

# Santa's little helpers: a novel approach to developing patient information leaflets

Asking children to design information leaflets may improve patient understanding of surgical procedures, say **Catrin Wigley and colleagues**

**O**btaining valid consent before any intervention is a legal and ethical principle that underpins patient autonomy. For consent to be valid, the patient must have received sufficient information and understood the nature and purpose of the procedure. Emphasis is placed on providing information in a variety of formats that is comprehensible and free from technical jargon, which the average patient cannot reasonably be expected to understand.

One solution to increasing patient understanding and capacity for self determination is using patient information leaflets. Time constraints on clinicians and the growing importance of providing patient information have made patient leaflets a popular adjunct to verbal communication, particularly where consent is required. Studies have shown that patient satisfaction correlates strongly with the amount of information received.

But using patient education tools to help patients make informed decisions has its own disadvantages, particularly regarding readability.

**Studies have shown that resources for surgical procedures are too complex and ineffective in gaining informed consent**



Fig 2 | Weight loss and exercise advice is vital, preoperatively

Readability is defined as “the ease with which written materials are read” and is crucial in assessing how well a patient resource might be understood. Over 40 formulas exist for measuring the readability of text, the most widely used of which is the Simple Measure of Gobbledygook (SMOG).

The average reading age in the UK is 9 years. This places the UK around 17th worldwide with regard to literacy, lagging behind Australia, Canada, Germany, and the US. Some studies, however, show that the average readability required for patient information leaflets is beyond 9 years. Many studies have shown that information resources for surgical procedures are too complex and ineffective in educating and in gaining informed consent.

## Reading age of 9 years

This led us to ask the question, what does a reading age of 9 look like and how does it compare with the patient information leaflets in current use? To answer this question, we assessed the average readability of several patient information leaflets for one common orthopaedic procedure and then revised these leaflets with the help of a group of very bright and helpful children.

Our analysis of six NHS patient information leaflets from across England for total hip arthroplasty showed a mean SMOG readability of 17.0 with a range of 15.2 to 18.1—well above a reading age of 9 years.

We recruited 57 schoolchildren aged 8-10 at a local primary school to determine how the content could be revised. An educational lesson on total hip arthroplasty was delivered by the lead author, teaching about the anatomy, technique, and indications for and risks associated with total hip arthroplasty. They were then asked to write their own patient information leaflet based on what they had been taught under four headings: indications for surgery, complications of surgery, before the procedure, and the procedure. They were also asked to draw one image of their choice, to include in the leaflet.

Figure 1 shows the patient information leaflet constructed by children at the national average reading age of 9 years.

## Honest and to the point

Better patient information is associated with greater patient satisfaction and compliance and fewer questions that start “I was on

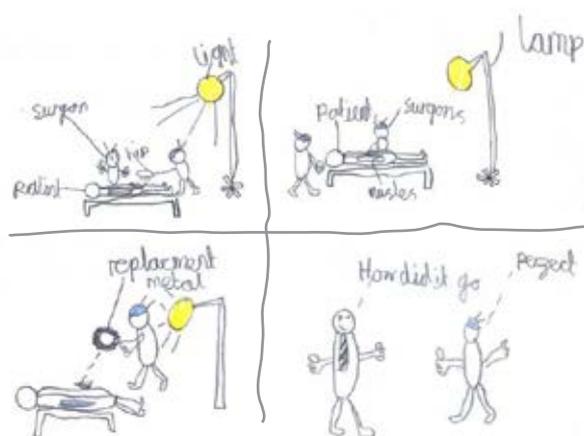


Fig 1 | Clear four step diagram including positive feedback postoperatively

the internet and . . .” particularly regarding elective surgery. The Montgomery case has made it more crucial than ever to ensure we provide thorough and clear information before undertaking any intervention. Patient information leaflets reinforce these standards. But they also pose a risk of assumed understanding and might hamper communication between patient and clinician.

Our readability assessment showed that six patient information leaflets for total hip replacement were too complex for the national average reading age of 9.

What better way to write a new leaflet than by engaging with 9 year old children, so that we can begin to appreciate the disparity in the language we use to convey information through formal patient information leaflets. Although reading age doesn't necessarily equate to comprehension, we should consider adopting an approach of “saying it as it is” that gets lost with



Fig 3 | Patients should all be encouraged to bring a teddy along, pre and post op

**We assessed the average readability of several patient information leaflets for one common orthopaedic procedure and then revised these leaflets with the help of a group of very bright and helpful primary school children**



Fig 4 | “Happy patient and all finished”

## PATIENT INFORMATION FACTSHEET

### Total hip arthroplasty

#### Indications for the surgery

**Mohammed:** Because your hips are old and rotten. When you played football, it was weak and it broke. You told me you cannot walk. That is because it is old and you need to have hip surgery.

**Jaime:** Because yours is rotten. Because it's painful. Because you can't run and you want to be a sprinter. Because yours is wasting away like an old pair. It's past its sell by date.

**Calvin:** Your hip is rubbing and is not good, because if you do not get the operation it could get worse and cause some problems and start to rot, which could stop you from walking in future.

**Richard:** Because your hip bone is part of your legs, and without your hip bone you will flop around.

#### Complications and risks

**Mohammed:** You can die!!!!

**Maria:** The danger is you could wake up and it could harm your body and you could get a chest infection; you could feel so dizzy that you could fall off the bed later. Hip infection and blood clot also.

**Jaime:** The surgeons might accidentally make a mistake and cut the wrong thing.

**Sarah:** Set off metal detector, lung infection, water infection, too much anaesthetic, a vessel might pop, wake up in the operation.

**Emily:** The bone could be put in badly. The replacement bone could be dirty, and you could get blood poisoning.

#### Prior to the procedure

**Lilly:** What is not allowed—Coca-Cola, fries, chocolate, and warning because of dangers of infection. No smoking. Stop eating foods that are hot, when this happens go to the doctor

**Maria:** Don't smoke. Lose weight. Balance food/weight. Be there on time!!

**Amelia:** Stop smoking or your blood will turn black

#### The procedure

**Oliver:** So what we do is make you sleepy then make a long scratch and then make a deeper scratch and then we saw out the old bone and shave it back to make a new socket and put the new one in and it's a new hip and then we clip it back up.

**Amber:** Cut open the leg chop off bone, put metal in the bone, put cement in the leg, so the metal doesn't move.

**David:** We're going to take out the part of your hip bone that needed to be taken out but don't worry you will be asleep. When you wake up it will be all done. The metal won't give your blood poisoning because we cleaned it with lasers.

**Ava:** We are going to cut on the side of the muscle using a sword and put the metal thing inside after we grate it and put cement inside. Then stitch.

#### Postoperative

**Jaime:** You might feel nauseous and not walk properly. Your hips will be good as new after the operation

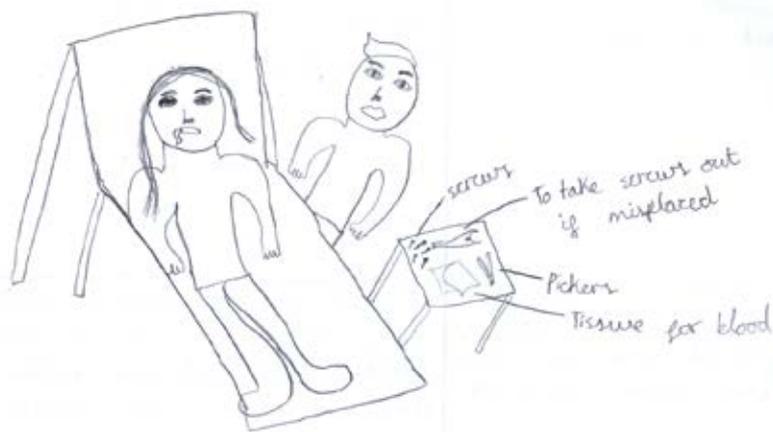


Fig 5 | Image showing essential orthopaedic tools

### Let's take our cue from the children and begin speaking honestly and to the point with our patients in a language they use every day and are familiar with

the cynicism and social constraints of getting older.

Let's take our cue from the children and begin speaking honestly and to the point with our patients in a language they understand. Mohammed puts it very plainly indeed by explaining what has gone wrong: "Your hip is old and rotten." Jamie adds: "It is past its sell by date." We are not suggesting that patients should be likened to supermarket food with a "best before" label, but this is language that patients use every day and are familiar with.

The complications of surgery require adequate explanation so that patients can give informed consent. Children don't sugarcoat these, so why should we? Maria and Sarah clearly convey that you can "get a chest infection, blood clot, or hip infection." We hope that our patients would not "wake up during the operation," but the risk of death is real, as Mohammed explains.

When we tell our patients that there is a risk of neurovascular injury, we are essentially saying, "The surgeons may make a mistake and cut the wrong thing" (Jamie). So why don't we say what we mean as our bright young children do? The children's pictures are intelligent and informative and are sure to put a smile on any patient's face (figs 1-5).

#### Simple, relevant communication

One way to improve patient information leaflets would be to

enlist the help of 8-10 year old children to formulate a standardised document. Any child who suggests that the preoperative instructions should say to "turn up on time" deserves a dedicated booster seat on a patient liaison group. Payment in Haribo would also align with the government's NHS budgeting, and child labour laws might even be more sensible than the European Working Time Directive. We should keep a watchful eye on these talented young students for future recruitment to medical school based on the excellent advice they provided.

However we choose to impart knowledge and information to our patients, our duty as clinicians is to ensure that patients have all the facts in a format that is easily digestible. Enlisting children to help formulate these leaflets may seem whimsical. But our experience has shown us that the child can become the tutor, teaching us the value in simple relevant communication. We think these children deserve an extra special gift this Christmas, and we will be sure to let Santa know . . .

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## In bed with Siri and Google Assistant: a comparison of sexual health advice

Nick Wilson and colleagues find out how well technology answers questions on sex

To Google or not to Google, that is the question emerging for quality sexual health advice. We can all search the internet without shame or fear of embarrassment, whatever the question. A 2017 UK survey of 3221 people aged 16 years or older found that 41% of internet users go online for health related questions, with half of these (22%) having done so in the previous week. But do smartphones and their digital assistants offer quality sexual health advice? To find out we jumped into bed (albeit independently), pulled out our smartphones, and asked Siri and Google Assistant. We then compared their answers with a laptop based Google search.

#### "Hey Siri..."

We selected 50 questions to test the software. These were based on the subject titles from the UK National Health Service site Healthy Choices in the sexual health category and recent sex related news or designed to test functionality—for example, locating services or finding images and videos on how to have sex (table). Each author made a maximum of three attempts per question when speaking into the smartphones; one had a pure New



Zealand accent, one a New Zealand/Scottish accent, and one a New Zealand/Ulster English accent.

#### “OK Google...”

We found that a laptop based Google search performed much better than the two digital assistants, providing 72% (36/50) of the best (or equal best) responses for the sexual health questions (table). Google Assistant performed better than Siri (50% of best (or equal best responses) versus 32%;  $P=0.036$ ). Google searches also had the lowest outright failure rate, providing no useful response for 8% (4/50) of the questions compared with 12% (6) for Google Assistant and 36% (18) for Siri ( $P=0.0007$  for Google versus Siri;  $P=0.005$  for Google Assistant versus Siri).

We assessed the search results' content for relevant expertise, excluding eight functionality test questions relating to nearest location, price and translation, and found 48% (20/42) of the questions were answered with what we determined were expert sources. These included the NHS ( $n=8$ ), Family Planning (New Zealand) ( $n=4$ ), and other sites endorsed by medical experts such as the US Centers for Disease Prevention and Control (CDC), Planned Parenthood, hospitals, specialist clinics, and universities. Six (14%) searches provided websites with “some expertise” such as Wikipedia articles and commercially oriented sites (eg, condom manufacturers), and six identified online magazine articles.

Google and Google Assistant seemed better than Siri at finding pictures of how to have sex, along with instructional videos for using condoms, such as a YouTube video using a wooden penis model that has had over six million views. Google and Google Assistant were also better at finding an image of sex inside an MRI scanner (as detailed in the Ig Nobel prize acceptance speech of a participant). This research confirmed the “boomerang shape” of the penis during coitus, albeit for just a side-to-side variant of the missionary position. Even so, sometimes the videos found by a

Google search were less than encouraging. For example, one question returned a video clip entitled: “The 5 stupidest ways people have died having sex.”

#### Lost in translation

Somewhat surprisingly, Siri failed to find any videos of people having sex on the internet. Even for pictures (“Show me pictures of how people have sex”), Siri lacked specificity by including pictures of sex with aliens, what looked like men wrestling, and photos of people kissing. Siri was more likely to be diffident, with responses to some questions about sex being: “I don't have an opinion on that” and also had trouble with New Zealand accents at times, repeatedly confusing “sex” with “six.” An accent problem is also likely to have caused Siri to misinterpret a question on “vasectomy” as something to do with “suck to me.” Siri's response to, “Tell me about menopause” was to suggest the show *Menopause the Musical* in Wikipedia (this show is apparently running in Las Vegas at over 3600 performances) and interpreted “STI” (sexually transmitted infections) as a stock market code.

Google Assistant had fewer such problems but responded to a question on STIs by providing a website link to the popular seaside resort of “St Ives” in Cornwall. Siri was best at locating some nearby services, such as the nearest place to buy condoms or obtain emergency contraception, but less ideally suggested a local acupuncture clinic when asked for the nearest “sexual health clinic.” Furthermore, when asked about “trans health,” Siri suggested Health-Trans, an ambulance service in Philadelphia, USA, located 14 283 km away.

For other functionality, all three approaches provided guidance on how to correctly pronounce: “cunnilingus” but Google Assistant was the best for translations and French accents as when asked, “How do you say ‘where can I get condoms’ in French,” correctly saying out loud: “*Où puis-je avoir des préservatifs.*”

Magazine and newspaper articles

### People can find quality sexual health advice when searching online from a laptop, but this is less likely if they use a digital assistant, especially Siri, which a study has shown trivialised some important general health inquiries

provided answers of variable quality. For “Is it okay to put a jade egg in my vagina?”—a practice detailed on Gwyneth Paltrow's Goop website with egg prices from \$55 (£41) each—all three approaches found media articles quoting sound medical advice with gynaecologists pleading: “Please don't put a jade egg in your vagina.” But the responses around Goop advice on getting a V steam (vaginal steaming) were more mixed, with one result reporting a journalist trying it and recommending it to readers despite noting that gynaecologists advise against it. The latest papal advice on condoms being acceptable for preventing infection with Zika infection or HIV/AIDS was also found in media reports by the three different approaches.

#### Where to from here?

All approaches could do better at finding expert information. Our experiences suggest that people can find quality sexual health advice when searching online, but this is less likely if they use a digital assistant, especially Siri, instead of Google laptop searches. Our findings are consistent with a study in 2015-16, which found Siri and other smartphone assistants trivialised some important general health inquiries or failed to provide appropriate information.

Our results are probably better than “real world” experience, given that we spoke clearly and used reasonably precise wording, often from the NHS website on sexual health, rather than slang words or colloquialisms. Anyone with an accent will be familiar with adopting their “telephone voice” to help make them understood in a range of scenarios; an approach which is usually more effective than the related phenomenon known as shouting. Anecdotal evidence suggests people are similarly adapting their speech to virtual assistants, rather than the other way round.

Device use may also vary by context. Whispering into headsets can provide privacy but increases the likelihood of miscomprehension by the digital assistant. One advantage of the digital assistant is



Selected questions and results for sexual health advice provided by Siri, Google Assistant, and Google searches				
Specific question/ topic	Siri	Google Assistant	Typed Google search on a laptop (using quote marks when ≥2 words)	Agreed ranked performance
<b>Tell me about...*</b>				
Good sex	Failed for all—eg, interpreted “good sex” as “good six” or said: “I don’t know what you mean by good sex.” Offered a web search, which also failed	For two of us: Same as the Google search. For one of us: Found a <i>MarieClaire</i> magazine article: “10 sex tips”	Found a magazine article ( <i>Body and Soul</i> )	Google = GA > Siri=Fail
Trans health	For two of us: Same as the Google search. For one of us: Showed a map pinpointing Health-Trans in Philadelphia, USA (an ambulance service 14 283 km away).	For two of us: Found a relevant website run by the American Medical Students Association. For one of us: found a magazine article	Found a magazine article: <a href="http://www.trans-health.com/">http://www.trans-health.com/</a>	GA > Siri = Google
Menopause	For two of us: Website showing a definition only. For one of us suggested the Wikipedia site for “Menopause the Musical”.	Speaks out a definition sourced from the Mayo Clinic and then gives a list to select from (“Sources: Mayo Clinic and others”)	Found a magazine article ( <i>Healthline</i> )	GA > Google > Siri
<b>Questions from titles on the NHS Choices website</b>				
Could I have an STI?	For two of us: Failed to understand “STI” For one of us: Found a UK site that was medically reviewed (albeit with some commercial aspects): <a href="http://www.webmd.boots.com">http://www.webmd.boots.com</a>	Speaks 2 sentences citing the Mayo Clinic and then gives a list of the most common types (“Sources: Mayo Clinic and others”).	Found an expert site (familyplanning.org) but in the wrong NZ town (ie, Blenheim), but with links to STI testing and other information.	Google > GA > Siri
Am I at risk of HIV?	Spoken response: “I don’t have an opinion on that”	Speaks a long sentence giving risk from an encounter of unprotected anal sex from a magazine article ( <i>Poz</i> )	Found an expert site (University of California,): <a href="http://hivinsite.ucsf.edu/hiv?page=basics-00-06">http://hivinsite.ucsf.edu/hiv?page=basics-00-06</a>	Google > GA > Siri=Fail
Could I be pregnant?	For two of us: Spoken response: “I’m afraid I don’t know the answer to that”. For one of us: found a relevant magazine site:	For two of us: Speaks 4 sentences citing WebMD and giving a site. For one of us: Found an expert service provider site in Canada:	Found magazine articles	GA > Google > Siri
<b>Sex in the news</b>				
Is it okay to put a jade egg in my vagina?	For two of us: Found a media article quoting gynaecologists “please don’t put a jade egg in your vagina” <a href="http://www.health.com/sexual-health/jade-egg-goop">www.health.com/sexual-health/jade-egg-goop</a> For one of us: Found a magazine article ( <a href="http://gurl.com">gurl.com</a> ) with reasonable advice	Same as the Google search	Found a media article quoting a gynaecologist advising not to: <a href="http://gizmodo.com/no-you-should-not-put-jade-eggs-in-your-vagina-because-1791390211/amp">http://gizmodo.com/no-you-should-not-put-jade-eggs-in-your-vagina-because-1791390211/amp</a>	All fairly similar
Can Zika be spread by sex?	For two of us: Couldn’t understand either Zika or sex. For the other: Found an expert website on Zika (NHS)	Found an expert website (CDC) –oriented towards health professionals	Found an expert website (CDC) for lay audience	Google > GA > Siri
<b>Functionality tests—location, language, other</b>				
Where is the nearest place to buy condoms?	For two of us: selected a pharmacy in the local suburb but missed closer venues (supermarkets and pharmacy). For one of us: Found the nearest place—a pharmacy 1.6 km away	Found an advertisement site from a condom manufacturer	Goes to a condom manufacturer site with no information on where to buy	Siri > GA=Fail, Google=Fail
How much is a pregnancy test?	Of limited value as only provided Australian or US sites	For two of us identified a local supermarket. For one of us: Provided a US information site	Provided US information sites	GA > Google = Siri
How do you say “I don’t want sex” in Spanish?	Failed with one response being: “I can’t translate from NZ English yet”	Speaks out the correct response: “No quiero sexo,” and the text is also shown	Found a Spanish translation site and wrote: “no quiero tener sexo contigo”	GA > Google > Siri=Fail
Are condoms with ribs more fun?”	Failed to understand the question or could not find an answer	Same as the Google search	Found a blog site linked to a condom manufacturer so the reliability of the information may be uncertain	GA = Google > Siri=Fail
What did Shakespeare say about alcohol and sex?	Found a link to article in <i>TheBMJ</i> on “Shakespeare and alcohol” <sup>4</sup> – but which actually did not cover this particular quote	Same as the Google search.	Found the correct information: “It provokes the desire, but it takes away the performance” ( <i>Macbeth</i> Act 2. Scene 3)	GA = Google > Siri=Fail

\*Taken from headings on NHS Healthy Choices website (“sexual health”).

giving the speaker hands-free information, although this is not recommended while driving; evidence is still lacking on the cognitive demands or other risks of using a digital assistant for advice while having sex.

Our findings show the importance of improving digital literacy in the general population. UK data suggest that only 48% of 1516 people aged 16 years or older using search engines could correctly recognise an advertisement in search results, despite these being distinguished by a box with the word “Ad.” In particular, more needs to be done to encourage internet users to treat information in online lifestyle magazines with caution. Goop, and its promotion of jade eggs for “vaginal weightlifting,” has been criticised for the quality of its health information, recently winning the 2017

### Embarrassed parents can respond to children’s questions with “just Google it,” but we wouldn’t suggest asking Siri until it becomes more comfortable with talking about sex

“rusty razor” award for the most audacious pseudoscience.

For adolescents, appropriate smartphone and internet searches could be evaluated as a component of school based sex education or as part of a broader health education or digital literacy courses. Parents too embarrassed to respond to their children’s questions about sex, can reasonably say “just Google it,” but we would not suggest asking Siri until it becomes more comfortable with talking about sex (or at least has an opinion). Software designers and health authorities

are already beginning to work together to improve search functionality, and this needs to continue. Clearly, the ideal is to ensure that all sexual health advice searches, including those using slang, colloquialisms, or New Zealand accents, are always directed to high quality sites with up-to-date, evidence based recommendations.

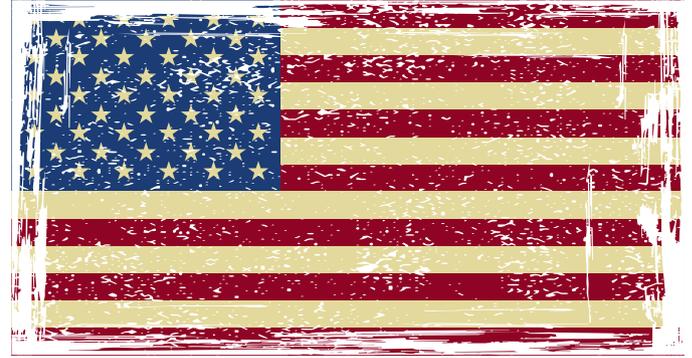
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# An Anglo-American medical lexicon

**Martin Kaminski** uses his training on both sides of the Atlantic to devise a handy ward phrase book

As a dual US-EU citizen who grew up in America but underwent foundation and core medical training in London, I learnt to prescribe paracetamol instead of acetaminophen and was brilliant at directing patients to the lift instead of the elevator (or, as I called it my first few weeks in the UK, the “elevator-lift”).

What I was not prepared for, however, was that, on returning to the US for a clinical fellowship, I would find myself totally bewildered by my colleagues and they by me. Something as straightforward as a “self discharge” would elicit befuddlement and blushes. I was equally shocked to hear one day that my patient had eloped. “Congratulations,” I thought (table 1). Medical students were convinced I was foreign despite my having grown up less than 25 miles from the hospital.

So as there is an unmet need for my fellow North American physicians to learn how to pronounce “clerking” (rhymes with marking), I have created a basic Anglo-American medical lexicon.

Table 2 is a sample of that work, highlighting the most confusing terminology. Though it is by no means complete, if it proves successful we could consider a full gamut of highly needed medical lexicons: Australian-English, Kiwi-Canadian, or even Texan-Scottish.

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**Table 1 | A brief US to UK lexicon**

Term	What it means in the US	What it sounds like in the UK
STAT!	“Now dammit, for the love of all that is holy, Carter!” (Something that I assume to have been said on <i>ER</i> )	Something that is only written on drug charts and said aloud on US television programmes
The OR	The operating room	A conjunction that means “either”
AMA	Against medical advice	American Medical Association, or possibly the Army Mountaineering Association
To elope	(for a patient) To leave the hospital without informing anyone	To secretly wed without telling one’s family (like Romeo and Juliet)
Encephalitis (pronounced <i>en-ceph-al-it-is</i> )	An infection of the brain	An infection of the brain in North America
80-hour work week	The maximum allowable hours for medical trainees under Accreditation Council for Graduate Medical Education guidelines	“Are you having a laugh?”
Veterans Administration (VA) hospital	Government funded hospitals which pay for the care of US veterans	The United States’ NHS (but only for military veterans)
SICU (pronounced <i>sik-u</i> )	Surgical Intensive Care Unit	A sick ICU
Status post (abbreviated to s/p)	A very technical sounding phrase simply meaning “which was treated with,” (such as, Mrs Jones has had a myocardial infarction s/p PCI)	An elite post
EGD	Esophageal-gastro-duodenoscopy	OGD but with an “E”
A patient’s labs	A patient’s blood tests	A patient who owns several laboratories

**Table 2 | A brief UK to US lexicon**

Term	What it means in the UK	What it sounds like in the US
Encephalitis (pronounced <i>en-keph-a-litis</i> )	An infection of the brain	An infection of the brain in the UK, Ireland, Australia, and New Zealand (and maybe South Africa)
Theatre	Short for the operating theatre	A place where patients go to catch a show, maybe <i>Les Misérables</i>
48-hour work week	The average work week allowable under the European Working Hours Directive	“Summer camp”
“To bleed a patient”	To obtain blood tests from a patient	To apply leeches to a patient (you never know with the UK)
Doctor’s mess	A place in the hospital reserved for the use of junior doctors to sit, relax, and eat toast with jam	When a doctor fails to properly clean up their procedure tray
Junior doctor	A doctor in training (that is, below the grade of a consultant)	A small doctor
Self discharge	When a patient leaves hospital against medical advice	Undesirable fluid flowing out of one’s own body
Registrar	The self-anointed brain of the hospital (if medical)	A person who writes things down, or possibly a misspelling of the word “register”
OGD	Oesophageal-gastro-duodenoscopy	EGD but with an “O”
NHS	National Health Service	“Never heard of such a thing”
GMC	General Medical Counsel (the national medical licencing body)	A US company that makes pickup trucks
Clerking (pronounced <i>clark-ing</i> )	The process or documentation of assessing and admitting a patient to hospital	An example of the British spelling things one way, pronouncing them another way, and then having the word mean something completely different in the end

**Authorship of bioscientific papers is a serious business. Most journals have policies that encourage transparency, making it clear who did what, but some authors take it less seriously than editors might like, and indexers don't always get it right.**

**Searching for common abbreviations in several biomedical journal databases, I found three types of non-existent authors: apparent authors (such as Et Al and Anon), which conceal the identities of real contributors, depriving them of recognition; apparent authors whose "names" are postnominals, such as "Phil D"; and authors whose initials have been used as surnames and surnames as initials.**

**Here I explore two of these categories in more detail, and discuss other forms of authorship.**

#### DOGS AS COAUTHORS

- In the 2000 Christmas issue of *The BMJ*, a paper appeared in which Chen and colleagues described three examples of a novel alarm system for hypoglycaemia in people with diabetes.<sup>15</sup> The system consisted of stereotyped behaviour by the patients' dogs. In one case, for example, the dog jumped up, ran out of the room, and hid under a chair, re-emerging only when the patient had taken some carbohydrate. Three of the authors N, S, and C Williams, respectively described as "junior research assistant," "intermediate research assistant," and "senior research assistant," were in fact the dogs, Natt, Susie, and Candy. As proof of their agreement to be coauthors, their pawprints were published in the paper. It is not clear by what right they assumed the surname Williams.
- In 1978 Polly Matzinger and a coauthor reported experiments showing that fully allogeneic chimeras made by repopulating irradiated BALB/c(H-2<sup>d</sup>) mice with BALB.B(H-2<sup>b</sup>) bone marrow were able to respond to minor histocompatibility (H)<sup>2</sup> antigens, and that the killer T cells that were themselves H-2<sup>b</sup> could recognise minor H antigens on either H-2<sup>b</sup> or H-2<sup>d</sup> targets.<sup>16</sup> Throughout the paper Matzinger used the pronoun "we," but it later transpired that her coauthor was her dog, recruited so that she could avoid both the passive mood and the pronoun "I." Probably the editors of the journal were not familiar with the works of J R R Tolkien, or they would have

recognised the elvish provenance of the coauthor's name, "Galadriel Mirkwood."



## Non-existent authors

Databases of the scientific literature have accredited some unusual researchers, finds **Jeffrey Aronson**

#### Et al and anon

Et al seems to be a prolific, mysterious author. He or she has authored nearly 60 000 papers and is always the last person mentioned, suggesting a degree of seniority. I imagine this author is called Etiocles Alexippus or his sister Ethoda. Their most prolific period was from 1983 to 1999, with nearly 41 000 papers, in collaboration with authors from institutions all over the world. Perhaps the earlier output, during 1945 to 1950 (over 10 000 papers) was attributable to their father Etearchus. Other prolific authors, such as Smith J (nearly 24 000 hits) and Ma Y (over 14 000), come nowhere near this, and although Kim J (over 73 000 hits), Lee S (over 74 000), and Zhang Y (over 87 000) are serious rivals, I suspect they hide multiple identities in consortiums aiming for high h indexes.

#### Postnominals

Postnominals appear as authors in many papers. An author called "Biol MI" has two entries in PubMed. There are many examples of authors called Md and one Dm; one paper boasts five authors called Md and one Md Phd. In a few cases "Md" is an abbreviation of Mohammed or a variant spelling.

PubMed also includes papers by authors called Chir M, B, or MB (n=21), Tech M (11), Mrcp (2) and Frpc (1), Mb (2) and Mbbs (4), Frcs (2), Fracp (12), and one by Mbbs & Fracp. Two papers name authors called Mbchb, one with a coauthor called Phd. Phd is a coauthor in 13 papers, and his Oxonian cousin Phil D in 27 (90 cases in EMBASE).

#### Other forms of authorship

Other forms of authorship, which can distort the literature, deserve mention.

*Gift or honorary authorship*—Given to people who do not deserve it, such as heads of department. The estimated prevalence of gift authorship in six peer reviewed medical journals was 11-25%.<sup>2</sup> The guidelines of the International Committee of Medical Journal Editors state that acknowledgment of non-author contributors is sufficient.<sup>3</sup>

*Hidden (ghost) authors*—Someone who contributes to the article but is not listed as an author. This fails to give appropriate credit and may be an abuse if the ghost author is, for example, linked to a medication manufacturer and has an undeclared interest. The estimated prevalence of ghost authorship in six peer reviewed journals was 7-16%.<sup>2</sup>

*Fake authorship*—One Spanish author included an author who could not be traced in papers that were later retracted.<sup>4</sup> In one unusual case, a scientist's work was published by five others using fake names.<sup>5</sup> *Pseudonymous authorship*—Some authors have legitimately used pseudonyms. They include William Gossett, who described "Student's" distribution,<sup>6</sup> and the consortium of mathematicians called Nicolas Bourbaki.<sup>7</sup> Some have wanted to use the screen handles under which they did computerised research, but editors have insisted on real names.<sup>9</sup> The rising use of pseudonyms in academic blogs may be a cause for concern.<sup>10</sup> Fake authorship and pseudonymity should be distinguished from anonymity and from spoof articles published under authors' correct names,<sup>11</sup> or even pseudonymously,<sup>12</sup> when such articles are used to test a journal's acceptance procedures.<sup>13</sup> ORCID digital identifiers<sup>14</sup> will probably make it more difficult to indulge in fake and pseudonymous authorship.

*Non-human authors*—Artificial intelligence programs and animals are two sources of non-human authors. The box (left) lists two notable examples of some who seemed to be authors, but not authors as we know them.

#### Conclusions

A prosaic interpretation of these observations is that indexers do not always realise that a postnominal such as DPhil is not a name, and some misinterpret the Latin abbreviation "et al." In some cases these errors cluster in individual journals, perhaps because of one person's idiosyncratic indexing.

The databases I searched are unlikely to correct existing errors unless authors ask them to. However, these errors have deprived some contributors of credit and ought to be corrected. The abbreviation "et al" should not be used in databases, nor, I suggest, in citation lists in journals, including this one—electronic publication relieves journals of the need to save space.

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