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Media Reporting of Medical Advances: Helpful or Misleading?

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“The right to search for truth implies also a duty; one must not conceal any part of what one has recognized to be true.”

Albert Einstein 1879-1955

Introduction

If you read the papers, watch the news, listen to the radio or surf social media, it seems that we medical scientists are incredible. Almost every day there is a new operation, a new piece of technology, a new cause for cancer or a new cure. You will find the best foods to avoid, and those you simply must eat. Stories are overwhelmingly positive in tone [1]. Some of the reporting is excellent, but much (especially in the redtop and equivalent media) is sensationalised hype based on inadequate or false information, poorly researched and inadequately challenged.

The basis of the relationship between doctor and patient is trust, and that depends on us telling the truth, to ourselves and to each other. Distorted reports can (and do) generate both false hopes and fears [2]. When truth is questioned, trust breaks down. These days it seems that truth is rather a fluid concept, certainly in politics (think fake news) and it behoves us to question what we read about medicine. Truth is at risk.

News, according to Bloom, is “*anything that interests a large part of the community and has never been brought to its attention before*”[3]. **Information** is that which resolves uncertainty, or which provides the answer to a question of some kind. It is thus related to data and **knowledge**, which signifies *understanding* of real things or abstract concepts. Sadly, the huge increase in available medical information over the last few decades does not equal increased knowledge [4]. People may be either misinformed or not helped to understand. There is a rapacious public appetite for health and medical stories, and the media are a leading (and important) source of health information for the public. We search for ways to avoid disease, how to manage disease and to learn about potential cures. We seek advice. What the media choose to cover may not only satisfy that appetite but can also affect, and indeed drive, public health policy and healthcare decisions.

In this lecture, I will discuss the importance of medicine to the media and vice versa, consider what is or is not newsworthy, highlight potential conflicts of interest, identify what influences publication and how you, the public, might better interpret what you read, watch or hear. I will also consider the impact of development of social media.

Tin Foil

Given that we care about our health, the diseases we get and how they might be treated, it is obviously important that we are able to separate fact from fiction and understand what hard evidence is and what it is not. Sometimes that is hard to do. Let me tell you a story.

In the late 1970’s, when I was carrying out research in Newcastle for my Doctorate, a local newspaper journalist somehow heard about what we were doing and came to spend the better part of a day with us observing the work. We were studying how to make cardiac surgery safer for diabetic patients and had to use a large machine



called an artificial pancreas which allowed us continuously to measure the patient's blood glucose and which could be programmed to infuse a variable dose of insulin to keep the patient's blood glucose levels within a narrow range. It was technically challenging, hard work and innovative. We spent a few hours explaining the procedures, including how we calibrated the machine, programmed the software and took additional frequent blood samples to measure several other metabolic variables relevant to diabetic control. The journalist, and his photographer, showed great interest and followed us and a study patient to and from the operating room, making notes and taking pictures.

Two days later, a double-paged spread appeared in the local paper. The headline read; "Tin-Foil Treatment Saves Lives". It was above a photograph of our patient being transferred from the operating room to the ICU, wrapped in a space blanket to be kept warm, as was routine practice in those days. There was no picture of the artificial pancreas and little discussion about the control of blood glucose. The article had completely missed the point and created a new 'breakthrough' of its own. The 'news' became the tin-foil treatment, the 'information' about the dangers of diabetes to patients undergoing cardiac surgery was hidden, and the 'knowledge' of what could be done to manage the risk was missed completely. Perhaps unsurprisingly, I have maintained a healthy scepticism of media coverage of medical advances ever since.

What is Medical News?

Medical news is different from general news in which, traditionally, the journalist will work through a well-established checklist; the famous, who, what, where, when, and why. Medicine is inherently interesting, but its structure is built on cumulative research and innovation. Medical information has a slower development. It emerges from a series of experiments or experiences, with data accumulating over time. Doubt and uncertainty are the norm; research findings are always tentative. Scientists and doctors are used to thinking in probabilities rather than certainties. Absolute truth emerges over time, like the picture of a complex jigsaw puzzle. Certain pieces are discovered, but either we are not sure of where they fit or how they fit together. Our first attempts to complete the puzzle are quite likely to fail. What seems correct at one moment is obviously not right later as other pieces of the puzzle emerge. Medical scientists are trained in classic scientific method, and categorise evidence according to an established hierarchy, with randomised clinical trials and meta-analyses at the top and anecdote at the bottom. Anecdote that involves gripping individual human stories is often the core of general news stories and frequently finds its way into medical reporting...rather like my tin-foil treatment.

Medical scientists write in scientific journals aimed at each other and are used to qualify their findings, and thus to the sharing of doubt with their peers. Journalists on the other hand often seem to want a clear statement of effect, and see such scientific qualification of findings as defensive or as Nelkin calls it [5], 'protective colouration'. Public media pieces must be 'readable', but what is readable in the eyes of a journalist may seem like dumbing down to the scientist. The scientist's cautious, gradual, considered conclusions seem like 'old news', far less interesting to the journalist than dramatic, new, but tentative research. Media constraints of time, brevity, and simplicity preclude the careful documentation, nuanced positions, and precautionary qualifications that scientists feel are necessary to present their work [5]. However, the inevitable simplification which must accompany presentation of complex science to the public should not be at the expense of accuracy or balance [6]. That is why some newspapers and other media outlets employ doctors to write columns and opinion pieces, although they too often reflect what is already in the news or which seems relatively trivial, rather than trawling the medical literature for what might be important.

In the UK, we are used to public service broadcasting and put great store by the concept of its independence and editorial integrity. We must not forget, though, that the foremost goal of the *commercial* media industry is to make a profit; there have to be sales and a large readership to justify the existence of the relevant medium [7]. News forms part of the business plan, and medical news is profitable. The goals and values of journalism are often in conflict with the mass media itself, because of the profit motive. Journalists like to identify a good story, and often hope to change public opinion. Media owners are concerned with audience and readership, and the advertising revenue which follows. Merrill Goozner, a former journalist and Director of the Centre for Science in the Public Interest, Washington DC pointed out in 2005 that "*stories from the front line of medical research can make*



it onto page one - *the most coveted real estate in daily journalism*'. Health news sells, may increase readership and will attract advertising, and advertising 'real estate' makes the real money.

So where do the stories come from?

Timothy Johnson¹ said in his 1998 Shattuck Lecture [8], "*The fundamental question in medical journalism is how best to identify, process and report legitimate medical information to the general public*". Johnson describes the **U-2 syndrome**; that is if the editor, anchor or chief reporter becomes interested in something, then **'you too'** (the public) must be interested. Media coverage may **frame** news by selective coverage of specific topics, facts, controversies, and assertions [9]. It may also act in an **agenda-setting** way by highlighting specific issues for public debate at the exclusion of others.

Health reporting clearly involves 'telling a story', but it first requires writers to find the story, collect and collate information, and check its veracity. Producers, editors and reporters have to exercise considerable judgment in identifying the 'right' medical stories. One TV producer (quoted in Leask et al [10]) called the key job 'news selection'. Certain characteristics of a story (listed below) make it more likely to gain entry into the daily news cycle. There needs to be a good 'hook';

- sensationalism (fear, death, destruction [e.g. a pandemic])
- novelty (new, fresh, exciting, different, quirky, technology)
- controversy or disagreement
- something that has directly affected the relevant audience
- local involvement/detail/people
- a moral or ethical element

Sensationalism means that recent, new health hazards tend to be over-reported by mass media in comparison with common threats to public health, as this diagram from Bomlitz's paper [11] (considering the media coverage in one country over a single year, 2003) demonstrates, SARS (severe acute respiratory syndrome) and bioterrorism result in few deaths but massive media coverage, whilst smoking and inactivity have the opposite consequence.

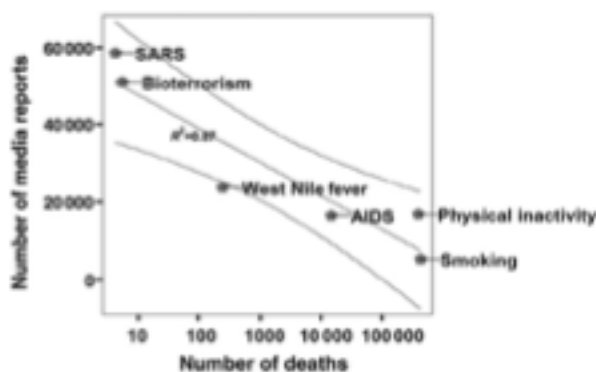


Fig. 1 Number of media reports in the United States on selected causes of death versus actual number of deaths from these causes (4,5) in 2003 (on log scale). Regression line is represented with 95% confidence intervals.

¹ Johnson was a doctor turned medical journalist for American TV, becoming medical editor of ABC News. Famously when asked what he did for a living, he said "I provide cheap entertainment for hypochondriacs".



The public perception of risk is often biased by over-estimation of small probability events, and this may be amplified by media coverage [12]. Many less people were smoking in 2003 than in the mid-20th century, largely because of sustained medical pressure, media support and slow, steady and uniform campaigning. Perhaps it is understandable that coverage was low in that year. However, the same cannot be said for inactivity and obesity which were and are pressing health risks.

Reporting rates of particular areas of science are heavily influenced by both controversial political decisions and if a celebrity is affected by a particular disease. This is very clearly demonstrated [13] by coverage of spinal cord injury, when two peaks of media coverage occurred; one in association with President Bush's restriction of funding for stem cell research in 2001 and the second in association with the death of the Superman actor Christopher Reeve in 2004.

The first story is usually not the full story. Initial enthusiastic reports are often **not** followed by reporting of later, contradictory work in studies trying to replicate the first study, a practice normal in science (remember the jigsaw analogy). Journalists, it seems, favour initial findings over replication studies [14]. Dumas-Mallet and colleagues also observed that newspapers never covered initial findings reporting null (no change) findings and under-reported subsequent null findings. The preferential coverage of initial studies was even stronger in reports relating to psychiatry.

Much of the news, especially broadcast news, is quite derivative. It may grow from stories on the wire, from other newspapers or via conventional or personal sources within medicine. Medical scientists publish in professional journals and in textbooks. They present their research findings at professional scientific meetings, and these will emerge as short abstracts, highlighting the main points of the work. The creeping commercialisation of research, and the competition for research funding and institutional kudos, result in grant-giving bodies, universities and hospitals delivering press releases or press conferences to highlight work which they think will bring either.

A great deal of research work involving drugs is sponsored in various ways by the pharmaceutical industry, and the press releases may come *directly* from those companies, almost always highlighting a positive benefit, which many interpret as bias. Press releases can have an important effect on stock prices [15], positive reports raise prices, negative reports lower prices. It is thus hardly surprising that companies try to control the flow of information. Sadly, many journalists simply reproduce (uncritically) the press releases they are fed. Such journalists were pithily described by Scientific American's Christie Wilcox as "*churnalists*" [16]. Biased, incomplete news may be fed straight to the public.

Journals too issue press releases with the aim of increasing their own exposure or circulation, and there is good evidence this works. The respected New England Journal of Medicine reported in 1991 [17] that those of its papers subsequently covered in the New York Times received more citations over the next 10 years than those not reported, and up to 80% more in the first year. I am grateful to Richard Smith (former Editor of the BMJ and 'TV Doctor' for both the BBC and ITV) for pointing out how hard it is to attract media attention with a press release from a journal. A scientific paper which might seem important to the Journal and to professionals may be judged "*worthy but dull*" by editors. Smith emphasises that the mass media are increasingly a branch of the entertainment industry, "*competing desperately with a thousand other interests for people's attention*" [18, 19].

In my own experience, and that of many of my colleagues, patients and their families often get in touch with the media directly. Sometimes to praise the care they have received, to reveal a one-off treatment or 'breakthrough', or to thank a healthcare professional who has cared for them. On other occasions they may contact the media to try to obtain treatment denied to them or because they disagree with the clinical team (as for example in the Charlie Gard and Alfie Evans stories). Such contacts are increasingly made via social media, and the stories are often incomplete, and one-sided. It takes a great journalist to sort out the wheat from the chaff, whilst simultaneously demonstrating care for both families and clinicians.



Conflicts of Interest

Sadly, press releases are open to abuse. Some press releases contain flagrant exaggerations [20] of the content of the associated scientific paper, and these may transfer into journalistic coverage if the reporter is uncritical. For example, some scientists were exposed as taking money (£1400 to £7500 at the turn of this century) for papers which had been ghost-written by drug companies themselves. Sometimes the scientists had not even seen the raw data; it was described as approaching “*a high-class form of professional prostitution*” [21].

Media-releases from large corporations are often handled by specialist public relations companies, not scientists. This is expensive, and motivations deserve to be questioned [22]. Sometimes it is difficult to differentiate between advertising, marketing and fraud. As Elliot Ross pointed out in an excellent article in the Guardian in 2011 [23], drug companies stand to win or lose large amounts of money depending on what is written in journal articles. ‘Big Pharma’ has been accused of ‘information laundering’ and may place a hold on the release of medical information through publication planning agencies (of which there are over 250) paid to implement high-impact publication strategies for specific drugs. As Ross and Krinsky [24] point out, they target the most ‘influential’ academics to act as authors, whilst drafting the articles in house to ensure clearly-defined branding messages. The publication planners seem to work ‘hand-in-glove’ with the drug company to create the first draft of an article. This quote from Ross’s article makes worrying reading;

“The issue that dominates industry discussions is authorship. In a flow-chart drawn up by Eric Crown, publications manager at Merck (the company that sold the controversial painkiller Vioxx), the determination of authorship appears as the fourth stage of the article preparation procedure. That is, only after company employees have presented clinical study data, discussed the findings, finalised “tactical plans” and identified where the article should be published.”

New guidelines have been drawn up, but appear, from those within the business, not to have made a great deal of difference. Again, from Ross’ article;

“Alastair Matheson is a British medical writer who has worked extensively for medical communication agencies. He dismisses the planners’ claims to having reformed as “bullshit”. “The new guidelines work very nicely to permit the current system to continue as it has been”, he said. “The whole thing is a big lie. They are promoting a product.””

Press releases are also issued by medical journals themselves, and sadly the probity of those releases has also been questioned [25, 26]. Such press releases were found not routinely to highlight study limitations, to have been ‘spun’ or importantly, to omit detail of the role of industry funding [27]. Data were observed to have been presented in formats that exaggerated the perceived importance of the findings.

Press officers are highly reliant on scientists to ensure the accuracy and balance of press releases. It makes it hard for us to criticise media reporting if we can’t get it right ourselves. Although press releases are clearly so important to news distribution, it has been suggested that the scientists do not give them the attention they deserve (seeing them as just one more piece of irritating bureaucracy), and thus what goes out may not accurately reflect the scientist’s views, by which time it may be too late [28].

There has been a rise in pre-prints (sending early versions of papers to open-access digital publication platforms for early peer comment and seen by many to be a good thing) and academic publishing through personal blogs. This means that a news item seen in the media may link not to a peer-reviewed paper which has been published in a journal, but to an early, un-reviewed version on the academic’s personal blog [29]. Whilst formal peer criticism is not without its own problems (see my previous Gresham lecture <http://bit.ly/2f5QBr0>), it does however provide some reassurance in the best journals.

It is essential that journalists investigate and report possible conflicts of interest amongst the sources of medical information and those who promote a new idea or therapy [7]. Such conflicts might be quite hard to identify but exposing them is clearly in the public interest. They are a source of potential bias and may be a signpost to actual fraud, as famously the case in the MMR scandal and the work of Andrew Wakefield, who was not only paid for his research by an interested party but also falsified data [30]. If the links between researchers and their various backers are not made public then, as Schwitzer points out, not only is the integrity of the news item put in



doubt, but the journalist may find him or herself the “*unwitting mouthpiece of incomplete, biased and imbalanced news and information*” [7]. Not the best reference they will ever get. For example, New Scientist reported that a novel stem cell therapy employed in Mumbai, India had cured patients with chronic aplastic anaemia [31]. The story was apparently based on claims made by the developers of the therapy, a private British company. A little more patience and investigation would have led the magazine to the real story: **none** of the patients had responded to the treatment, and the clinical collaborators in India had terminated the study [*Mudur GS, 27/12/2004 Ethics blown to winds. The Telegraph — Calcutta. http://www.telegraphindia.com/1041227/asp/knowhow/story_4139179.asp].*

Patients can be very vulnerable to conflicting stories. A colleague of mine suffered from uterine fibroids and rather than have surgery, she was persuaded to try a relatively new drug called Esmya (ulipristal acetate) which is designed selectively to block the effect of progesterone on the uterine lining. It is supposed only to be taken for three months, not being licensed for longer term use. My colleague began researching the drug and she came across an interesting article in an American newspaper (<http://www.philly.com/philly/health/allergan-fda-approval-first-pill-to-treat-bleeding-from-uterine-fibroids-20171031.html>) encouraging the use of Esmya and indicating that an American company was hoping to get FDA approval for the use of Esmya in the USA. At about the time the article was written, the European Medicines Agency had suspended the use of the drug because a risk of severe liver damage, including liver failure leading to transplantation (http://www.ema.europa.eu/ema/index.jsp?curl=pages/medicines/human/referrals/Esmya/human_referral_p_rac_000070.jsp&mid=WC0b01ac05805c516f). A uniformed member of the public would have been unlikely to find such a report. My (well-informed) colleague wrote to the journalist in the USA pointing this out and received no reply. No correction or warning to patients followed and the encouraging piece stands. I can't help feeling that this is blatant suppression of important information and is simply wrong.

When new guidelines for cholesterol management were published by the National Heart, Lung and Blood Institute in the USA in 2004, the front pages of every major US newspaper advocated using statins to reduce the blood cholesterol in people who had never had heart disease but were ‘moderately’ at risk. That would have meant millions of people being prescribed daily statins, and thus making massive profits for the pharmaceutical companies. Only three days later, Newsday broke the story that 8 out of 9 of the physicians on the group which drew up the guidelines had financial links with the statin manufacturers [7]. Good journalism exposed the link, and more transparency has now been introduced compulsorily to reveal the industry links of those on guideline committees.

It is common nowadays for manufacturers to pay for product placement in movies and TV shows. It is less well known that such stealth advertising is used by the health care industry, with marketing messages delivered by apparently independent third party ‘experts’². PR departments often give misleading names to such connections. Industry-funded lay patient groups are called “*grassroots*” organisations. Doctors who have been wined and dined or recruited by the industry’s speakers bureaus are called “*Key Opinion Leaders*” and politicians or celebrities who are similarly recruited are called “*grasstops*” entities. Industry will fund ‘*disease recognition*’ events to disguise the promotion of a particular drug. Journalists will be invited and may unwittingly help fool a gullible public. The old journalistic motto of ‘follow the money’ was never more apposite.

As an aside, it is interesting to look at the sponsors of the Medical Journalists Association of the UK (www.mjauk.org). Out of eighteen listed sponsors, all but two (NHS Employers and the NHS Confederation) are either pharmaceutical companies or private health providers. Money has to come from somewhere but gets everywhere.

Not all scientific studies are created equal. Good medical reporting needs not only good journalistic skills, but also knowledge of study design, epidemiology, statistics and a good dose of science. It is a specialism, but often not treated as such by media organisations. Again to quote from Johnson; “...*we automatically expect our sources on the medical side to have some kind of credentials (medical or science degree or appropriate institutional affiliation), but we do not expect it of the media side, even though both sides are critical to good reporting* [8].” I have found it quite difficult to identify on-going in-service education schemes for medical journalists, something which would be the norm in many other industries.

² <https://www.centerforhealthjournalism.org/resources/lessons/stealth-marketing>



Perhaps there should be ‘credentialing’ (necessary recognisable qualifications) for medical journalists. After all, as Maria Simbra³ (a Neurologist, Journalist and Professor of Medical Journalism at Point Park University Pittsburgh, PA, USA) has pointed out; “*some meteorologists are credentialed. Are personal health decisions less important than the weather?*”

Large media organisations do employ specialists and there are some good training schemes, such as the one run by the Royal Statistical Society (<https://www.statslife.org.uk/resources/for-journalists/195-about>). But smaller outfits and local media, especially local TV news, can rarely afford to employ either. Young or generalist journalists often end up delivering the medical news, often in short, ill-informed soundbites (Deborah Potter, Apr 18 2013, www.healthcarereviews.org). Given that in many countries, and particularly in the USA, most people get their health news from local TV, this is quite a problem. The average story gets only 45 seconds of airtime and there is clear evidence of a lack of journalistic specialisation, sensational claims unsupported by data, commercialism, disregard for uncertainty, baseless predictions and little coverage of health policy [32].

Pressures on Journalists

Life is not easy for journalists. Especially in the commercial media. Whilst we know that some editors search for the truth or wish to provide a public service, those employed by commercial outlets (whether in print, broadcast or on line) must maintain and attract the attention of the eyeballs that are addressed by their advertisers, usually through confirmation bias of the demographic they serve. Articles must ‘fit in’ with the observed bias of the readership; preaching to the choir. An article is unlikely to be published unless these boxes are ticked. For the journalist, therefore, the pressures are huge. Unless they identify a great long-term story, suitable for investigative journalism, and they have an understanding editor with a budget to allow them to follow the leads, then the daily schedules, strict deadlines, space and time limits will leave them little time to assemble stories, understand the science, do the necessary background checks, seek corroboration, prepare scripts and update editors or producers.

Stories, especially in broadcast media, are typically short, usually 1.5 to 3.5 minutes [10], much less on local news media. And it is a very competitive field; there are no brownie points for being beaten to a good story by a rival paper or channel. Journalists must work their contact lists, trying to interview not only those involved in a study, but also independent respected experts who could provide an independent view, hopefully in well-constructed soundbites. The less the journalist understands, the more vulnerable they are to be misled, and thus to poor presentation of the issue. Making a complex issue understandable and relevant is what journalists are supposed to do, and that must be done simply to get it over the primary hurdle of inclusion in a programme or an issue of a paper. For those working in TV or the web, the importance of an associated visual image to inclusion is obvious, further adding to the time constraints faced by the journalist. Whilst big general news stories usually have an angle provided by two individuals (often the government and the opposition) from which some sense of balance emerges, for some reason possibly just a shortage of time, in medical stories often only the person who wrote the press release is interviewed. It’s easy for something a bit too sensational to come out. When balance is offered, it is often lop-sided, with the scientist up against a lay person with a fixed belief or an axe to grind. The 24-hour news cycle of rolling news exacerbates the problem.

The journalist has to get their story before the editor, convince the editor that it is worth inclusion, leave it to the sub-editors to headline and prune to fit. Many of us may not even be aware that it is not the journalist we have met who chooses the title of the piece. Titling is crucial. Modern metrics from online publication of newspapers and magazines expose the pressures on a journalist. What an online reader reads and for how long they do so can easily be tracked. I was shocked to hear from Chris Smyth of The Times (*personal communication*) that the median time taken to read a medical article was 15 seconds. Enough to read the headline and first paragraph. A small percentage read the full article. There is not much room for more than ‘the message’ faced with such a short attention span, and certainly little space for doubt, analysis or discussion of sources. Such

³ quoted in 7. Schwitzer, G., et al., What Are the Roles and Responsibilities of the Media in Disseminating Health Information? PLoS Medicine, 2005. 2(7): p. e215.



metrics can also inform the placement of advertisements on the page and increase commercial pressure on the journalist to include content of interest to the hand that feeds them.

The headline may not tally with what we scientists thought was going to describe the article, and it may be something totally unlike what the journalist conceived. A colleague of mine in Belgium (*Professor Kris Vanhaecht, an expert in human factors and care pathways, personal communication*) was interviewed about the impact of medical accidents in hospitals on those caring for patients who suffered. The impact on staff can be huge, and they have been described as “second victims”, who need care and support, just as the patients. When the interview was published, its emphasis was totally altered by the choice of headline which became ‘Medical Blunders’. Kris is sure that this is not what the journalist intended and clearly not the message that Kris was trying to get over to the public.

The journalist may work hard to write their story and submit to editors to be included in the paper or the programme and trust that nothing else comes along to ‘trump’ their story. For those of us in medicine who are interviewed about a story, it can be incredibly frustrating to hear that a story has been shelved (sometimes for months) to make way for something the editors consider more interesting.

Pressures on Medical Scientists

It used to be that one’s career was solely dependent on publication in scientific journals and/or a strong clinical reputation. Nowadays, additional pressures exist. Publication (measured by citation indices and impact factors) remains a cornerstone of academic performance monitoring. Publish or be damned. But universities, hospitals, grant giving bodies and charities are all competing for money for research and want to get any new development ‘out there’ as quickly and as widely as possible. This leads to the aggressive use of news releases and press conferences discussed above. Scientists, more used to a cautious approach, may find themselves having to undergo media training and being ‘placed’ in certain programmes or articles to present their work, often in its earliest, tentative stages. Such media appearances can be seductive and lead to exaggerated claims and not infrequently sniping from colleagues or even frank jealousy. It is important also not to be seduced by what Jeffrey Beale has described as “*predatory journals*” with dubious structures, editorial practices and often personal axes to grind (<https://beallslist.weebly.com/uploads/3/0/9/5/30958339/criteria-2015.pdf>). Similar ‘predatory conferences’ exist which offer little pretence at peer review or other criticism (<http://www.authoraid.info/en/news/details/1156/>), even accepting ‘gibberish’ papers written by autocompletes in iOS [33].

I note with interest that many of the medical CVs I read these days list ‘media appearances’ as an achievement. Forty years ago, we were encouraged to stay in the background. Now, as Professor David Winlaw from Sidney points out (*personal communication*), there is a pressure to reduce things to a soundbite; something pithy, maybe a bit bombastic and to ‘talk up’ one’s research findings. Fundamentally, there is a pressure to entertain, to use short sentences, simple words and often colloquialisms.

Kris Vanhaecht has suggested that there is an unwritten and un-agreed Media Impact Factor (MIF), relating to how much your work is covered in the general media rather than the scientific media. There seems little doubt that such a measure is in some way recognised by universities, hospitals and charities. Perhaps all publicity *is* good publicity. Certainly, when our own work on Patient Handover and Lessons Learned from Formula One was reported in the Wall Street Journal [34], it had a much greater reputational impact than its initial airing in Pediatric Anesthesia [35].

Symbiosis

Accurate communication is the responsibility of **both** the media and the medical researcher. If we accept that the mass media do have an important role to play in the dissemination of news about health and advances in health care, then there is no point in ignoring them or treating them as the enemy. Medical scientists need to work **with** them, understand their problems and help ensure that what gets out there is as accurate as possible.



Leask et al. have offered some useful advice as to how medical scientists might sensibly help the journalists [10]. Here, briefly, is that advice;

1. *Timing*; call journalists in the morning; it is best for their news cycle
2. *Be available*; you can help them with their story, background, accuracy, etc.
3. *Pre-prepared resources*; including audio, photos, video; whatever they might need. You can save them time, and help with accuracy
4. *Find the personal touch*; provide an individual story or a willing patient; the correct anecdote
5. *Stay Networked*; include journalists in your contacts
6. *Help them with the ethics*.

We must of course first live up to our own ethical standards and behave well. If only all doctors and scientists did that! More advice can be found here; <http://www.sciencemediacentre.org>.

Misinterpretation

This paper and lecture cannot be a deep discussion of medical statistics, but it is necessary to make a few points. The usefulness of biomedical research depends on appropriate study design, high quality measures, proper selection and application of statistical methods and correct interpretation of the results [36]. It is easy to assume that a scientific paper, published in a recognised journal and having gone through both editorial and peer review, would have passed these tests. Unfortunately, this is not the case. Statistical tools are often misused, either inadvertently because of ignorance or lack of planning, or consciously to achieve a desired result. There is a surprisingly widespread absence of basic statistical knowledge, even amongst the medical community. In a cross-sectional study of faculty and students from colleges of medicine, Gore reported [37] that 54% found statistics to be very difficult, 53% could not correctly define the meaning of the ‘P’ value⁴, 36% poorly defined standard deviation, and 51% failed to correctly calculate sample size⁵. One hopes this is not universally true, but if the scientists don’t get it right, it is not entirely surprising that the media also misinterpret data. On the other hand, one could reasonably argue that it is the very job of the media to highlight such faults in papers and to deliver the *correct* message to the public.

The classic quote, attributed to Disraeli, that “There are three types of lies. Lies, damn lies and statistics,” reflects not only a systemic distrust of statistics and our recognition that they can be manipulated, but also a widespread ignorance about how they should be interpreted. Our understanding of **risk** is a good example. Risk is the chance of something happening, and there are different ways of describing it. People of all countries seem to struggle to understand risk. Researchers asked people in the USA and Germany to say which of the following represents the greater risk; 1 in 100, 1 in 1000, or 1 in 10. They found [39] that 25% of people failed to identify 1 in 10 as the highest risk, associating the largest number in the printed sequence (1000) with the magnitude of the risk.

We see headlines such as these; ‘*People who use sunbeds are 20% more likely to develop malignant melanoma*’, or ‘*One drink a day increases the breast cancer risk by 5%*’. These are all statements of the **relative risk**, indicating to us how much more or less likely the problem is in one group compared to another. Such statements tell us nothing about overall likelihood that anything will happen; the **absolute risk**. If you are 20% more likely to get breast cancer using a sunbed than not, it is important to know what the 20% is 20% of. If the absolute risk is incredibly low, then a 20% increase may be insignificant. 20% of 0.0001 is not a lot. But if the absolute risk is high, then a 20% increase would be very worrying and significant⁶.

⁴ see Appendix

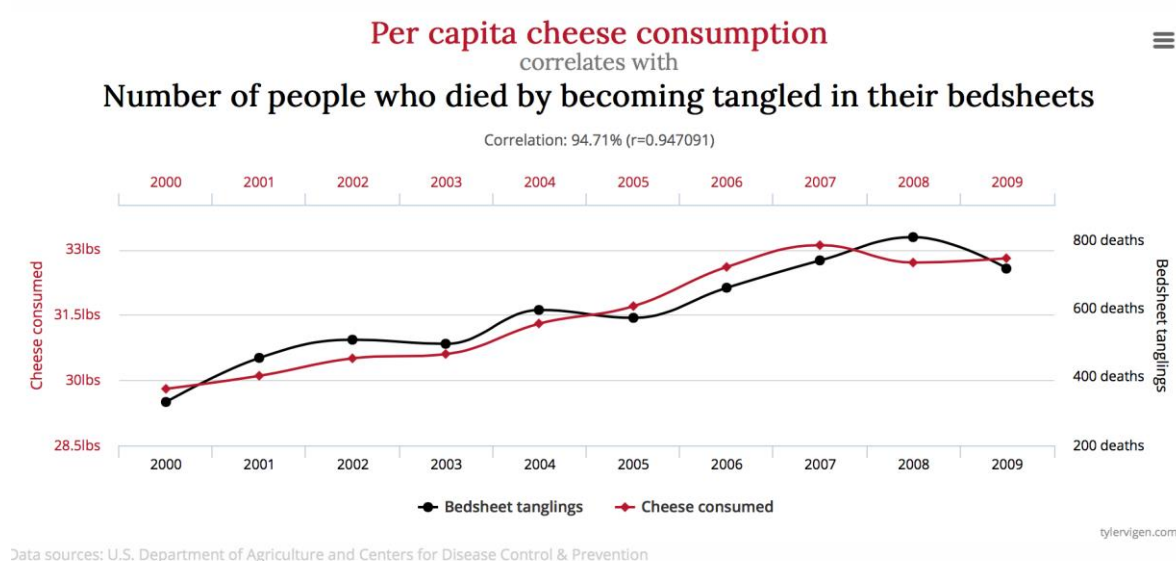
⁵ See Whitely and Ball 38. Whitely, E. and J. Ball, Statistics Review 4: Sample size calculations. Crit Care, 2002. 6(4): p. 335-341.

⁶ Sir David Spiegelhalter FRS, The Winton Professor for the Public Understanding of Risk (Cambridge University) has developed a very good website www.understandinguncertainty.org which explains and demonstrates some of the best ways to interpret risk (there are at least 2,845 ways to talk about risk) presented in medical research papers.



The **misuse** of statistics occurs by using numbers (this can include graphical representation) in such a manner that, either by intent or through ignorance or carelessness, the conclusions are unjustified or incorrect [29]. Such misuse is increasingly a problem, as the debate over ‘fake news’ demonstrates. But as Leetaru asks [29], how do we handle statistical fallacies in a world in which few citizens (and even academics) have even a basic understanding of statistics or data? Journalists now have wonderful tools to explore and make use of datasets ranging from infographics to investigation of raw data sources. We see these regularly employed on the news, and especially on election nights. Statistics are widely employed, although inconsistently, and not necessarily applied well [40].

There are some classic misinterpretations, for example sorting out the difference between correlation (when two variables are treated but one does not necessarily cause the other) and causation (when one variable causes another). You may be surprised to learn that there is a good correlation between per capita cheeses consumption and the number of people who die by becoming tangled in their bedsheets (<http://www.tylervigen.com/spurious-correlations>).



They may be correlated, but common-sense dictates that there is no chance that there is any **causative** relationship. Eating cheese is hardly likely to make you either tangle your sheets or die in the process. Multiple correlations may add up to a causative link, as was the case when the relationship between smoking and lung cancer was determined. It was not just whether you smoked, but how much, for how long and what type of tobacco.

A couple of other points of statistical importance are presented in the appendix to this paper.

Truth, Lies and Balance

In the UK, we are spared the problem of Direct to Consumer (DTC) marketing of prescription drugs in our mass media. But this is a huge problem in the USA. The DTC budget of Big Pharma is twice that of the FDA [41]. The consumer is encouraged to ask their physician for a particular drug (usually expensive), and the pressure is effective in increasing sales.

However, I regularly get upset about the apparently ridiculous claims relating to cosmetic products put out over expensive pages in my weekend papers. Cosmetics are in essence drugs for the skin, and the marketing unashamedly uses scientific terms. The articles always seem to be ‘advertainmentments’ but use supposedly ‘scientific’ data to support their claims. The studies and mechanisms they report look to me like unadulterated rubbish in many cases, and it seems that I may not be wrong! A recent study [42] reviewed 289 full page cosmetic



advertisements from seven magazines during 2013. The authors used a panel of assessors to classify the pages in terms of: outright lie, omission, vagueness and acceptable. Only 18% were found to be acceptable, and only 14% had anything approaching scientific evidence. In terms of ‘performance’ only 25% were found to be acceptable, but 25% were ‘outright lies’. How do they get away with it? It must be to do with advertising revenue, and again emphasises the conflict between the underlying aim of commercial media organisations (to make profit) and more altruistic investigative journalistic goals.

Similar suspicions exist with regard to diet and nutrition pieces. There are fads, often pushed by celebrities, warnings about danger, often based on tentative data or a small number of cases, and ‘superfoods’, which carry with them all the hallmarks of a marketing exercise. Truth and lie are once again difficult to separate. Just a few words here or there can influence interpretation. For example, the true statement that “Vitamins are chemicals that will make you healthier if you are deficient in them”, whereas “Vitamins are chemicals which will make you healthier” sounds more like magic and may lead to the consumption (and purchase) of excess and unnecessary vitamins.

I do not have time or space to discuss all the implications of diet and nutrition research and advice. It would be the subject of a whole lecture series for someone. Nutrition research is complex and often oversimplified. But how is the reader to know if the science is mature and replicable? If the researchers, magazine or journalist are sponsored by industry? An awful lot of nutrition research is funded by industry grants, and it is a really good idea always to ask, “Who paid for this?”. Then your cynical antennae can help you determine what to believe, and if you are interested, the Harvard School of Public Health has created a useful checklist of what to look out for in nutrition and diet reports (<https://www.hsph.harvard.edu/nutritionsource/media/>). And Levi has published an interesting and wider review of the whole topic of medical publishing fraud [43].

I have already noted that medical journalists are very dependent on the scientific publications of researchers for their source material. I have also pointed out the symbiosis of that relationship and the need for journalists to identify and expose ‘bad science’. An excellent and effective example of that symbiosis is the website www.retractionwatch.com (parent organisation the Center for Scientific Integrity) set up by Ivan Oransky and Adam Marcus, both distinguished medical journalists. Exposure of problems with scientific papers, either by subsequent failure to replicate the work, or exposure of data manipulation, plagiarism or other fraudulent acts hopefully results in **retraction** of the paper from the original journal, with a public explanation of the reasons for the retraction. Oransky and Marcus view tracking of retractions as ‘*a window on the scientific process*’. Their database and website allow readers to monitor retractions and read why retractions occur. They also provide an interesting league table of those workers (sadly a list dominated by men, in common with other reports of scientific fraud [44]) whose papers have most frequently been retracted (<https://retractionwatch.com/the-retraction-watch-leaderboard/>) and a ‘Top 10’ list of the most cited withdrawn papers (<https://retractionwatch.com/the-retraction-watch-leaderboard/top-10-most-highly-cited-retracted-papers/>). It is to Oransky and Marcus’ credit that they highlight potential scientific fraud in this way, and they have further pushed [45] for greater transparency from the medical publishers themselves in a call for a ‘Transparency Index’, which I think would be a significant advance.

It is hard to find direct evidence of fraud amongst medical journalists, although bad journalism can have consequences, as occurred when Maryanne Demasi was suspended in 2016 from ABC’s Catalyst programme for failing to declare that interviewees had serious conflicts of interest; had conflated different categories – high-risk and low-risk patients, different types of radio frequency radiation, and so on – and allowed viewers to assume that what was true of one, was true of the other. And most of all, they simply failed at showing good judgment. It turned out that Demasi had a history of reporting ‘questionable science’ and had failed repeatedly with the editors of the programme to show balance. Slezak, in a commentary on the case [46], makes the important point that balance is difficult to achieve and that ‘*no journalist should be in thrall to mainstream opinion*’. I agree with that, but I am driven crazy by news pieces which give apparently equal weight to ill-informed opponents of a particular field of science to that of researchers whose conclusions are backed up by years of research data. In the UK, we have come to expect balance in our public service media coverage. The recent criticism of the BBC over an interview about climate change of Nigel Lawson by Justin Webb on the BBC Radio4 Today program <http://bit.ly/2EUv4d2> demonstrates the value we place on such balance. This is not the case everywhere. Totalitarian regimes may censor or at least ‘control’ content. Commercial outlets may prioritise income over equity, controversy over fact.



This was most evident in the MMR debate when eminent respected scientists armed with definitive evidence were set up to debate against anti-vaccine believers with little if any scientific knowledge. You will remember that Andrew Wakefield published a paper relating MMR vaccination to autism and inflammatory bowel disease [47][30, 48]. His fraudulent behaviour and poor media reporting resulted in a significant reduction in immunisation rates throughout the world and a rise in both the incidence of and death rates from measles, causing significant pressures on governments to manage public health policy [49, 50].

Broadcast Media

There is extensive coverage of medical news on both TV and radio, although both are reducing in impact as social media and the internet rise. Television reporting often emphasises the rare and dramatic over the common and harmful, and does so not only because it is sensational but also because it is relatively easy to cover in the short time available to the reporters [51].

Television doctors are commonly seen and can become celebrities in their own right. Medical pieces are often included in breakfast shows, and in some countries, there are *daily* syndicated medical television talk shows such as Dr Oz or The Doctors. Television lends itself to the presentation of stories with a human face; a personal story. A good human example intensifies the audience response [52], but does it mean the truth is being told? Sadly, it has been shown [53] that recommendations made on such daily medical talk shows often lack adequate information on specific benefits or the magnitude of the effects of these benefits. Approximately half of the recommendations observed by the authors were not backed up by evidence or were actually contradicted by the best available evidence. Potential conflicts of interest were very rarely addressed (in only 0.4% of recommendations made). Sensibly, the authors advised the public to be sceptical.

The large audiences which television attracts in many countries exemplifies the responsibility held by television companies and programme producers. They can influence the behaviour of significant numbers of the population with regard to both risk management and attitude to disease and therapy. This impact has been seen in relation to the use of bisphosphonate drugs to prevent hip fracture and statins to control blood cholesterol (see summary with links here for more detail <https://psmag.com/social-justice/power-of-tv-news>).

The Impact of Social Media

Social media allow organisations and individuals to obtain rapid direct access to the mobile communications devices of millions, indeed billions, of individuals. Apart from social interaction and the creation of connectedness between groups of like-minded people (no matter how small), social media are becoming an increasingly important source of news for many people. The sources of news on social media are very disparate. **Anyone can upload anything**, making it the equivalent of word of mouth. As recent events at Facebook demonstrate (<https://www.nytimes.com/2018/04/04/us/politics/cambridge-analytica-scandal-fallout.html>), sharing of data with advertisers or interested parties is frequent, and target ted marketing related to medical news and drug development is a priority for both parties (<https://cnb.ccx/2qEPzPM>). The type of news social media offer is different in content and often in length, especially on Twitter. It seems more about messaging and emotion; connecting with hearts, rather than delivering facts which might seek to connect with minds.

Alarmingly, social media form the **dominant** source of news for those under the age of 35, and the proportion is increasing [54]. In older people, TV, newspapers and radio remain the primary sources, but internet use is increasing in all age groups. In 2016, 48% of all adults accessed the internet for news, a marked rise from the 32% in 2013 [55]. Many of us, myself included, get our news form a wide range of sources, and there is considerable crossover. However, as I read the OFCOM review of news access in the UK [55], I was surprised to learn how many people using the internet access news *primarily* via search engines such as Google (28%) or directly from social media sites (40%) as well as those using an established news provider such as BBC or The Guardian (46%).



I don't need to tell this audience of the well-publicised tales of 'fake news' (<http://www.bbc.co.uk/news/world-42487425>), and the difficulty in separating online truth from fiction. Indeed, there has been a significant fall in those who agree that the news can be trusted (from 50% to 43% in the last 12 months alone), with under-35s being particularly distrustful [54]. Much of this is related to the use of social media, where only 18% say that social media can be trusted to separate fact from fiction, compared with 41% for established news brands. I think it is encouraging that the under-35s are the most distrustful, after all they are the peak-users of these media. Maybe, as suggested in the Boston Globe [56], teenagers are our best hope against fighting fake news. Bernhard Warner points out in his Globe article just how many countries are rolling out educational programmes to provide students with the tools to help identify and ignore falsehoods. The classroom goal now is to groom 'a better educated citizenry that will save the rest of us'. They will need to be able to separate fact from fiction within simple, general news. Just imagine how hard it will be for them to be able to do so for specialist items like medicine.

Yet despite such anxieties, patients, doctors and hospitals all over the world have embraced social media with enthusiasm. Social media are used for professional networking, professional education, organisational promotion, patient care, patient education, and public health programmes [57] not to mention burgeoning patient groups and follow up mechanisms. Healthcare workers are well trusted online. In 2013, PricewaterhouseCoopers surveyed a thousand patients and a hundred healthcare executives and found that the most trusted resources online were those posted by doctors (60%), nurses (56%) and hospitals (55%) [<https://www.digitaltrends.com/social-media/the-internet-and-healthcare/>]. Trust is fine, but (just as in general news) how do we know that what is published is true? How do you prevent abuse, by reader or poster? Most hospitals and universities have social media policies for their employees, and often block social media sites from local networks. But that doesn't stop people using their private accounts or setting up blogs and websites of their own.

The potential is obvious, but the dangers are considerable. As Ventola pointed out [57], apart from issues relating to potential poor quality of information, there are risks to professional image, the potential for breaches of patient privacy, violation of the traditional professional boundaries, including between patient and medic, and licensing and legal issues. In the context of this essay, it is the poor quality of information which is most worrying. The author or source of the information is often not identified or is inadequately challenged. Medical information may be incomplete, anecdotal or unreferenced. Scientific publication places little weight on anecdote, broadcast media and newspapers thrive on it, but social media tend to **magnify** it. More so since any user can upload information to a site. Social media users may thus be uniquely vulnerable to uninterpretable data and of course to hidden conflicts of interest. In the mass media, there is at least the journalist to act as a filter (good or bad) between source and recipient of information. In social media, there is no such filter.

There is one great advantage to using the internet to access news. That is the opportunity to include in articles hyperlinks to the source material and/or critical reviewing sites such as "Behind the Headlines". Sadly, this is not a technique uniformly used by news websites, even by big brands like BBC or The Guardian. Hyperlinks are the modern form of serendipitous library searches...opening the next book on the shelf. To be able to access the source paper, see the graphics and occasionally (but not often enough) the raw data allows the critical reader to understand more and better what is being said. Without sight of the source material, hyperlinks can be used to misdirect and misinform the reader, and thus following the links should for part of our critical appraisal of what we read. Unfortunately, many journals have set up financial 'firewalls' which mean that the interested reader has to cough up a significant fee (up to £50) to read an individual article. Hardly conducive to the transparency we seek.

Can We Critically Analyse Media Reports?

Ben Goldacre once wrote [58] "*The Daily Mail, as you know, is engaged in a philosophical project of mythic proportions: for many years now it has diligently been sifting through all the inanimate objects in the world, soberly dividing them into the ones which either cause – or cure – cancer.*" This perspicacious observation prompted Paul Battley to review the Daily Mail's website for such articles. His website <http://kill-or-cure.herokuapp.com> makes wonderful reading to test your ability



to define truth and takes you to hundreds of Daily Mail stories (from ‘Ketchup Can Perk up Your Pancreas’ to ‘Viagra Boost after Cancer’; it’s all there).

Several organisations have devoted their time to improving the critical thinking about healthcare. In the UK, a good critical guide is available at “**Behind the Headlines**” found on the NHS Choices website (<https://www.nhs.uk/news/>). Media articles are categorised, and short critical reviews are made. The analyses are good, the language used to describe their findings clear and the sources are available via links. For example, the Daily Mail recently (6 April 2018) reported some research from Johns Hopkins University. The headline read; **Type 2 diabetes drug could be used to treat nicotine withdrawal for people trying to quit smoking** (<http://www.dailymail.co.uk/health/article-5583387/Type-2-diabetes-drug-Metformin-help-treat-nicotine-withdrawal.html>) This proved to be a report of a paper (<http://www.pnas.org/content/pnas/early/2018/03/30/1707047115.full.pdf>) reporting a study in mice. The “Behind the Headlines” review points out that humans are not mice, that metformin is only licensed for use in diabetes, that there was little discussion of potential side effects and that other treatments for smoking cessation were very effective. The article was both optimistic and premature in its conclusions.

A similar optimistic, misleading and premature headline appeared in the Sun on 28 March 2018; **Painkiller ibuprofen could ‘wipe out dementia’** (<https://www.thesun.co.uk/news/5914613/ibuprofen-could-wipe-out-dementia-daily-dose-preventing-alzheimers-disease/>). The review (<https://www.nhs.uk/news/neurology/claims-ibuprofen-will-wipe-out-alzheimers-are-misleading/>) highlights the paucity of evidence and the small size of the study; too small to have any confidence in the results. The study (<https://content.iospress.com/articles/journal-of-alzheimers-disease/jad170706?resultNumber=0&totalResults=1219&start=0&q=Alzheimer's+disease+can+be+spared+by+nonsteroidal+anti-inflammatory+drugs&resultsPageSize=10&rows=10>) did not provide anything new regarding the use of drugs like Ibuprofen.

There are many such examples: I just chose the first two on the NHS Choices ‘Behind the Headlines’ homepage on a given day (7 April 2018). I recommend reading that page (which is updated regularly) and following the links to see more good examples. It is astonishing to see how many errors exist in newspaper reports. **Behind the Headlines** is a great place to cross check what you read in the UK media. Sadly, I know of few people, medics included, who are aware of this website’s existence.

There is another excellent critical resource available at www.healthnewsreview.org. Whilst based in the US, and largely covering news stories published there, they have developed a series of 10 questions against which they test the quality and accuracy of news reports (and news releases). The headline panels on their website signpost clearly their view of the quality of the reporting and clicking on the headline leads to a detailed assessment based on the questions. The ten questions form a wonderful mental check list for anyone reading a news piece about a medical advance and who wants to approach it critically; like ‘healthnewsreview.org’, you can score the piece out of 10, with each question scoring 1 or 0. Here are those questions;

1. Does the story adequately cover the **costs** the intervention?
2. Does the story adequately cover the **benefits** of the intervention?
3. Does the story adequately explain/quantify the **harms** of the intervention?
4. Does the story adequately grasp the **quality of the evidence**?
5. Does the story commit **disease-mongering**? (*Disease-mongering was a term christened in 1992 by Lynn Payer [59] to define the process of convincing people who are well, or at least asymptomatic, that they require medical attention. It appeared in a book accusing doctors, drug companies and insurers of exploiting patients’ fears for profit*)
6. Does the story use **independent sources** and identify **conflicts of interest**?
7. Does the story **compare** the new approach with existing options?
8. Does the story establish the **availability** of the intervention?
9. Does the story establish the **true novelty** of the intervention?
10. Does the story appear to rely solely or largely on a **news release**?

I don’t suppose many people will use such a list; if most of us only spend 15 seconds reading an article, it seems pretty unlikely that any of us will bother to be so thorough in our criticism. But, because of my personal healthy



scepticism, I am glad that organisations like *healthnewsreview.org* exist. I can at least go to their site and see a critical, considered and rational view of both the science and the reporting.

Conclusions

What have we learned?

The relationship between medicine and the media is a complex one. It seems almost everybody has an interest in medicine, and the media both feed and foster that interest. Medicine is rife with human interest stories to add colour to the items. Visually, it is engrossing, and it has the added advantage of including technological and scientific advances. It overlaps with politics and finance and thus is never out of the wider public gaze. Medical news helps sell newspapers and increase viewing figures, making such stories popular with editors and owners whose job is to make money for the shareholders.

Yet medical advances usually come along gradually and tentatively in the manner of scientific progress. The rapid news cycle and rise of social media are at odds with such a cautious tradition, and news is often built on anecdote and single sources rather than cumulated evidence and a robust system of cross checking. Journalists and sub-editors have to grab your attention with a striking image, a headline and a paragraph, and hope you hang on for the ride to the end of the piece which itself may be short to fit in with demands of scheduling or competing news.

Research and its funding are increasingly competitive for the researcher and for his or her institution. Media manipulation is part of the job these days, and may even miss out conventional media, heading straight for blog post or social media release. Drug companies and medical manufacturers will themselves release information to 'colour' the interpretation of data and may even manipulate the writing or the data themselves.

Truth is at risk, but never so important. People make decisions about their lives and politicians are influenced when making policy. One might have hoped that journalists would report well and critically what is in the scientific papers, but they are hampered by several things: the complexity of the subject (medical science is not easy); the poor quality of some scientific papers, and the poor statistical design and interpretation of many (journalists need to be able to interpret accurately what they read; the time constraints under which they work as there is little time to prep a story and do all the necessary checks on veracity); the availability of press and news releases (if in a hurry, it might be easier just to replicate what appears on the desk). Mainly though, it is time and the sheer volume of science publication which they have to filter. In late 2014 there were 28,100 active scholarly, peer-reviewed journals in English alone; a number growing at greater than 2.5% per year. It is a tough job.

Sadly many journalists are generalists who have a leaning towards the 'story' and not the 'science'. This favours anecdote over evidence and can offer an opportunity for uneven balance, equating one with the other in presenting, for example, radio and TV debates. This leaves the reader, viewer or listener in a difficult place. What or who should they believe? The system is characterised by a lack of clear responsibility or oversight to prevent miscommunication [2]. And everything is magnified by the growth of social media.

A colleague of mine in the USA, Professor Tom Karl, suggested I question the role that the public may play in this game. After all, the media are in part responding to what they believe the public wants, and there must be reasons that modern humans want to be fed this stuff. He asks, why does the public not crave details, why is our communal attention span so short, why is reading ability in decline in many places, and why we are now conditioned to the quick fix? He is right to ask, but I am not the one to answer; that could form a whole lecture series on its own.

It has been argued that news items should be screened by a cadre of journalists trained in the art of interpreting scientific publications [2], but this seems to me utterly impractical, especially as the role of the journalist becomes marginalised as newspaper sales fall, TV viewing is reduced and less and less people listen to the radio. We need you the public to become more cynical and better informed about how **critically** to interpret what you read. This must start in schools with the programmes now spreading across the world. Maybe the 45th President, Russian bots and Brexit will leave us a useful legacy if we can achieve such benefit. Sadly I doubt it.



In the meantime though, it is up to us to approach the media reporting of medicine with a very large dose of salts. Look for the sources of the information, read them if you can, check what is thought about the source paper at “Behind the Headlines” on the NHS Choices website and “healthnewsreview.org”. Haneef and colleagues have begun a prospective study [60] to understand more closely the interpretation of health news items with and without ‘spin’, and I look forward to the findings of this study. In the meantime, we medics must learn to work with the hard-pressed journalists and to get our own house in order. Our studies should be well designed, statistically sound and include the raw data. We should be certain our data are correct and complete and that no-one has manipulated them, including our sponsors. We should then make sure that our abstracts are accurate and that any press release that goes out in our name is sound and complete. It must not make exaggerated claims or predict a future that is not there.

Be particularly wary if you come across these words or phrases in a media article or news release; “*breakthrough*”, “*could become the new standard of care*”, “*magic*”, “*this might/may lead to*”, “*cure*”, “*first of its kind*”, “*miracle*”, “*game-changer*”, “*simple blood test*”, “*Holy Grail*”. There is little in medicine so simple or so transforming that it can be described accurately in these terms. Sprinkle your dose of salts liberally if you read them [61]. And most of all, **follow the money**. Look carefully for conflicts of interests and search for the sponsor of the study, especially if it is about a drug or a device.

Many of the journalists I have met during my career seem to have had very high ethical standards and I have come to respect them hugely. They understand the importance of being informative, responsible and critical. They feel some degree of social responsibility. They are naturally curious and suspicious, looking for the truth within a story; using their skills to see through the bullshit and deliver a clear, precise synopsis of the topic. I like to think of good journalism as a ‘critical friend’ of society in general; helping the public to see through bad science or bad medicine. Perhaps there should be a group of experts (sorry Mr Gove) who could vet what is released. Perhaps scientists should work **with** journalists to ensure accuracy, and perhaps editors should be more directly accountable for content. The balance between reward and consequence is not clear. It seems easier than it should be to publish rubbish, and the consequences are few. Yet we need the truth in articles about medicine; our lives depend on it. Truth is at risk both by commercialisation of research and medicine itself, and by the lack of filters in social media.

To quote from Ransohoff [2], “*sensationalism may prevent the public from being knowledgeable participants in policy discussions about scientific issues*”. Unless we wish to exclude the public from policy discussion, clinical scientists need to work with the media and not fight them. We need to understand them, their pressures and their goals but we must all strive to identify and respect that precious truth.

Appendix

Significance

You will often read that a particular result of a study is or is not **significant**. Significance is the quality of being important and in medicine this may be **statistically significant** or **clinically significant**.

Medical research studies are usually carried out on *selected* samples of people from a population, but the purpose of a study is to be able to use the results to help treat another, larger population of patients. You have to be sure that the results of the study are robust enough to try the treatment on the larger group of patients. Statistical significance takes into account the size of the study population and whether the study group contained outliers whose results were just weird. Statistical significance calculates the **probability** that the results observed in a study may have been merely a chance finding and would not be repeated if the study were re-done. It takes into account the sample size and the size of the difference observed.

Statistical significance in hypothesis testing is expressed in terms of a probability (hence the letter “*p*”). By convention this is set at 5%, or $p < 0.05$: there is only a 5% chance that a difference of the size found in your study, or a greater difference, would occur by chance, if there was actually no difference in the whole population. (In other words, you have drawn a false positive conclusion over the new therapy). The 5% value is arbitrary and is not chosen in terms of the actual magnitude of the effect seen in the study. Results are said to be



"statistically significant" if the probability that the result is compatible with the null hypothesis is very small.⁷ Caution is needed because many apparently good research studies are carried out in groups of patients with very specific characteristics, selected to avoid any confounding issues. It may be unwise to think that a treatment which works in such selected groups will work in a wider, unstudied population.

The result may be statistically significant, but is it clinically important? Do you feel confident enough in the results to change what you do? Obviously, the bigger the difference the more likely you are to be convinced, but if treatments are complex, expensive and/or risky, choices may still be difficult. And statistical significance only tells you the *probability* that the result was not due to chance. It does not tell you directly how big the difference was. We search for better ways to demonstrate this, and Number Needed to Treat is one of the best ways of doing this, and worth seeking out in articles.

Number Needed to Treat (NNT)

This is a useful way of understanding the effectiveness of a particular treatment, usually a drug. The NNT is the average number of patients who need to be treated to prevent one additional bad outcome (e.g. the number of patients that need to be treated for one of them to benefit compared with a control in a clinical trial). It is defined as the inverse of the absolute risk reduction. It is clinically useful as it tells clinicians and patients in more concrete terms how much effort they must expend to prevent one event [62]. The effect of the baseline risk and risk reduction on the number needed to treat can be seen in the table below, taken from Laupacis' 1988 paper [62]:

Table 2. The Effect of the Base-Line Risk and Relative Risk Reduction on the Number Needed to Be Treated.

| BASE-LINE RISK* | RELATIVE RISK REDUCTION BY A NEW THERAPY (%) | | | | | | |
|-----------------|--|------|------|------|------|------|--------|
| | 50 | 40 | 30 | 25 | 20 | 15 | 10 |
| | <i>number needed to be treated</i> | | | | | | |
| 0.9 | 2 | 3 | 4 | 4 | 6 | 7 | 11† |
| 0.6 | 3 | 4 | 6 | 7 | 8 | 11 | 17 |
| 0.3 | 7 | 8 | 11† | 13 | 17 | 22 | 33 |
| 0.2 | 10 | 13 | 17 | 20 | 25 | 33 | 50 |
| 0.1 | 20 | 25 | 33 | 40 | 50 | 67 | 100 |
| 0.05 | 40 | 50 | 67 | 80 | 100 | 133 | 200 |
| 0.01 | 200 | 250 | 333 | 400 | 500 | 667 | 1,000 |
| 0.005 | 400 | 500 | 667 | 800 | 1000 | 1333 | 2,000 |
| 0.001 | 2000 | 2500 | 3333 | 4000 | 5000 | 6667 | 10,000 |

*Risk of an adverse event in control patients. †Numbers used as examples in the text.

⁷ https://www.med.uottawa.ca/sim/data/Statistical_significance_importance_e.htm



If the baseline risk is 1:1000, and the relative risk reduction by a new treatment is 10%, then you have to treat 10,000 patients for one to see benefit. If the baseline risk is 3:10, and the relative risk is 50% then you only need to treat 7 patients for one to benefit.

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References and Further Reading

1. Marcon, A., M. Bieber, and T. Caulfield, Representing a “revolution”: how the popular press has portrayed personalized medicine. *Genetics in Medicine*, 2018. Online publication 4/1/18.
2. Ransohoff, D. and R. Ransohoff, Sensationalism in the Media: When Scientists and Journalists May Be Complicit Collaborators. *Eff Clin Pract*, 2001. **4**: p. 185-188.
3. Bloom, S., The legend of the potholes: newsroom changes increase medical and health care news coverage. *Pharos*, 1996. **59**(2-7).
4. Karpf, A., *Doctoring the Media; the reporting of health and medicine*. 1988, London: Routledge. 288.
5. Nelkin, D., An uneasy relationship: the tensions between medicine and the media. *Lancet*, 1996. **347**: p. 1600-1603.



6. Academy of Medical Sciences, T., Perspectives on 'Communicating evidence in the media'. 2016, The Academy of Medical Sciences: London.
7. Schwitzer, G., et al., What Are the Roles and Responsibilities of the Media in Disseminating Health Information? PLoS Medicine, 2005. **2**(7): p. e215.
8. Johnson, T., Shattuck Lecture; Medicine and the Media. N Engl J Med, 1998. **339**: p. 87-92.
9. Kamenova, K. and T. Caulfield, Stem cell hype: Media portrayal of therapy translation. Science Translational Medicine, 2015. **7**(278): p. 1-4.
10. Leask, J., C. Hooker, and C. King, Media coverage of health issues and how to work more effectively with journalists: a qualitative study. BMC Public Health, 2010. **10**: p. 535-542.
11. Bomlitz, L. and M. Brezis, Misrepresentation of health risks by mass media. Journal of Public Health, 2008. **30**(2): p. 202-204.
12. Carducci, A., et al., Mass media health information: Quantitative and qualitative analysis of daily press coverage and its relation with public perceptions. Patient Education and Counseling, 2011. **82**: p. 475-478.
13. Kehn, M. and T. Kroll, Reporting trends of spinal cord injury research representation: a media content analysis. Disability and Health Journal, 2011. **4**: p. 121-128.
14. Dumas-Mallet, E., et al., Poor replication validity of biomedical association studies reported by newspapers. PloS One, 2017. **12**(2): p. e0172650.
15. Rothenstein, J., et al., Company Stock Prices Before and After Public Announcements Related to Oncology Drugs. J Natl Cancer Inst, 2011. **103**: p. 1507-1502.
16. Wilcox, C., Scientists play a large role in bad medical reporting, in Scientific American. 2012.
17. Phillips, D., et al., Importance of the lay press in the transmission of medical knowledge to the scientific community. N Engl J Med, 1991. **325**: p. 1180-1183.
18. Smith, R., *The Trouble with Medical Journals*. 2006, London: Royal Society of Medicine Press.
19. Smith, R., Medical journals and the mass media: moving from love and hate to love. J Royal Soc Med, 2006. **99**: p. 347-352.
20. Sumner, P., et al., The association between exaggeration in health-related science news and academic press releases: retrospective observational study. BMJ, 2014. **349**: p. g7015.
21. Bosely, S., Special Investigation: Scandal of scientists who take money for papers ghostwritten by drug companies: Doctors named as authors may not have seen raw data, in The Guardian. 2002, Guardian Newspapers Ltd: London.
22. Fugh-Berman, A., The Haunting of Medical Journals: How Ghostwriting Sold "HRT". PLoS Medicine, 2010. **7**(9): p. e1000335.
23. Ross, E., How drug companies' PR tactics skew the presentation of medical research, in The Guardian. 2011, Guardian Newspapers Ltd: London.
24. Krimsky, S., Science in the Private Interest: Has the Lure of Profits Corrupted Biomedical Research? 2003, New York: Rowman and Littlefield.
25. Woloshin, S. and L. Schwartz, Press Releases; translating research into news. JAMA, 2002. **287**(21): p. 2856-2858.
26. Schwartz, L., et al., Influence of medical journal press releases on the quality of associated newspaper coverage; retrospective cohort study. BMJ, 2012. **344**: p. d8164.
27. Yavchitz, A., et al., Misrepresentation of Randomized Controlled Trials in Press Releases and News Coverage: A Cohort Study. PLoS Medicine, 2012. **9**(9): p. e1001308.
28. Sciences, T.A.o.M., Perspectives on 'Communicating evidence in the media'. 2016, The Academy of Medical Sciences: London.
29. Leetaru, K., Lies, Damned Lies and Statistics: How Bad Statistics are Feeding Fake News, in Forbes. 2017, Forbes: New York.
30. Godlee, F., J. Smith, and H. Marcovitch, Wakefield's article linking MMR vaccine and autism was fraudulent. BMJ, 2011. **342**: p. c7452.
31. Cohan, A., *Do you believe in miracles?*, in *New Scientist*. 2004, New Scientist Ltd: London. p. 2468.
32. Schwitzer, G., Ten troublesome trends in TV health news. BMJ, 2004. **329**: p. 1352.
33. Hunt, E., Nonsense paper written by iOS autocomplete accepted for conference, in The Guardian. 2016, Guardian Newspapers Ltd: London.



34. Naik, G., A Hospital Races to Learn Lessons of Ferrari Pit Stop, in *The Wall Street Journal*. 2006: New York.
35. Catchpole, K.R., et al., Patient handover from surgery to intensive care: using Formula 1 pit-stop and aviation models to improve safety and quality. *Paediatr Anaesth*, 2007. **17**(5): p. 470-8.
36. Thiese, M., Z. Arnold, and S. Walker, The misuse and abuse of statistics in biomedical research. *Biochemica Medica*, 2015. **25**(1): p. 5-11.
37. Gore, A., et al., Application of biostatistics in research by teaching faculty and final-year postgraduate students in colleges of modern medicine: A cross-sectional study. *Int J Appl Basic Med Res*, 2012. **2**: p. 11-16.
38. Whitely, E. and J. Ball, Statistics Review 4: Sample size calculations. *Crit Care*, 2002. **6**(4): p. 335-341.
39. Galesic, M. and R. Garcia-Retamero, Statistical Numeracy for Health; A Cross-cultural Comparison with Probabilistic National Samples. *Arch Intern Med*, 2010. **170**(5): p. 462-468.
40. Cushion, S., J. Lewis, and R. Callaghan, Data Journalism, Impartiality and Statistical Claims. *Journalism Practice*, 2017. **11**(10): p. 1198-1215.
41. Greene, J. and D. Herzberg, Hidden in Plain Sight: marketing prescription drugs to consumers in the twentieth century. *Am J Public Health*, 2009. **100**: p. 793-803.
42. Fowler, J., T. Reisenwitz, and L. Carlson, Deception in cosmetics advertising: Examining cosmetics advertising claims in fashion magazine ads. *Journal of Global Fashion Marketing*, 2015. **6**(3): p. 194-206.
43. Levi, R., *Medical journalism: exposing fact, fiction, fraud*. 2001, Iowa: Iowa State University Press.
44. Fang, F., J. Bennett, and A. Casadevall, Males Are Overrepresented among Life Science Researchers Committing Scientific Misconduct. *mBio*, 2013. **4**(1): p. e00640-12.
45. Marcus, A. and I. Oransky, *Bring on The Transparency Index*, in *The Scientist*. 2012, LabX Media Group.
46. Slezak, M., Criticism of Catalyst misses the point. No journalist should be in thrall to mainstream opinion, in *The Guardian*. 2016, Guardian Newspapers Ltd: London.
47. Deer, B., How the case against the MMR vaccine was fixed. *BMJ*, 2011. **342**: p. c5347.
48. Deer, B., How the vaccine crisis was meant to make money. *BMJ*, 2011. **342**: p. c5258.
49. Burioni, R., A. Odone, and C. Signorelli, *Italy's policy shift on immunization*. *Nature*, 2018. **555**: p. 30.
50. Editorial, Laws are not the only way to boost immunization. *Nature*, 2018. **553**: p. 249-250.
51. Pribble, J., et al., Medical news for the public to use? What's on local TV news. *Am J Managed Care*, 2006. **12**(3): p. 170-176.
52. Hong, H., Audience responses to television news coverage of medical advances: The mediating role of audience emotions and identification. *Public Understanding of Science*, 2014. **24**(6): p. 697-711.
53. Korownyk, C., et al., Televised medical talk shows—what they recommend and the evidence to support their recommendations: a prospective observational study. *BMJ*, 2014. **349**: p. g7346.
54. Newman, N., et al., *Reuters Institute Digital News Report 2017*. 2017, Reuters Institute for the Study of Journalism: Oxford.
55. OFCOM, *News Consumption in the UK 2016*. 2017, OFCOM: London.
56. Warner, B., Teenagers are our best hope in fighting fake news, in *The Boston Globe*. 2018, The Boston Globe: Boston.
57. Ventola, C., *Social Media and Health Care Professionals: Benefits, Risks, and Best Practices*. *Pharmacy and Therapeutics*, 2014. **39**(7): p. 491-499.
58. Goldacre, B., A rather long build up to one punchline, in *The Guardian*. 2007, Guardian Newspapers: London.
59. Payer, L., *Disease-Mongers: How Doctors, Drug Companies, and Insurers are Making You Feel Sick*. 1992, New York: John Wiley.
60. Haneef, R., et al., Interpretation of health news items reported with or without spin: protocol for a prospective meta-analysis of 16 randomised controlled trials. *BMJ Open*, 2017. **7**: p. e017425.
61. Goldacre, B., *Bad Science*. 2008, London: Fourth Estate, Harper Collins.
62. Laupacis, A., D. Sackett, and R. Roberts, An assessment of clinically useful measures of the consequences of treatment. *N Engl J Med*, 1988. **318**(26).