation.

INTRODUCTION
It is important that information provided to patients as part of their treatment should be comprehensive and accurate. Within our area of practice relating to osteoporosis and fragility fracture we have noticed a tendency to compare normal, healthy bone to the finely honeycombed structure of a Crunchie (Cadbury Trebor Bassett; Bournville, Birmingham) chocolate bar and to compare abnormal, osteoporotic bone to the coarser structure of an Aero (Nestle UK; York) bar (fig 1).1 2 Although this explanation is readily appreciated by patients and clinicians it struck us that the comparison may not be completely valid as no work has been published on the fracture potential of each bar. This might mean that with best intentions we are advising patients to aspire to a bone structure that is actually more liable to fracture. To enable us to provide accurate data to our patients we studied the fracture risk for each chocolate bar.

METHODS
We randomly purchased 20 chocolate bars (10 Crunchie and 10 Aero) from a reputable high street confectioner; the number of bars was limited by research funds and our rural environment. Each bar was measured to provide information on height (defined as the longest dimension of the bar, in metres) and mass (determined in kilograms). The composition of the bar was determined through reference to the packaging. We could ascertain no data on other fracture risks. The tests were completed in a controlled environment and the flooring was standard 33×33 cm ceramic kitchen floor tiles with average grouting. This environment was chosen as being representative of the home environment, where many fractures occur.

The end point of the study was fracture. Firstly, we allowed each bar to topple from its standing height in the centre of a tile. We then dropped each bar horizontally on to the centre of the tile from increasing heights until fracture, defined as a break in the cortex;
we did not regard mild deformity as a fracture. The
tests were carried out at a temperature of 22°C after
the bars had had eight hours to reach a steady state
temperature. We used a bone densitometer (Discovery-C; Hologic, Bedford, MA) to carry out dual energy
x ray absorptiometry (whole body) on one Aero and
one Crunchie, with bone mineral density being used as
a surrogate for measuring chocolate density. Height
was measured with a tape measure (Olympia (6 m/16 ft)
Power Return Tape; Olympia (UK); Reading, Berks).
We chose a Kaplan-Meier “fracture free” survival curve
as the best means of analysing the data obtained.

RESULTS
The table provides comparative data for Crunchie and
Aero chocolate bars. All bars had the same dimensions
(to within the accuracy of our measure). No bars fractured
in falls from a standing height. A Kaplan-Meier survival
curve shows the occurrence of fractures according to
heights (fig 2). Figures 3-5 show the range of fractures.

DISCUSSION
Using Crunchie and Aero chocolate bars to explain bone
structure and fracture risk to patients may be visually
attractive but oversimplifies the situation. Our findings
must be interpreted with some caution as we used a
small number of participants and the falls were not low
trauma—that is, standing height or less. To date a reli-
able population database for chocolate densities has not
been established and we acknowledge that our reference
population is somewhat subjective; there may be scope
for further research in this area, including risk of frac-
ture over 10 years. Our findings, however, clearly show
that despite the apparently more robust structure of a
Crunchie it is more likely to fracture than an Aero.

It is generally recognised that bone strength is a reflec-
tion of bone density and bone quality and therefore the
explanation for our incidence of fracture is likely to be
multifactorial. It may include differences in chocolate
mass index (2.16 for Crunchie v 2.76 for Aero), and the
higher protein content of the Aero is likely to provide
more elastic stress properties than that of the Crunchie.

Characteristics of Crunchie and Aero chocolate bars

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Crunchie</th>
<th>Aero</th>
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<tbody>
<tr>
<td>Height (m)</td>
<td>0.136</td>
<td>0.129</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>0.04</td>
<td>0.046</td>
</tr>
<tr>
<td>Chocolate mass index (kg/m2)</td>
<td>2.16</td>
<td>2.76</td>
</tr>
<tr>
<td>Content:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein (g)</td>
<td>1.6</td>
<td>3.0</td>
</tr>
<tr>
<td>Carbohydrate (g)</td>
<td>27.8</td>
<td>27.0</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>7.6</td>
<td>14.6</td>
</tr>
<tr>
<td>Fibre (g)</td>
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</tr>
<tr>
<td>Sodium (g)</td>
<td>No data</td>
<td>Trace</td>
</tr>
<tr>
<td>Salt equivalent (g)</td>
<td>No data</td>
<td>0.1</td>
</tr>
<tr>
<td>Calcium (g)</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>Collagen (g)</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>T score†</td>
<td>−9.5</td>
<td>−8.8</td>
</tr>
<tr>
<td>Z score‡</td>
<td>−9.5</td>
<td>−8.8</td>
</tr>
</tbody>
</table>

† and ‡ scores are referenced to 50 year old woman.

†Number of standard deviations above (or below) mean for peak bone mineral density score.
‡Age and sex matched number of standard deviations above (or below) the mean bone mineral density score.
Our data provide evidence of the disparity between chocolate density and fracture rates. The use of Crunchie and Aero bars to explain bone health and fracture risk to patients, although palatable, is not justified. In practical terms we believe that the findings should contribute to the provision of improved patient information and education by enlightened healthcare professionals. The study serves to remind clinicians that both chocolate density and bone mineral density form but one component of fracture risk. The accurate assessment of fracture risk should ideally take into account other measurable indices that contribute to fracture risk in addition to that provided by chocolate density and bone mineral density.

We thank Phil Stone for measuring the bars and Diane Hughes for carrying out the dual x-ray absorptiometry.

Contributors: PJ, SJ, and DS recognised the need for research in this area and devised the protocol. DS recorded the data. PJ and SJ carried out the drop tests. PJ, DS, and SJ wrote the manuscript. PJ is guarantor.

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Dissent of the Testis

We previously reported that two chocolates—T easers and Truffles (Celebrations, Masterfoods UK, Melton Mowbray)—were strikingly similar to the 8 ml bead of the orchidometer used to assess testicular volume. We therefore suggested that they could be used to stage puberty in males and, because of their wide availability and low cost, commended their use. We were recently dismayed to discover that the manufacturer has changed the shape of both these chocolates. Both are now flat bottomed (figure), and even non-specialists will notice that they bear little resemblance to testes. More disturbingly, they are no longer much use for assessing testicular volume. Only one of six paediatric endocrine specialists (comprising trainees, consultants, and specialist nurses) felt confident that they could use the new T easers or Truffles to gauge testicular volume relative to the 8 ml cut-off which indicates that puberty is proceeding satisfactorily. This is a major setback for paediatric endocrinology, and the manufacturer’s decision to change the sweets’ morphology without consulting the medical profession is a further kick in the T easers. Despite conveying our concerns to the manufacturer, we have received no clear explanation, nor any reassurance that this issue is being taken seriously.

We appreciate that marketing chocolates is a matter of great commercial sensitivity and hope that we have not inadvertently hit a delicate spot by drawing attention to the fact that these sweets looked and felt like testes.
Physicians understand that practicing good medicine requires the constant acquisition of new knowledge, though they often assume their existing medical beliefs do not need re-examination. The medical myths we give here are a light hearted reminder that we can be wrong and need to question what other falsehoods we unwittingly propagate as we practice medicine.

We generated a list of common medical or medicine related beliefs espoused by physicians and the general public, based on statements we had heard endorsed on multiple occasions and thought were true or might be true.

We selected seven for critical review. We used Medline and Google to search for evidence to support or refute each of these claims. Because “proving a negative” can be challenging, we noted instances in which there was no evidence to support the claim.

Rachel C Vreeman is a fellow in children’s health services research at Indiana University School of Medicine, Indianapolis
rvreeman@iupui.edu
Aaron E Carroll is an assistant professor of paediatrics at the Regenstrief Institute, Indianapolis.
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### Medical Myths

#### Drink at least eight glasses of water a day

The advice to drink at least eight glasses of water a day can be found throughout the popular press. One origin may be a 1945 recommendation that stated: “A suitable allowance of water for adults is 2.5 litres daily in most instances. An ordinary standard for diverse persons is 1 ml for each calorie of food. Most of this quantity is contained in prepared foods.” If the last, crucial sentence is ignored, the statement could be interpreted as instruction to drink eight glasses of water a day.

Another endorsement may have come from a prominent nutritionist, Frederick Stare, who recommended, without references, the consumption of “around 6 to 8 glasses per 24 hours,” which could be “in the form of coffee, tea, milk, soft drinks, beer, etc.” The complete lack of evidence supporting the recommendation to drink six to eight glasses of water a day is exhaustively catalogued in an invited review by Heinz Valtin in the American Journal of Physiology. Also, existing studies suggest that adequate fluid intake is usually met through typical daily consumption of juice, milk, and even caffeinated drinks. But drinking excess amounts of water can be dangerous, resulting in water intoxication, hyponatraemia, and even death.

#### We use only 10% of our brains

The belief that we use only 10% of our brains has persisted for over a century, despite considerable advances in neuroscience. In another extensive expert literature review, Barry Beyerstein provides a detailed account of the origins of this myth and the evidence disputing it. Some sources attribute this claim to Albert Einstein, but no such reference or statement by Einstein has ever been recorded. This myth arose as early as 1907, propagated by multiple sources advocating the power of self-improvement and tapping into each person’s unrealised latent abilities. Evidence from studies of brain damage, brain imaging, localisation of function, microstructural analysis, and metabolic studies show that people use much more than 10% of their brains. Studies of patients with brain injury show that damage to almost any area of the brain has specific and lasting effects on mental, vegetative, and behavioural capabilities. Many types of brain imaging studies show that no area of the brain is completely inactive. The many functions of the brain are highly localised, with different tasks allocated to different anatomical regions. Detailed probing of the brain has failed to identify the “non-functioning” 90%. Even micro-level localisation, isolating the response of single neurones, reveals no gaps or inactive areas. Metabolic studies, tracking differential rates of cellular metabolism in the brain, show no dormant areas.

#### Hair and fingernails continue to grow after death

Morbid information about the body captures the imagination and reinforces medical mythology. In All Quiet on the Western Front, the author describes a friend’s fingernails growing in corkscrews after the burial. Johnny Carson even perpetuated this myth with his joke, “For three days after death hair and fingernails continue to grow, but phone calls taper off.” To quote the expert opinion of forensic anthropologist William Maples, “It is a powerful, disturbing image, but it is pure moonshine. No such thing occurs.” This myth does have a basis in a biological phenomenon that can occur after death. As Maples and numerous dermatologists explain, dehydration of the body after death and drying or desiccation may lead to retraction of the skin around the hair or nails. The skin’s retraction can create an appearance of increased length or of greater prominence because of the contrast between the shrunken soft tissues and the nails or hair. The actual growth of hair and nails, however, requires a complex hormonal regulation not sustained after death.
The fearful idea that reading in dim light could ruin your eyesight probably has its origins in the physiological experience of eye strain. Suboptimal lighting can create a sensation of having difficulty in focusing. It also decreases the rate of blinking and leads to discomfort from drying, particularly in conditions of voluntary squinting. The important counterpoint is that these effects do not persist.

The majority consensus in ophthalmology, as outlined in a collection of educational material for patients, is that reading in dim light does not damage your eyes. Although it can cause eye strain with multiple temporary negative effects, it is unlikely to cause a permanent change to the function or structure of the eyes. Even in patients with Sjögren’s syndrome (an autoimmune disease that features inflammation in some glands of the body), decreased functional visual acuity associated with strained reading improves when they stop reading.

One review of myopia concluded that increased use of the eyes, such as reading in dim light or holding books too close to the face, could result in impaired ocular growth and refractive error. The epidemiological evidence cited was primarily of the increased prevalence of myopia and the high incidence of myopia in people with more academic experience. The author notes that this hypothesis is just beginning to “gain scientific credence.”

Reading conditions used to involve less light, relying on candles or lanterns, so increased rates of myopia over the past several centuries does not necessarily support that dim reading conditions are to blame. In contrast to that review, hundreds of online expert opinions conclude that reading in low light does not hurt your eyes.

Another common belief is that shaving hair off will cause it to grow back in a darker or coarser form or to grow back faster. It is often reinforced by popular media sources and perhaps by people contemplating the quick appearance of stubble on their own body.

Strong evidence disproves these claims. As early as 1928, a clinical trial showed that shaving had no effect on hair growth. More recent studies confirm that shaving does not affect the thickness or rate of hair regrowth.

Also, shaving removes the dead part of hair, not the living section below the skin’s surface, so it is unlikely to affect the rate or type of growth. Shaved hair lacks the finer taper seen at the ends of unshaven hair, giving an impression of coarseness. Similarly, the new hair has not yet been lightened by the sun or other chemical exposures, resulting in an appearance that seems darker than existing hair.

Despite the concerns, there is little evidence. In the United Kingdom, early studies showed that mobile phones interfered with only 4% of devices and only at a distance of <1 m. Less than 0.1% showed serious effects. At the Mayo Clinic in 2005, in 510 tests with 16 medical devices and six mobile phones, the incidence of clinically important interference was 1.2%.

Rigorous testing in Europe found minimal interference and only at distances <1 m. Recent technological improvements may be lessening even this minimal interference. A 2007 study found no interference in 300 tests in 75 treatment rooms. But a large survey of anaesthetists found that use of mobile phones by doctors was associated with reduced risk of medical error or injury resulting from delays in communication (relative risk 0.78; 95% confidence interval 0.62 to 0.96).

Eating turkey makes people especially drowsy

Tryptophan in turkey may be the most commonly known fact pertaining to amino acids and food. Evidence shows that tryptophan is involved in sleep and mood control and can cause drowsiness. L-tryptophan has been marketed as a sleep aid.

The myth is that consuming turkey (and the tryptophan it contains) might particularly predispose someone to sleepiness. Actually, turkey does not contain an exceptional amount of tryptophan. Turkey, chicken, and minced beef contain similar amounts of tryptophan (about 350 mg per 115 g), and other sources of protein, such as pork or cheese, contain more tryptophan per gram than turkey. The effects of tryptophan in turkey are probably minimised by consuming it with other food, which may limit its absorption. And in fact, supplemental tryptophan on an empty stomach is recommended to aid absorption.

Other physiological mechanisms explain drowsiness after meals. Any large meal (such as turkey, sausages, stuffing, and vegetables followed by Christmas pudding and brandy butter) can induce sleepiness because blood flow and oxygenation to the brain decrease, and meals rich in protein or carbohydrate may cause drowsiness. Wine may also play a role.
Safety is paramount to travellers. Governments agree, and the airport operator BAA has spent £20m (£28m; $41m) on airport security in the past year alone. Add the $15bn that the government of the United States spent between 2001 and 2005 on aviation screening, or the estimated $5.6bn that worldwide airport protection costs each year, and we reach one conclusion—airport screening is extremely costly. Yet on 30 July 2007, the head of the International Air Transport Association, Giovanni Bisignani, launched a scathing attack on airport security in the United Kingdom: he claimed that the UK’s “unique screening policies inconvenience passengers with no improvement in security.”

Complaints about the cost of airport security have flooded the news in recent months, but the problem is not new. The UK has seen a 150% increase in airport security costs since the terrorist attacks on 11 September 2001 and even steeper rises since the London bombings on 5 July 2005. With such high value attached to airport security, the details of efficacy, precision, and cost effectiveness of screening methods are easy to ignore. Protection at any cost is a reassuring maxim for us jetsetters. But preventing any death—whether from haemorrhagic stroke, malignant melanoma, or diabetic ketoacidosis—is surely an equally noble cause. In most such cases, screening programmes worldwide are closely evaluated and heavily regulated before implementation. Is airport security screening an exception?

Screening evaluated
The UK National Screening Committee’s remit is to assess screening technologies on the basis of sound scientific evidence and advise on whether they should be implemented, continued, or withdrawn. The table outlines the criteria used to evaluate screening programmes. These criteria include an important and treatable condition, an accurate and acceptable test, and sufficient evidence of benefit of the proposed screening project from randomised trials. To be considered for a screening programme, the condition must be common and of considerable burden to society. Furthermore, a “preclinical” phase must exist, during which the condition can be detected and treated. Cervical cancer is

<table>
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<th>National Screening Committee criteria for implementation of screening programmes</th>
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<tr>
<td><strong>Criteria</strong></td>
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<tr>
<td>The condition</td>
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<tr>
<td>Important health problem</td>
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<tr>
<td>Detectable marker or risk factor available</td>
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<tr>
<td>Latent period or early symptomatic stage exists</td>
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<tr>
<td>All cost effective interventions for primary prevention already implemented</td>
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<tr>
<td>The test</td>
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<tr>
<td>Simple, safe, precise, and validated screening test</td>
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<tr>
<td>Acceptable to the population</td>
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<tr>
<td>Agreed cut-offs known and policy for further testing in place</td>
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<tr>
<td>The treatment</td>
</tr>
<tr>
<td>Effective treatment or intervention for those identified early with better outcome than those identified late</td>
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<tr>
<td>Evidence based policies for deciding who should be treated</td>
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<tr>
<td>The screening programme</td>
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<tr>
<td>Evidence from high quality randomised controlled trials that screening programme is effective in reducing mortality or morbidity</td>
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<tr>
<td>Evidence of clinical, social, and ethical acceptability</td>
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<tr>
<td>Benefit of screening outweighs physical and psychological harm</td>
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<tr>
<td>Opportunity cost of the programme economically balanced in relation to expenditure on medical care as a whole</td>
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<tr>
<td>Quality assurance and monitoring in place</td>
</tr>
<tr>
<td>All other options for managing the condition have been considered</td>
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Would airport security checks pass the National Screening Committee’s criteria for an effective test, ask Eleni Linos, Elizabeth Linos, and Graham Colditz.
a classic example—although morbidity and mortality are high worldwide, if detected early, premalignant lesions can be cured. The criteria also mandate that a suitable screening test should be simple, safe, and validated. For example, cholesterol monitoring—used to screen for hyperlipidaemia and prevent its complications—fits these requirements. It is acceptable to the population, it has well defined cut-off values, and the benefit of treatment is established, making it an excellent screening test. Yet things are rarely this straightforward, and for most screening programmes we rely on scientific evidence to show efficacy and effectiveness, cost-benefit balance, and acceptability.

Discussion on whether screening programmes should be implemented inevitably centres on at least one of these key criteria. For example, recent debates on cervical screening have focused on the test—namely, the sensitivity and predictive value of testing for human papillomavirus or liquid based cytology compared with conventional cervical smears. For lung cancer screening the sticking point has been the quality of the evidence showing that computed tomography screening improves overall mortality. A similar debate for prostate specific antigen testing remains unresolved.

We examine whether airport security screening is an acceptable screening programme—is the evidence sufficient to meet the National Screening Committee’s criteria? We then identify points of future research that could encourage a more rigorous evaluation of airline security measures.

**Airport security**

**The “disease” and its treatment**

Presumably, one of the negative outcomes or “diseases” we are trying to prevent is injury to passengers or crew as a result of in-flight terrorist attacks. The time between arriving at the airport and boarding the plane is the latent period during which dangerous objects can be detected and attacks prevented by confiscation, explosive disarmament, or arrest. These are analogous to the condition, preclinical phase, and treatment—so, far so good. But although any potential threat to the safety of passengers is a noteworthy cause worth fighting against, such events are extremely rare.

Since 1969, only 2000 people have died as a result of explosives on planes, yet the US department of homeland security spends more than $500m annually on research and development of programmes to detect explosives at airports. Even the devastating 11 September 2001 attacks caused around 3000 deaths, which is similar to the number of deaths attributed to high blood glucose each day or the number of children dying of the human immunodeficiency virus every three days worldwide. The publicity awarded to such terrorist attacks is so high that the perceived threat is far higher than the numbers suggest. Furthermore, the cost of airport security ($9 per passenger) is 1000 times higher than for railway security ($0.01 per passenger), even though the number of attacks on trains is similar to that in planes. This is analogous to committing mammography resources to screening only the left breast, and ignoring the right side, even though cancer can affect both breasts.

**The tests and evidence of benefit**

We systematically reviewed the literature on airport security screening tools. A systematic search of PubMed, Embase, ISI Web of Science, Lexis, Nexis, JSTOR, and Academic Search Premier (EBSCOhost) found no comprehensive studies that evaluated the effectiveness of x ray screening of passengers or hand luggage, screening with metal detectors, or screening to detect explosives. When research teams requested such information from the US Transportation Security Administration they were told that evaluating new screening programmes might be useful, but it was overshadowed by “time pressures to implement needed security measures quickly.” In addition, we noticed that new airport screening protocols were implemented immediately after news reports of terror threats (fig 1).

The little we do know about airport security screening comes from investigations of the factors that influence the sensitivity of visual screening of x ray images. These studies conclude that sensitivity depends on the screener’s experience, rather than the precision of the machine. Practice improves the Screener’s performance, but unfamiliar or rare objects are hard to identify regardless of experience. Mammography radiologists realise this and undergo years of specialised training after medical school.

Even without clear evidence of the accuracy of testing, the Transportation Security Administration defended its measures by reporting that more than 13 million prohibited items were intercepted in one year. Most of these illegal items were lighters. The screening literature shows that length time and lead time bias produce misleading interpretations of screening studies because of earlier detection of more benign cases that would not necessarily become clinically apparent (overdiagnosis). A similar problem arises with the above reasoning—although more than a million knives were seized in 2006, we do not know how many would have led to serious harm.

**The questions**

The absence of scientific evaluations of the screening tools currently in place and the vast amount of money spent by governments worldwide on airport security have led us to muse over current airport security protocols and wonder about their optimal implementation. What is the sensitivity of the screening question, “Did you pack all your bags?” and has anyone ever said no? Can you hide anything in your shoes that you cannot hide in your underwear? What are the ethical implications of preselecting high risk groups? Are new technologies that “see” through clothes acceptable? What hazards should we screen for? Guns and explosives certainly, but what about radioactive materi-
An experiment

If we were to evaluate the effectiveness of airport screening, we would start by assessing the accuracy of current tests for illegal objects in passengers’ luggage. This would yield only preliminary information on screening test performance; we would need to reapply for funding to evaluate the overall benefit of security screening on mortality and calculate the number needed to screen to prevent the death of one traveller. After informing the airport managers, gaining approval from research ethics committees and police, and registering our trial with one of the acceptable International Committee of Medical Journal Editors trial registries, we would select passengers at random at the check-in desks and give each traveller a small wrapped package to put in their carry-on bags. (We would do this after they have answered the question about anyone interfering with their luggage.) A total of 600 passengers would be randomised to receive a package, containing a 200 ml bottle of a non-explosive liquid, a knife, or a bag of sand of similar weight (control package) in a 1:1:1 ratio. Investigators and passengers would be blinded to the contents of the package. Our undercover investigators would measure how long it takes to get through security queues and record how many of the tagged customers are stopped and how many get through. A passenger who is stopped and asked to open the wrapped box would be classed as a positive test result, and any unopened boxes would be considered a negative test result. We would use the number of true and false positives and true and false negatives to estimate the sensitivity and specificity of the current screening process and pool the waiting times to estimate an average waiting time for each passenger (fig 2).

We have heard rumours that this sort of thing actually goes on—that agents occasionally carry illicit items through airport screening units to “test” them and identify gaps in security. Perhaps the evidence we are searching for is strong, but secret. And of course rigorous airport screening may have other benefits. It certainly deters the transport of any illicit object, such as less dangerous but equally unwanted plants, animals, or drugs. In addition, in the midst of mounting reports of thwarted terrorist attacks on airports, the process is comforting to frequent flyers and their families. Nevertheless, the absence of publicly available evidence to satisfy even the most basic criteria of a good screening programme concerns us.

Conclusion

Of course, we are not proposing that money spent on unconfirmed but politically comforting efforts to identify and seize water bottles and skin moisturisers should be diverted to research on cancer or malaria vaccines. But what would the National Screening Committee recommend on airport screening? Like mammography in the 1980s, or prostate specific antigen testing and computer tomography for detecting lung cancer more recently, we would like to open airport security screening to public and academic debate. Rigorously evaluating the current system is just the first step to building a future airport security programme that is more user friendly and cost effective, and that ultimately protects passengers from realistic threats.

A day in the life of a doctor: the PowerPoint presentation

The main purpose of a PowerPoint presentation is entertainment. Intellectual content is an unwarranted distraction. In preparing a PowerPoint presentation, aesthetics should transcend substance. The background colour scheme and logo for your slides should be selected for maximum emotogenic potential. The first inverse ridicule of PowerPoint presentation states: “The more lines of writing that can be coerced onto a slide and the smaller the font, the lower the risk of anyone criticising any data which has accidentally been included.” The second rule states: “The number of slides you can show in your allotted time is inversely proportional to the number of awkward questions which can be asked at the end.”

PowerPoint has superseded the carousel era, when presentations were severely limited by the number of slots in the slide carousel and the risk of dropping the lot seconds before your talk.

Plagiarism laws do not apply to PowerPoint; so cartoons of marginal relevance but high entertainment value can be downloaded and shown at suitable intervals to maintain audience mirth while minimising critical capacity. Research has shown that the ideal cartoon: data ratio is 5:1.

The seasoned PowerPoint artist or PowerPointilliste has refined the presentation into a son-et-lumiere extravaganza, in which scattered dots and luminescent clumps of meaningless datasets hurtle on to the screen from all points of the compass, to the strident strains of Handel’s Fireworks Music, building inexorably to a Fantasia-style Sorcerer’s Apprentice climax. This fulfils an important subsidiary purpose of the PowerPoint presentation—to act as a bioassay of the epileptic threshold of the audience, a form of PowerPoint EEG.

PowerPoint has spawned a number of hitherto unrecognised diseases. These include PowerPoint phobia (PPP), PowerPoint stress disorder (PPSD), and a form of depression called PowerPointlessness. Yet another purpose of the PowerPoint presentation is to test the capacity of the regional electricity grid. In case this should be found wanting, and your presentation succeeds in fusing the power supply to the surrounding region, it is advisable to have a back-up presentation, a box of matches and a Chinese lantern.

David Isaacs (davidi@chw.edu.au) is a senior staff specialist in the department of immunology and infectious diseases and Dominic Fitzgerald is a senior staff specialist in the department of respiratory medicine, at the Children’s Hospital at Westmead, Sydney. Stephen Isaacs is a consultant at Waltham Forest Child and Family Consultation Service, London, at Children’s Hospital at Westmead.

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**Fig 2 | Study design flow chart for evaluation of current screening test for hand luggage**

- **Total number of passengers eligible**
  - Passengers approached over three random 24 hour periods (n=400-1000)
  - Excluded (for example, refused to participate)
  - Passengers randomised (n=600)

- **Assigned to carry a knife** (n=200)
- **Assigned to carry 200 ml of liquid** (n=200)
- **Assigned to carry sand bag** (n=200)

**Outcomes: true positive, false positive, true negative, false negative**

- **Sensitivity = true positive / true positive + false negative**
- **Specificity = true negative / true negative + false positive**

**Provenance and peer review:** Not commissioned; externally peer reviewed.

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Eleni Linos is a doctoral student at Harvard School of Public Health (elinos@hsph.harvard.edu). Elizabeth Linos is a research assistant at Harvard University and Massachusetts Institute of Technology. Graham Colditz is associate director at Washington University School of Medicine. We thank Lorelei Mucci, Monica McGrath, Mike Stoto, and Pat Cox.

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All references and details about contributors, sources, and funding are in the version on bmj.com.
Sneezing etiquette and the efficacy of masks in the operating theatre remain a subject of debate. Standard teaching dictates that one must face the wound when sneezing, so that droplets escape backwards, via the sides of the mask. A literature search found no clear demonstration of this principle.

We therefore tested the hypothesis that one should face the wound when sneezing into a surgical mask in theatre.

Method
A surgeon wearing a surgical mask (Kimberley Clark Healthcare) was encouraged to sneeze by inhaling finely ground pepper. A small reservoir of water was held in the floor of the mouth to improve the appearance of the droplets on the photographs. All photographs were taken by the medical photography department in a dark room with a dark background, using a Kodak DCS Pro SLR camera (ISO 160, 13.5MP resolution, RAW format) and a Nikon Micro-Nikkor 55mm F2.8 lens. A Sony HVL56AM flashgun was strobed (1/32 power, 2 sec, 10Hz). Images were converted into TIFF files and then sharpened slightly on Adobe Photoshop.

Results
Fig 1 shows the droplet spray from a sneeze without a mask. Fig 2 shows slight droplet spray escaping from the sides of the mask. Fig 3 shows there is also little spray escaping anteriorly. On close inspection, however, a few droplets can be seen escaping inferiorty on to the surgeon’s upper chest. None of our photographs showed substantial numbers of droplets passing behind the head of the surgeon.

Discussion
The doctrine of facing the wound when sneezing seems logical. Our study does not, however, support this hypothesis. A few droplets of spray escaped sideways, but no substantial numbers passed behind the surgeon’s head. Our photographs show that the most important visible escape of spray comes from below the mask on to the surgeon’s chest. We therefore recommend that surgeons should follow their instincts when sneezing during operations.

J Granville-Chapman and R L Dunn are at the department of plastic surgery, Salisbury District Hospital, Salisbury
jgchapman@doctors.org.uk

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SLANG AND SCHIZOPHRENIA

Unconventional language may hamper identification of disorganised speech, say Oliver D Howes and colleagues

We report the case of a 26 year old streetwise young postman who presented with a six month history of reduced occupational and social function, low mood, and lack of motivation. He complained of feeling less sociable and less interested in his friends and of being clumsy and finding it harder to think. He was otherwise fit and healthy, with no physical abnormalities, neurological signs, or objective cognitive impairments. There was no history of a recent stressor that might have precipitated his symptoms. He was referred to a specialist service for patients in the prodromal phase of psychotic illness for further assessment after he had seen his general practitioner and the local community mental health team. The differential diagnosis at this stage was depression, the prodrome of schizophrenia, or no formal clinical disorder.

His premorbid occupational and social function had been good. There was no history of abnormal social, language, and motor development and he left school with two A levels. After three years of service at the post office he had been promoted to a supervisory role. He had a good relationship with his family and had six or so good friends. There has been a number of previous heterosexual relationships, although none in the past year. Aside from smoking cannabis twice when he was 19, there was no history of illicit substance use.

Detailed and repeated assessment of his mental state found a normal affect, no delusions, hallucinations, or catatonia, and no cognitive dysfunction. His speech, however, was peppered with what seemed (to his middle class and older psychiatrist) to be an unusual use of words, although he said they were street slang (box). It was thus unclear whether he was displaying subtle signs of formal thought disorder (manifest as disorganised speech, including the use of unusual words or phrases, and neologisms) or using a “street” argot. This was a crucial diagnostic distinction as thought disorder is a feature of psychotic illnesses and can indicate a diagnosis of schizophrenia.

We sought to verify his explanations using an online dictionary of slang (urbanictionary.com). To our surprise, many of the words he used were listed and the definitions accorded with those he gave (see box). We further investigated whether his speech showed evidence of thought disorder by examining recordings of his speech as he described a series of ambiguous pictures from the thematic apperception test, a procedure that elicits thought disordered speech. His speech was transcribed and rated with the thought and language index, a standardised scale for assessing thought disorder. Slang used in a linguistically appropriate way is not scored as abnormal on this scale. His score was outside the normal range (mean in remitted patients with schizophrenia (mean in normal controls 0.88, SD 1.15) and indicates subtle thought disorder, equivalent to that evident in patients with formal thought disorder (mean 27.4, SD 8.3).2

Over the following year his social and occupational functioning deteriorated further, and he developed frank formal thought disorder as well as grandiose and persecutory delusions to the extent that he met DSM-IV criteria for schizophrenia. His speech was assessed as before, and the thought and language index score had increased to 11.75. This mainly reflected abnormalities on items comprising “positive” thought disorder, particularly the use of neologisms such as “chronocociling” and non-sequiturs.

To our knowledge this is the first case report to describe difficulties in distinguishing “street” argots from formal thought disorder. It is perhaps not surprising that slang can complicate the assessment of disorganised speech as psychotic illnesses usually develop in young adults, whereas the assessing clinician is often from an older generation (and different sociocultural background) less familiar with contemporary urban slang. Online resources offer a means of distinguishing street argot from neologisms or a peculiar use of words, and linguistic rating scales may be a useful adjunct to clinical assessment when thought disorder is subtle. Differentiating thought disorder from slang can be especially difficult in the context of “prodromal” signs of psychosis, when speech abnormalities, if present, are usually subtle.3 Nevertheless, accurate speech assessment is important as subtle thought disorder can, as in this case, predate the subsequent onset of schizophrenia,4 and early detection and treatment of psychosis might be associated with a better long term clinical outcome.5

Oliver D Howes, Sara Weinstein, Paul Tabraham, Lucia Valmaggia, Matthew Broome, and Philip McGuire are at the Institute of Psychiatry, London SE5 8AF o.howes@iop.kcl.ac.uk

Contributors and sources: The authors work at OASIS, a clinical service for people with prodromal symptoms of psychosis in South London and have expertise in the neurocognitive basis of disorganised speech in schizophrenia. The article developed from a clinical case presentation and discussions among the authors about the difficulties in assessing this case and others. ODH is guarantor.

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References
Struggling to understand what your colleagues are saying? Paul Keeley explains some medical neologisms

One of the principal virtues of the English language is its easy incorporation of new words and new meanings for old ones. The language has been constantly changing, enriched by each wave of immigration and by exposure to other languages, most notably during the days of the British Empire.1

The rate of change has accelerated recently with the advent of electronic media. Coupled with this has been the development of urban slang, tracked by online publications such as the Urban Dictionary.2 New terms can be derived from existing words or from popular culture (especially film, television, and the internet). Just as doctors need to familiarise themselves with new words arising from new concepts and technologies they need to keep up with changing usages and slang.

But it can be hard,3 particularly for those who don’t recognise the references. Here is a small selection of new terms in current use. I would be delighted to hear of more. (No personal inventions, please.)

Paul W Keeley is a consultant, Department of Palliative Medicine, Glasgow Royal Infirmary, Glasgow G4 0SF. paul.keeley@northglasgow.scot.nhs.uk

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All references are on bmj.com

PIMP MY SLANG

404 moment
The point in a ward round when—despite searches of the notes or electronic records—a result cannot be found. (From the world wide web error message “404—document not found.”)

Adminosphere
The pleasantly decorated and furnished palatial offices of trust management or the dean.

Administrivia
The flurry of pointless emails and paperwork that emanate from the adminosphere.

Agnostication
The (usually vain) attempt to answer the question, “How long have I got, doc?”

Blamestorming
A session of mutual recrimination during which a multidisciplinary team attempts to apportion blame for some particularly egregious error.

Disco biscuits
E, ecstasy, or methylenedioxymethamphetamine (MDMA)—a class A drug under the Misuse of Drugs Act 1971. Commonly used as a recreational drug by clubbers. An emergency doctor might say: “The man in cubicle 3 looks like he’s taken one too many disco biscuits.”

Father Jack
The confused, usually elderly patient whose constant high pitched verbal ejaculation and attempts to get out of bed are responsible for insomnia on wards. (From a character in the TV series Father Ted, who would sit in the corner of a room shouting “Drink,” “Feck,” “Arse,” etc.)

Fonzie
A middle grade doctor seemingly unflappable in any medical emergency. Based on the character Arthur “Fonzie” Fonzarelli from the American sitcom Happy Days. The allusion is to a conversation in the final scene of the Quentin Tarantino film Pulp Fiction: Yolanda: You don’t hurt him! Jules: Nobody’s gonna hurt anybody. We’re gonna be like three little Fonzie’s here. And what’s Fonzie like? Come on, Yolanda! What’s Fonzie like? Yolanda: Cool? Jules: What? Yolanda: He’s cool. Jules: Correctamundo! And that’s what we’re gonna be. We’re gonna be cool.

Hasselhoff
A patient presenting to accident and emergency with an injury with a bizarre explanation. (After the former Baywatch actor David Hasselhoff, who suffered a freak injury when he hit his head on a chandelier while shaving. The broken glass severed four tendons as well as an artery in his right arm, which required immediate surgery.)

Jack Bauer
A doctor still up and working after 24 hours on the job—now something of a rarity but will be recognised by older clinicians. Usually a bit tetchy: Colleague: Going for lunch, Jack? JB: (shouts) “THERE ISN’T TIME!” (From the lead in the television series 24.)

MacTilt
The lateral movement of the head to an angle of 45° to the vertical by a palliative care nurse specialist. It is intended to convey sympathy and understanding. (Mac from Macmillan nurse—a specialist palliative care nurse—and tilt.)

Mini me
A trainee or medical student who emulates their senior colleague a little too much but doesn’t say a lot. Can be very annoying. (From the character in the Austin Powers films.)

Ringo
Expendable member of a team. (After Ringo Starr, drummer with the Beatles. John, Paul, and George went on to successful solo careers. Ringo did the voiceover for Thomas the Tank Engine.)

Search and rescue
The medical middle grader allocated to look after the patients dotted in non-medical wards.

Testiculation
The lateral movement of the head to an angle of 45° to the vertical by a palliative care nurse specialist. It is intended to convey sympathy and understanding. (Mac from Macmillan nurse—a specialist palliative care nurse—and tilt.)

Ward 101
The source of referrals that fills the recipient with dread. (From room 101, which contained all the deepest fears of the protagonist in George Orwell’s novel 1984.)
Among the most dreaded aspects of the practice of medicine is the need for direct communication with patients or their families about “death and dying.” Their mental suffering is paralleled by the emotional angst evoked in the communicating clinician. For some specialists who focus on chronic illness, these talks can be a routine, even daily, task. Systematic studies of physicians’ attitudes show that most of them tend to avoid answering specifically poignant questions posed by patients and their families, and they often give overestimates of predicted survival. In the absence of a well-defined training template, knowledge and recommendations about how to conduct such conversations reflect evolutionary behavior gleaned from practical advice. Our primary objective was to ascertain physicians’ approaches to the “death and dying” talk and to correlate them with such vital characteristics as type of practice (general or specialty based), years of experience, and environment of practice (academic or private).

**Distinct profiles**

After years spent in critical observation of our colleagues, we developed a keen awareness of the distinctly segregated and tangential ways in which physicians deal with the “death and dying” talk. We were able to discriminate the following distinct clinical profiles.

**The evangelist** (fig 1)—These people are usually very reflective and readily invoke references to a “higher power” and “destiny.” They are effusively empathic, seem genuine and caring, and are never hampered by time constraints. They are usually adept at the immediate expression of sadness or, when it is called for, can produce tears in concert with patients and family members. As the conversation proceeds, they express intense knowledge about the “after life.” When asked if they have ever directly experienced the “after life,” they usually become “deflectors.”

**The deflector** (fig 2)—People with this profile usually take on the semblance of a “lay person” and divest themselves of the garb of being a healthcare provider. They often shun the white coat or a stethoscope in an effort to “blend in.” They are very aware of their environment and can immediately suggest and solicit the expertise of any person available in the near vicinity to proclaim them as an “expert” in the field. They are enthusiastically supportive of the “don’t ask, don’t tell” policy.

**The amateur** (fig 3)—These are often a well-intentioned people, thrust into a critical conversation by the deflector or through aimless wanderings. They are usually typified by anxiety and the easy manifestation of forehead sweat. Once they realize the precarious nature of their situation, they often hope and wish for an immediate rescue by another person, irrespective of that person’s category. Unfortunately, help is usually unavailable and unwilling.

**The precisionist** (fig 4)—This profile is exemplified by a “numbers” person, who seeks to provide probabilistic certainty of future events. Such people tend to create the aura of certainty by often using a calculator as they seem to be deep in thought, calculating the odds of survival. People
fortunate enough to interact with the precisionist are often left marvelling at his or her knowledge, but they later develop grave confusion. Interestingly, contrary to their own personal beliefs, precisionists exhibit great disappointment in their ability to predict the stock market, as well as the eventual outcome of the patient.

The grim reaper (fig 5)—This is a special category of usually personally disgruntled healthcare providers who often initiate a dialogue with “Well, this won’t take long.” They are often perceived as “cut and dried,” “matter of fact,” and insensitive and are usually dreaded and avoided by colleagues from other categories.

The knight (fig 6)—Polar opposites of the grim reaper, people in this category are usually charming to a fault and can always determine at least one more possible treatment approach, irrespective of the miraculous nature of their suggestion. They often create the perception of “leaving no stone unturned” in the patient’s medical defence, despite fruitless use of resources. Such people quickly create gnawing sensations in insurers and hospital administrators.

The chameleon (fig 7)—This rare entity describes a person who is capable of matching the situation to the approach by transforming into the evangelist, precisionist, knight, grim reaper, or deflector but never the amateur.

Further analysis of clinical profiles
Surgeons usually present themselves as knights, despite an obviously optionless situation, but quickly transform into deflectors when their intervention results in a clearly worse clinical scenario. Among physicians, those who specialise in cancer are often identified as evangelists, precisionists, knights, grim reapers, or deflectors but never the amateur.

Cardiovascular specialists segregate most often as precisionists and are seen touting statistics gleaned from clinical trials that bear fortuitous acronyms such as Hope, Care, Cure, Valiant, Courage, and Miracle. Recently graduated physicians are, with only rare exceptions, identified with the amateur clinical profile. This class is also commonly encountered among people in their early years of practice or in specialties with limited contact with patients (pathology and radiology).

Compared with other profiles that remain stagnant, the amateur category is usually transient and quickly transforms to a more vivid category and follows a common pattern. The amateur becomes, for a brief period, a deflector and then develops into one of the other groups. A select minority (5%) of amateurs remain in that category for many years until the heavy emotional toll transforms them into grim reapers. Academic university practices enable and foster the persistence of the deflector profile, which thrives in the environment of being able to quickly identify an “expert” or unsuspecting “on-call” amateur from among circulating colleagues. Experienced private practitioners are most often identified as evangelists and cannot afford to be knights. In the rare situation in which a private practitioner falls into the grim reaper category, the practice is often faced with oppressive financial ruin.

The most coveted profile, the chameleon, can be seen in both academic and private practices. This clinical profile is the category most often imitated but is difficult to duplicate; all other categories except the grim reaper aspire to it. All chameleons should be tagged to teach and train others in this vanishing art.

Mandeep R Mehra professor and head of cardiology, Department of Medicine, University of Maryland
mmehra@medicine.umaryland.edu
Patricia A Uber assistant professor of medicine (cardiology), School of Medicine, 22 South Greene Street, Baltimore, MD 21201, USA
Hector O Ventura clinical professor of medicine, chairman, graduate medical education, The Ochsner Clinic Foundation, New Orleans, LA 70121, USA
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2 Mueller PS. Breaking bad news to patients: the SPIKES approach can make this difficult task easier. Postgrad Med 2002;112:15-6.
Recently, I was the anaesthetist for some elective caesarean sections. All was running smoothly, with relaxing background music in dimmed ambient light. Despite this, one mother was very anxious about the impersonal medical environment. Thus when the baby was delivered, I allowed her to touch her newborn without any “foreign body” interfering. Not thinking too much, I took the saturation probe off her finger and clipped the probe onto the drip chamber of the infusion set.

To my intense surprise, not only did the screen come up with a regular waveform, resembling an electrocardiograph trace rather than an artefact, but it also displayed the “oxygen saturation” of the bloodless solution and the rate of drops infused per minute (figure).

To my intense surprise, not only did the screen come up with a regular waveform, resembling an electrocardiograph trace rather than an artefact, but it also displayed the “oxygen saturation” of the bloodless solution and the rate of drops infused per minute (figure).

Pulse oximeters are used to determine arterial oxygen saturations by using oximetry and Beer-Lambert’s law. Diodes send out light of the required wavelength, usually in the red and infrared spectrum as absorbance of body tissues in this range is small. Therefore absorbance essentially results from the presence of oxygenated or deoxygenated haemoglobin. A photometer on the opposite side of the probe detects the transmitted light. The signal is converted to a DC component, representing venous blood and tissue, and an AC component, representing pulsatile flow. Only the latter component is amplified and averaged over a few cycles. Inaccuracies are the result of several factors, including bright ambient light, movement, electrical interference, venous congestion, and various pigments or molecules (such as nail polish, bilirubin, carboxyhaemoglobin, methaemoglobin, or methylene blue).

A near-infrared laser at a wavelength of 830 nm was used previously to measure lactic acid non-invasively. As Ringer’s solution was infused on this occasion, the lactate component (about 28 mmol/l) of the balanced crystalloid is the likely culprit, causing signal extinction and the generation of a numerical value for “oxygen saturation.” A gelatin solution was later tested, achieving a trace of inferior quality and lower readings. Physiological saline solution on the other hand produced a stronger signal, but even lower saturations. Both traces looked very much like artefacts compared with the one produced by Ringer’s lactate.

So what about the pulsatile flow—surely, there was none? Although this all happened just around Hallowe’en, surely there was no supernatural spirit in the machine? No, in fact, it was the regular intermittent light absorption, induced by the falling drops, that had fooled the sensor into recognising an AC component and then displaying a “pulse rate.”

Andreas Kopka is a consultant anaesthetist Greater Glasgow University Hospitals, Southern General Hospital, Glasgow G51 4TF. akopka@doctors.org.uk

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