Risk, probability and decisions in emergency medicine v2

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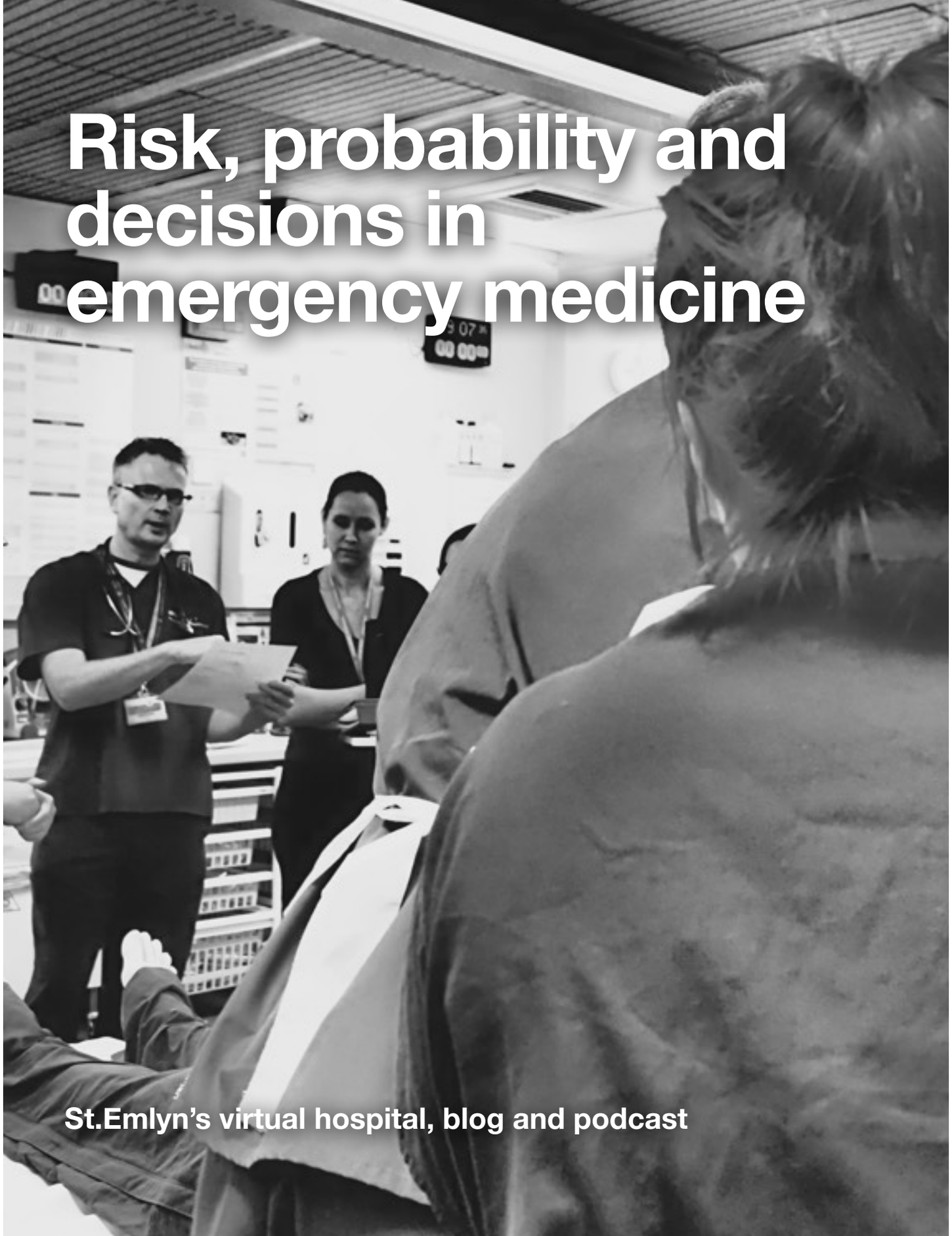
Risk, probability and decisions in emergency medicine
St.Emlyn’s virtual hospital, blog and podcast

Think

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Foreword

Thanks for downloading and reading our first St.Emlyn's e-book. In it, we focus on decision making, arguably one of the most important core skills of medicine. In the acute specialities such as Emergency Medicine, Acute Medicine, Critical Care and Prehospital Care the complexities of clinical decisions are amplified by the time critical nature of our practice. We are often required to make decisions quickly, and also at a point in the patients journey when there may be significant uncertainty as to what the underlying cause of the patient's injury or illness is.

Those of us who operate in the *time critical, information light* world of the resuscitationist know that we are judged by the quality of these complex decisions. This is both an immense challenge, but also a huge privilege as those decisions can transform a patient's clinical course. If you follow the St.Emlyn's blog and podcast then you will already know this, but I would challenge you to stop and consider how much of your formal time in training has been spent on understanding risk, uncertainty, decisions and dilemmas? I suspect relatively little, which is arguably surprising, considering its importance. How do we learn these skills, and how did others develop them? A useful exercise is to stop and think about a colleague or teacher who exhibits that elusive quality of *'great clinical judgement'*. How do you think they developed those skills? It's likely a combination of practice, reflection, feedback, review and time, but undoubtably, it did not come without effort or study. At St.Emlyn's we've always believed, that by thinking about thinking (meta-cognition), we can improve our understanding of clinical practice and thus become better clinicians. This book is an introduction into how we do this.

We hope to inspire you to think more deeply about the risks, uncertainties and complexities that underpin decision making in acute specialities.

We could not have put this work together without the help and guidance of all who have contributed to the St.Emlyn's blog and podcast. Clearly, the authors of the following chapters, blogs and podcasts have contributed, but the wider #FOAMed community have moulded and guided us to think harder and deeper about decisions in a way that we could never have achieved on our own. See Chapter 3 for links and ideas on others in the #FOAMed world who think the same way that we do, and who love to share what they know freely, openly and without deed or covenant.

As this is our first venture into e-books, we'd love to hear what you think. Get in touch via the website, twitter, Instagram or Facebook. We're interested in what you have to say and would love you to join our conversation.

Simon Carley

Professor of Emergency Medicine

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Note: There are no patient images in this book. Clinical pictures are of simulated patients and mannequins.

Chapter 1

Emergency Medicine

A risky business

This chapter explores some of the fundamental statistical principles that underpin diagnostics. All emergency physicians should understand these, as they are key to using diagnostic tests wisely.

There are a few stats in here, but don't be frightened, it's pretty straightforward stuff.

Section 1: Written by Simon Carley

You are not a diagnostician

KEY POINTS

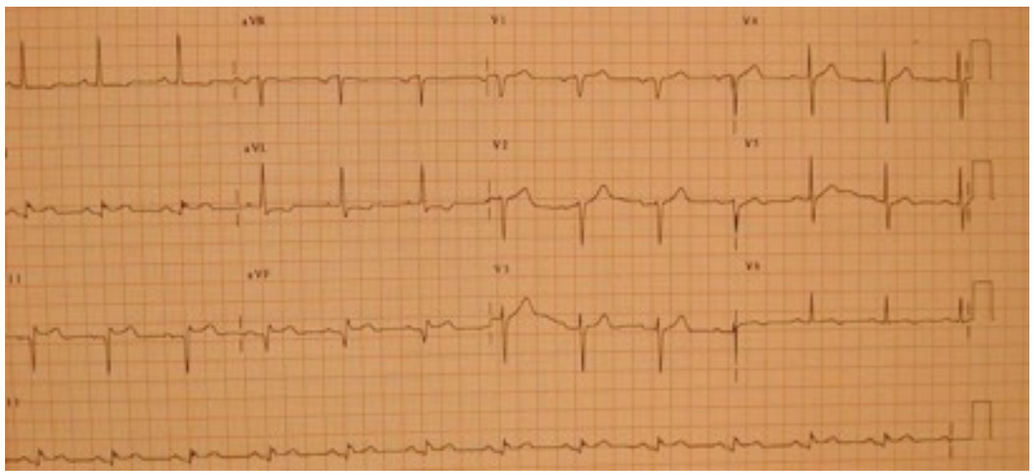
1. You are not (really) a diagnostician.
2. Most diagnoses you make are probabilities.
3. Maybe you're a problastician.

Let's start by thinking about whether you are really an emergency medicine diagnostician. Are you a diagnostician? Of course you are! Why do I even need to ask?

Well, to be honest I'm no longer very sure to be honest. When I speak to friends and colleagues in emergency medicine and ask them to describe themselves, 'diagnostician' is a word that is commonly used. I know what they mean and so do they, but is it the right word? Making a diagnosis is perhaps not quite as straightforward as you might think, and if diagnosis is as straightforward as we think, then perhaps we are not diagnosticians.

This can be a challenging topic so it may be simpler to understand if we consider an example.

Let's think about something really easy. Have a look at the ECG below and tell me what the diagnosis is. The patient is a 54 year old man with chest pain.



So, I'll bet that you said inferior MI didn't you. You did, I know you did because I would ahve said the same thing too, but we would both be wrong, well possibly….

The first reason, is that inferior MI is a politically incorrect diagnosis, according to the politically correct guide to cardiology.

Secondly, and leaving the PC brigade behind, when we look at this ECG, we come to a conclusion that it is, indeed, an MI yet we also know that there are many ST elevation mimics, such as LV aneurysm. In this case, we know that we should still start therapy and get the patient off to cath lab but there is a possibility that we will be wrong (about 5% of the time in fact). What we are doing is attaching a label (in this case MI) to a probability. So it's probably an MI, so let's treat it as an MI, and overall patients (as a population) will be better off.

Great, but that's all a bit picky isn't it? Does this really matter? Well in the example above, perhaps not, as we are going to treat on the basis of a high risk, so we have decided a diagnosis and we are going to treat. We know that this presents problems for some patients as the therapy for things like MI (and stroke) are risky in themselves. Every so often, we will harm a patient through a known complication of a therapyfor a disease they do not have. Worth stopping and thinking about that one for a moment. It means that if we assign therapies on the basis of a probability harm will happen, sorry, harm WILL happen.

Difficulties also arise when we consider what we might do in the exclusion of disease because the same problems arise. Let's think of another example where we are seeking to exclude a diagnosis. If we are talking about probabilities when 'ruling in' a diagnosis, then do we get similar problems when we 'rule out'?

The diagnosis of the moment seems to be PE, with loads of posts and debates pinging around the blogosphere. I'm sure that you will see a number of rule out strategies for the management of PE patients. I'll also bet, that in the majority of cases, the implication of the rule out strategy is that, if the patient is negative for investigation, then the patient does not have a PE. This is not true. Just as it's not true for most rule out MI, appendicitis, UTI, renal stone and subarachnoid bleed protocols. What we are actually doing is moving patients from a pretest probability where we are worried, down to one where the risks of pursuing further investigation, outweigh the benefits. This is one of the reasons why I like the way Scott Weingart wrote the rule out PE pathway at EMCRIT. The pathway from Scott Weingart is not typical in that respect, as the end point is 'stop work up', as opposed to PE ruled out – because it's not. In reality, the sensitivity of most PE rule out strategies is in the 90's but they are certainly not 100%.

The obvious result of this, is that if you use a typical rule out protocol, you are really using a probability protocol and therefore you must be missing something. Let's take a really good rule out protocol for PE that has 98% sensitivity, – that's fab and 98% is regarded by most people as a SnOut, but what we now know is that a sensitivity of 98% means that we miss 2% of patients with disease. That's 1 in 50 folks, with that implication, you will be missing a lot of serious disease in your career……or does it? (more of this later)

Now that you are worried that you're not a diagnostician at all, just a doc playing the odds and gambling with your patients life, it's time to think about the implications of being a probablestician rather than a diagnostician, and perhaps why as clinicians we like more certainty than we typically justify. That's for part 2.

Simon Carley

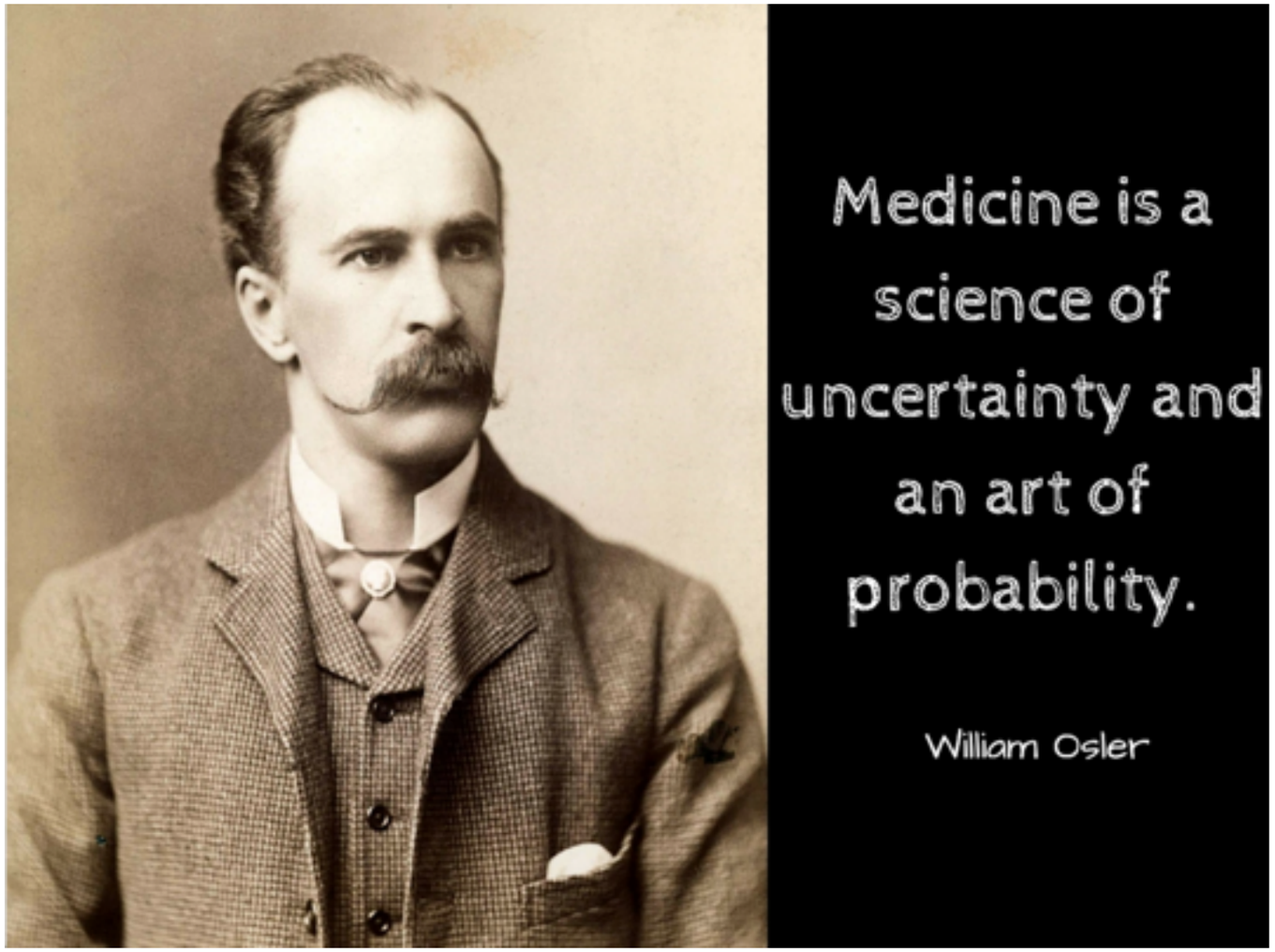
PS. Ever since I made the word probablastician up I'm still not quite sure how to spell it ;-)

Section 2: Written by Simon Carley

Almost every diagnoses is a mix of truth and error

KEY POINTS

1. Whether you get a positive or a negative result, it's probably a mix of truth and error.
2. As the clinician interpreting the test you won't know which it is!
3. Uncertainty is greatest in the earliest stages of clinical assessment (in other words in the emergency department).



Now that you have begun to understand the probabilistic nature of medicine, you will hopefully be wondering about probability, as it applies to diagnosis. I hope that I have convinced you that when we label a patient with a diagnosis, we are usually assigning that label on the basis that the likelihood of them having it is high….., but how high?

Well, to some extent that tipping point for labelling should depend upon the diagnosis we are looking at. At one extreme I often use the generic term for all non-specific paediatric illness (it's a bit of a virus – and no antibiotics won't work); at the other extreme I want to be pretty certain that my diagnosis of myocardial infarction is correct as, the therapy for the condition (thrombolysis ot PCI) has a risk in itself. So setting the tipping point for labelling is very much disease specific, but as diagnosticians (let's go back to using that word from now on) we need to have a good feel for the consequences of diagnosis.

The rather simplistic view of diagnostics could be summarised in the following flow chart.

The reality of course cannot be this simple though and there are two fundamental problems in this process, the first is that the diagnostic process is probabilistic and in the groups labelled 'diagnosis made' or diagnosis excluded, we are really mixing up two groups of patients.

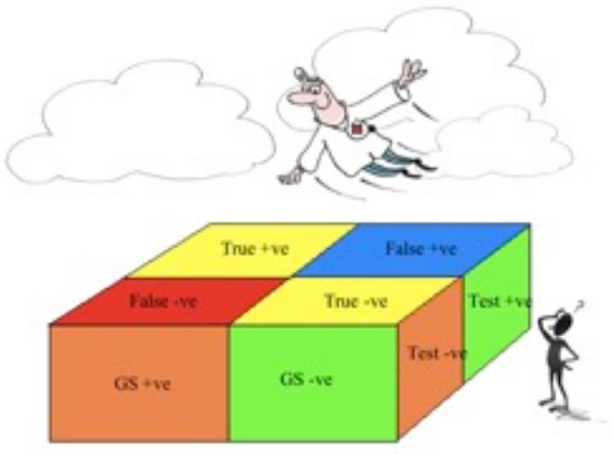
- The diagnosis made group includes, those who really have the disease (True positives) and also those of who do not have the disease (false positives).
- Similarly, the diagnosis excluded group, again, have a mixed group of those who do not have the disease (true negatives) and those that we have missed (false negatives).
-

Prediction	Observation: Yes	Observation: No
Yes	**a** true positive hit success	**b** false positive false alarm Type I error
No	**c** false negative miss Type II error	**d** true negative correct negative correct rejection

I know that you know this, as it will be familiar from med school stats lectures. In fact, we are really just talking about the traditional 2×2 diagnostic table that will be familiar to you all. Let's just review that 2×2 table before we recognise that it's bloomin' useless to clinicians.

“Useless you say”, is that not heresy?” The 2×2 table is the foundation of diagnostic studies, and to be honest, I’ve produced plenty in my time as a researcher. The difficulty, is that all 2×2 tables are created in the knowledge of the results of the gold standard ….which is not what we have, when using the new test. So from our perspective when we are using a clinical test, we only get the results of A+B or C+D, we cannot differentiate without doing more tests.

This is a situation that has been described as ‘researchers having their head in the clouds’, whereas we clinicians, have our feet firmly on the ground. Time to put on your glasses and go 3D!



As the poor clinician, we are left scratching our heads, not really knowing whether our patient does or does not have disease.

In (micro) summary, when we look back at the simplistic flow diagram of diagnosis above, we know that the first stage, the stage of making a diagnosis, is flawed.

We have yet another problem, and we’ve not even got onto therapy yet! We must accept that our diagnostic prowess is based on putting patients into categories that are inevitably mixed.

Simon Carley

Section 3: Written by Simon Carley

Is it OK to miss a diagnosis?

KEY POINTS

1. If we know we miss diagnoses, we need to ask ourselves how many it is acceptable to miss.
2. The hardest thing to do is to accept that we always work with a degree of risk.
3. The level of diagnostic risk we accept depends on many factors relating to the patient, the condition and the clinician.
4. We can improve our understanding of risk by explaining using natural frequencies.

Emergency medicine is a risky business. In this continuing series, we are going to spend a bit of time looking at how we feel about risk and what we consider to be acceptable in practice. If nothing else, it's a good excuse to look at a really risky video – watch this link and think about whether this is acceptable.

I'm guessing that you think not (unless you are crazy IMHO), but the Isle Of Man is where I did some of my med student training and was one of the placements that convinced me that EM was for me (as I was there for the TT races in 1991). As for the question, that's somewhat the point, as risk is a personal choice, TT riders accept a level of risk, which is pretty much at the highest level I can think of. Personally, I would not be caught dead on the back of a motorbike, but put me on a road bike descending in little more than lycra, at 50mph and I am seriously happy. Doesn't really make sense does it?

Anyway, enough of bikes for now. What about risk in the ED? Well, if you read the last post, I think I proved that our typical process of

diagnosis leads to a probability of disease rather than an absolute certainty of disease (or lack of disease). You may remember this diagram that explains how the poor clinician is looking at a combination of either true positives + false positives OR true negatives + false negatives.

So, having accepted that we are probablasticians, we must then face the fact that we are wrong some of the time. If you are keeping up to speed then you will already be getting to the next question which is….

How often is it acceptable for me to be wrong?

OK, if you think never, then you're just not getting this, go back to the beginning and start again! We have to be wrong some of the time when we are investigating for things like PE or ACS. The reason is that we cannot pursue these diagnoses to the absolute max as we eventually end up causing more harm than good, by exposing patients to diagnostic strategies (radiation usually), which are harmful in themselves.

So, are you happy with a sensitivity of 98%?

I reckon that you said yes. Not all of you would have said yes, but I reckon that you would be reasonably happy with 98%, as that's a level that is commonly considered to be a SnOUT: so sensitive that if it's not positive it rules out the diagnosis. Great, but let me ask you the question a different way.

How many patients are you prepared to send home with a missed PE?

- 1:5
- 1:10
- 1:25
- 1:50
- 1:100
- 1:500
- 1:1000

Not so easy now, I suspect. The answer you are looking for is, of course, 1:50 as that is the same as a 98% sensitivity. If you are normal, the expression of this risk as a natural frequency, will not fit as comfortably as the more palatable figure of 98% sensitivity. Don't worry if you are uncomfortable with this. It's normal for clinicians to be more wary about accepting risk as a natural frequency. When I've done this test at conferences, I get completely different answers, depending on whether I ask people for an opinion on; a test with 98% sensitivity (they love it), or a test with an ability to spot 49/50 PE's (not as keen), or a test which misses 1 in 50 PEs (really not very keen at all).

There is a whole world of literature out there on the subject of risk and risk perception. I personally like to explain risk in terms of natural frequencies (I think this came from Ken Calman).

The risk is…

- 1 person in your house
- 1 person in a school class
- 1 person on your road
- 1 person in a village
- 1 person in your town
- 1 person in your city etc.

Now, PE is a particularly good example for us to think of, as the 98% sensitivity point is considered to be the point of clinical equipoise where pursuing the diagnosis further is just not worth it. I think that's probably true for PE, but what other factors affect the clinical equipoise point for other diagnoses? I would consider the following.

- Consequence of a missed diagnosis
- The success of therapy for a confirmed diagnosis
- The risks of further testing
- The temporal proximity of further risk
- The likelihood of getting sued (sad but true folks)
- Who's risk is it anyway?

You may be thinking at this point that it's just about whether you miss it or not, isn't it?

Not really.

Consequence: There is clearly a difference in missing something like a subarachnoid bleed, versus missing a fracture of the lateral malleolus. One causes pain and delayed therapy, the other may result in death. Clearly, it may be more acceptable to have a lower sensitivity for less severe conditions.

Success of therapy: If we are to fret and worry about making a diagnosis, then it must be to some purpose. If there is no effective therapy for the condition we are seeking to diagnose, then the process of diagnosis is somewhat useless. For example, I might choose to define the exact virus causing that nasty sore throat – but since my treatment is going to be exactly the same, what's the point? Similarly, in conditions that are going to be fatal regardless of a diagnosis, should we pursue it?

Risk of further treatment: EM physicians do not use gold standard tests. This is either because there are risks associated (angiography for PE for example), or because we cannot achieve it in the time period available to us. Once you reach the point that further exposure to testing, results in more risk to the patient than just letting the patient go, you should stop (a major problem in litigious systems where errors of omission are considered to be worse than those of commission).

Temporal proximity: I'm sure that you are really interested in reducing the harms from unnecessary investigations, or at least, if you are like me, you are at this particular moment, whilst we are thinking about populations and risks. In reality, the risks of investigation are not linked in time to th patient in front of us. Miss a PE, and we might know about it really soon! Over-investigate with excess radiation, and your patients might get more cancer in 10-50 years time. There is no doubt, that the former risk weighs much more heavily on the mind, and on the medico-legal insurance.

Medico-legal factors: Many of us must face the fact that our practice is influenced by the consequences to us as emergency physicians. We are actually part of the decision making when we accept a diagnostic process, that we know leads to the missing of diagnoses, exposes us to a risk of medico-legal action. This is particularly important to realise in view of the temporal proximity of risk. You will get sued for missing a diagnosis this week, you won't for giving someone cancer in 20 years time. This is a real problem, as it skews your practice towards something that might be wrong, for the population you are investigating.

Who's risk are we talking about?: Thus far, we have really been talking about risk from a physicians perspective, but if we leave the medico-legal stuff to one side, it is clear that it is the patient that experiences the risk. It is really about them at the end of the day, and although we think about miss rates in terms of percentages, patients either experience the process of diagnosis working correctly or not. So, whilst we think about a % chance of getting it right, the patient only experiences a dichotomous outcome.

So what?

So, in summary, risk perception and acceptance is really quite complex depending on what you are looking at and who you are, and even how it is expressed. Bear this in mind, as we move to the next section to discuss the consequences of missing a diagnosis.

Simon Carley

Section 4: Written by Simon Carley

How many diagnoses do I really miss in the ED?

KEY POINTS

1. Prevalence has a huge impact on the performance of diagnostic tests.
2. Prevalence often allows us to practice with acceptable levels of risk.
3. We should practice great medicine, and not medico-legal medicine.

This section looks at understanding risk and diagnosis in Emergency Medicine. In part three, we looked at how tests with apparently high sensitivities (e.g. 98% sensitivities) actually mean that you miss 1 in 50 patients with disease. Now to be honest, if you just look at that figure in the context of a disease like PE or Acute Myocardial Infarction, then it makes for pretty uncomfortable reading. I know of few emergency physicians who are immediately uncomfortable with that kind of figure, and to be honest even as I write it down it makes me stop and think again (and I know the answer to the question that follows).

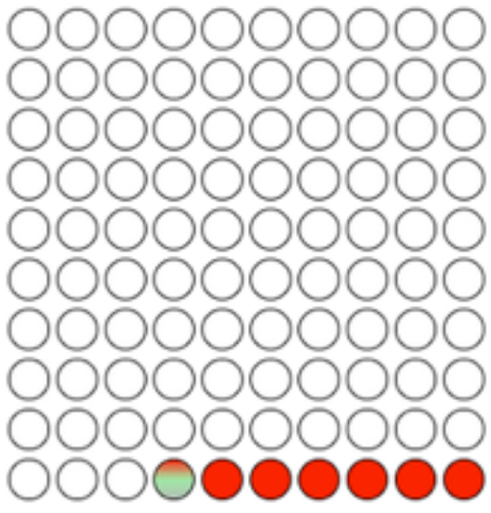
So, how can it be that we apparently miss 1 in 50 PEs in the ED, yet we are not in court every other week, or worse, in the coroner's court as a result of a patient's death? To explain this we need to start thinking about other factors that eventually affect the performance of a test in the real world that we work in. The best way to do this, will be for us to start with an example. For ease of convenience, let's stick with Pulmonary embolus. I've chosen PE as it is a topical subject and also the PERC rule to help illustrate the issues around risk. This post is not really about PE, more about how diagnostic test work in practice. It's just a convenient example….., oh and I hope my math is correct as we go along. If its not, I'm sure you will let me know.

How likely is PE in the patients I see in the ED?

You should probably have a feel for this from your own experience. What we are referring to is the prevalence of disease in the population of patients that investigate for PE. Probably best if we take out those in resus with no blood pressure. They are not the sort of patients that concern us from a discharge perspective, as you are just not going to send them home. Rather, we are thinking about the patient in the ambulatory end of the department who has some respirophasic (pleuritic) chest pain, some mild shortness of breath, but no major risk factors, a normal chest X-ray and a desire to go home (which you share).

The exact prevalence of disease will depend on a number of things, but we can use data from the literature to help us. Let's take the incidence from Kline's paper on the investigation of PE (6.9%), and express that as a diagram based on 100 patients who might turf up in your ED.

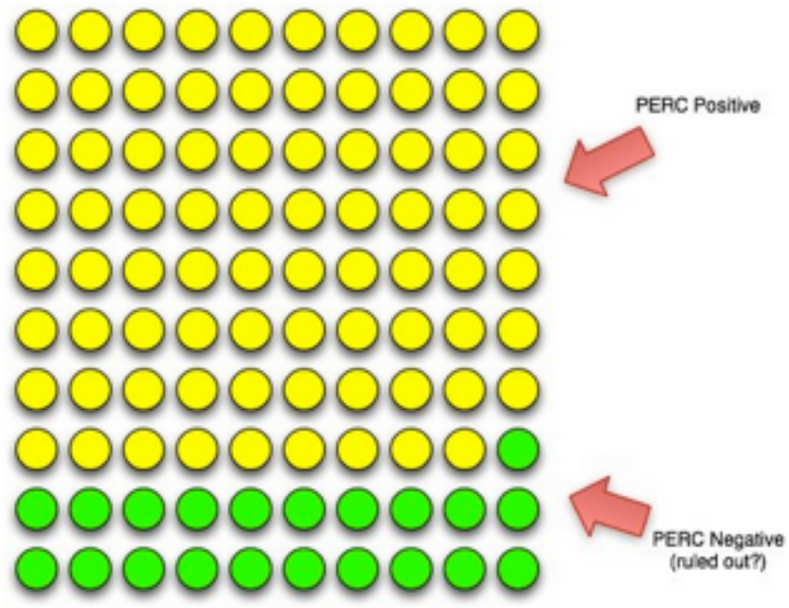
The white squares represent patients who do not have PE, and the red are those that do. Now of course, at this point, you have no idea who has, and who does not have the disease, so you are going to start investigating them. You would not want to send 6.9% of your patients home with an undiagnosed PE!



Right then!! Let's get testing.

So, there are a number of things we can do with our group of patients, but it's pretty clear we need to do something. Since we don't want to do any invasive tests at the moment we could start with the PERC rule as a way of starting the diagnostic process. (You might also want to whizz over to Life in the Fast Lane for a reminder as well). What happens if we apply PERC (lets take the original data at a sensitivity of 97.4%, a specificity of

21.9% and a prevalence of 6.9%) to the 100 patients who turn up in the ED? How many of them end up PERC positive and how many PERC negative? Again we can express this as in diagram form as shown below.

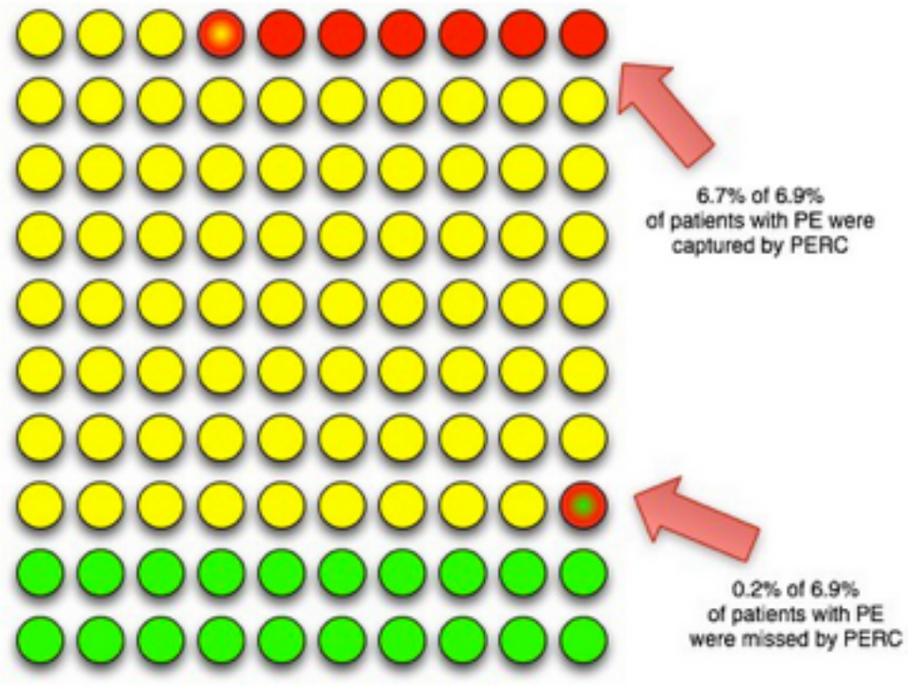


Patients represented by the yellow circles (**roughly 79% %** of patients) are those that are PERC positive and will need investigating further. Those in the green circles (roughly **21%** of patients) are classified as PERC negative and are the ones that you might consider sending home with no further testing. [/DDET]

But what about the patients who DO have a PE?

Key question that. We really need to get an idea of where those original 6.9% of patients have ended up after the application of the PERC rule, and again we can get an idea by mapping them onto the post-PERC diagram as shown below.

So after applying PERC, the patients who do have a PE remain



predominantly in the group who need further investigation and that's fine. However, there is a little bit of red left in the green zone, i.e. in the group that we are considering sending home with no further investigation.

So how many am I actually missing?

If you work the maths out (if you must, you can), it works out that 6.7% of your original 6.9% of patients are in the yellow zone and will hopefully be picked up by further investigation. In the green zone, that leaves just 0.2% of patients who had a PE. Why? Well basically, your high 90s sensitivity only applies to patients who actually HAVE disease. The sensitivity part of the performance of a diagnostic test is only really relevant to patients with the target condition (in this case PE). So basically, we capture the majority of patients with PE in the PERC positive group.

Great

That's just 1 patient missed for every 500 investigated as a low risk PE patient. This is clearly more reassuring. At Virchester, we investigate about 700 patients for PE every year, so we would expect to be missing 1-2 patients per year if we applied a strategy such as the one described above.

We think that's pretty good and we will argue that it is an acceptable miss rate. It means that there is a group of patients who do not need to go onto more invasive testing at this stage (so long as you are comfortable with that miss rate). Although we are still missing one in 50 PEs the number of PEs missed per person investigated is actually quite small.

So can I use this in my population?

Well, the key question is really to get an idea about the prevalence of disease in your population. Because of the way PERC rules, it will probably be similar, but that's not the case in other diseases where prevalence can vary a great deal. Clearly, as the prevalence rises you end up missing more patients per group of patients investigated.

In our case study around the PERC rule, if we were to increase the prevalence to 30% then we would end up missing more patients with PE (about 5 per 500 investigated) and at some point you would need to say that this is not an acceptable strategy.

If you want to play around with how prevalence changes how your diagnostic test will work, according to the number of people investigated, then download this excel file and play around with the numbers on a hypothetical population of 1000 patients in your ED. Just input the sensitivity, specificity and prevalence and you can see how it will perform.

DROPBOX DOWNLOAD HERE

In Virchester, we really quite like this calculator, as to be honest, the sums make our heads hurt and it's quite useful to see how the performance of a test changes with a change in prevalence. We prefer to see the effect as a natural frequency rather than percentages and statistics. It makes it feel more real to us as clinicians and you can also use it with patients if you are so inclined. If you want to work things round the other way by filling in the event rates to see sensitivity and specificity (plus a whole bunch of other stuff as well), then I would suggest using this fantastic online calculator.

This is one of the many reasons why it's so important to know about the characteristics of your own patients when assessing new diagnostic tests.

What if you miss the diagnosis in a lawyer?

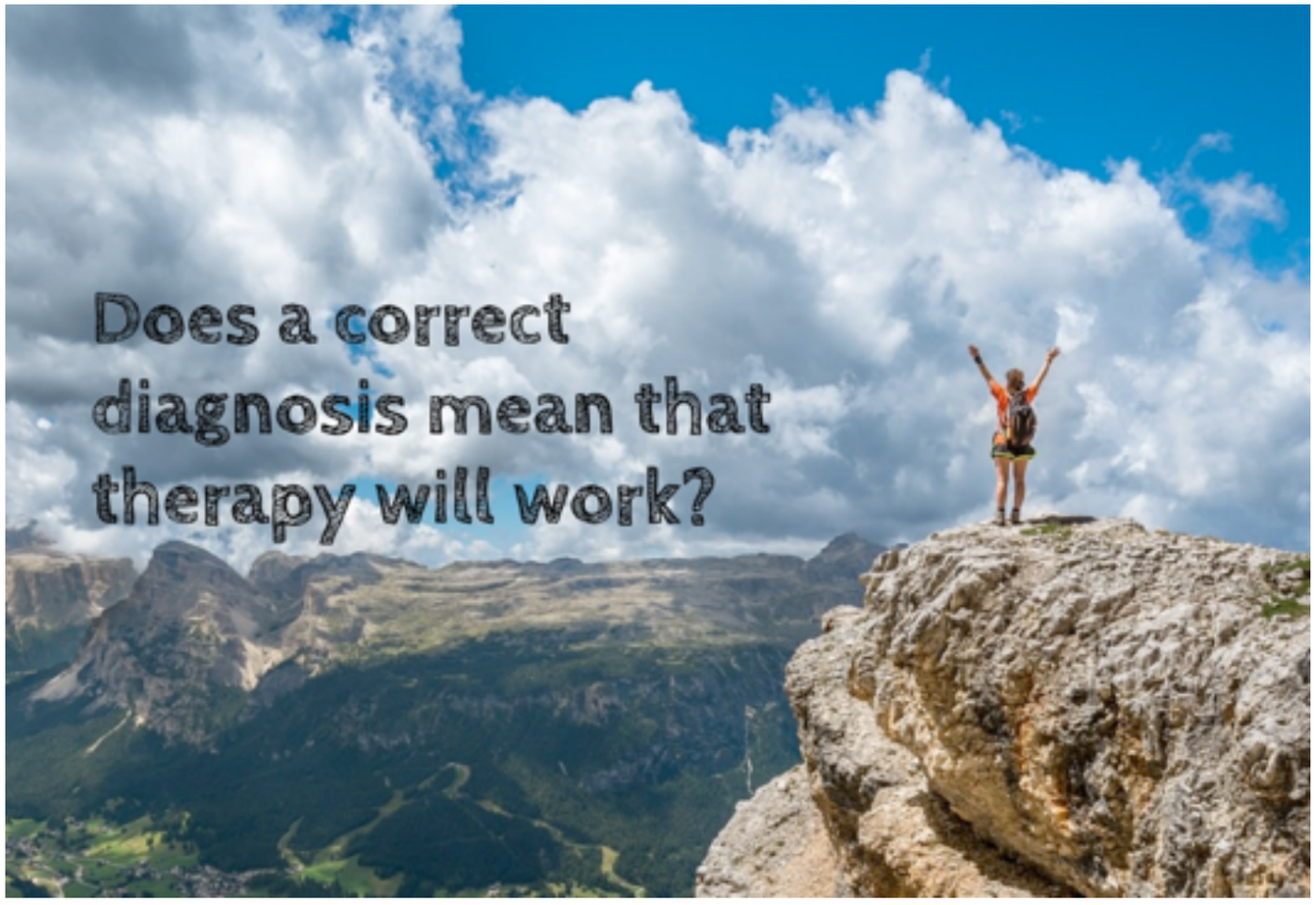
A very cynical question if you don't mind me saying so! However, it is a fair question, as we have accepted that we are going to miss a proportion of patients. We are going to have to balance the convenience of our investigation protocol, which does not include blood tests and radiology, against the knowledge that some people will be missed. Can we justify this or do we have to accept that we are doing the wrong thing some of the time? I put it to you that the question is 'what is the wrong thing?' Have a think and then revisit this in the next section.

Section 5: Written by Simon Carley

Does a correct diagnosis mean therapeutic success?

KEY POINTS

1. A correct diagnosis does not mean the treatment will work.
2. In fact patients can be harmed or helped by a correct or false diagnosis.
3. Diagnosis and therapy are rarely studied in the same trials (but they should be).
4. As we improve or change the performance of a clinical test it may subsequently affect the risk:benefit of therapy.



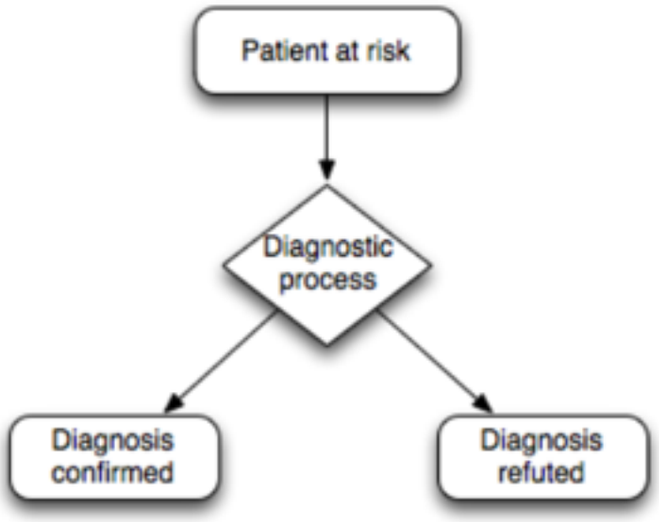
In the previous section we looked at how the performance of most of the clinical tests we use in practice, mean that we inevitably have to miss some patients who have the target condition we are looking for. We looked at PE and showed that a test with 98% sensitivity means that one in 50 people with the target disorder will slip through the net. BUT because only a minority of patients that we investigate actually have PE, we get away with it most of the time.

I reckon that you're still worried about those misses though….

If you are then I think that's fair enough. Few clinicians find this reassuring, but let's explore what we mean by a 'miss'.

Is missing a diagnosis always a terrible thing to do?

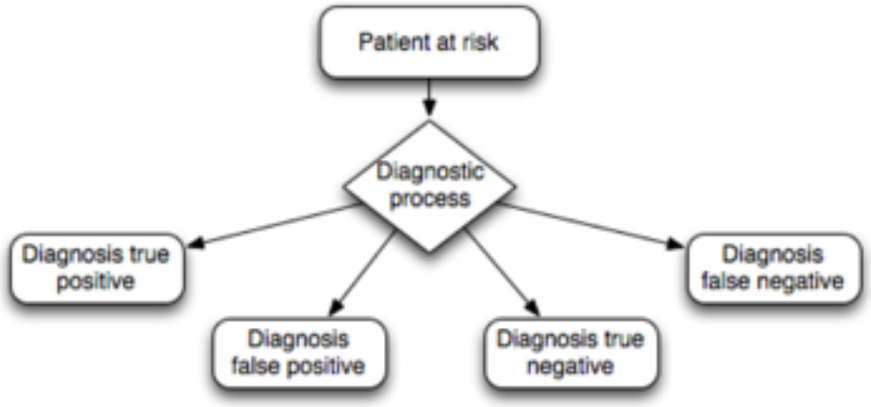
Clinicians generally start off with a fairly simplistic view about diagnosis and therapy and it looks a bit like this.



It's what I was taught at medical school, and I've probably promulgated it for many years. Why? Because it feels good to think like this. It gives the illusion of certainty and effectiveness.

However, we now understand a lot more about the process and realise that the diagnostic process does not confirm or refute a diagnosis, rather it moves probabilities around so that the true picture is more complicated.

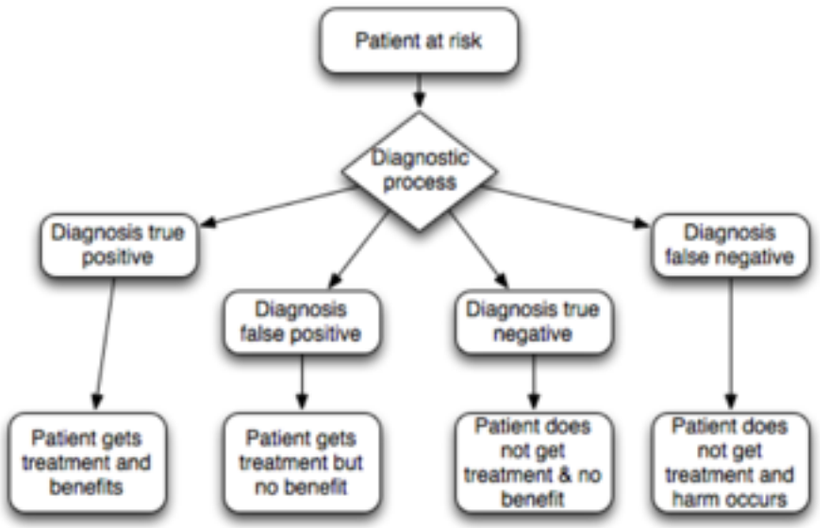
OK. So this is fine and dandy, but let's challenge the next assumption about the outcomes from diagnosis. In talking to clinicians, patients and lawyers the next assumption is that the correct diagnoses lead to benefit and false diagnoses lead to harm. Graphically we can draw this out as follows.



This too is still far too simplistic though. If you have been following any of the recent debates around the use of thrombolysis in stroke you will be all too aware that therapy itself has inherent risks, particularly when we consider therapies such as thrombolysis, operation (e.g. appendectomy), cardiac catheterisation etc.

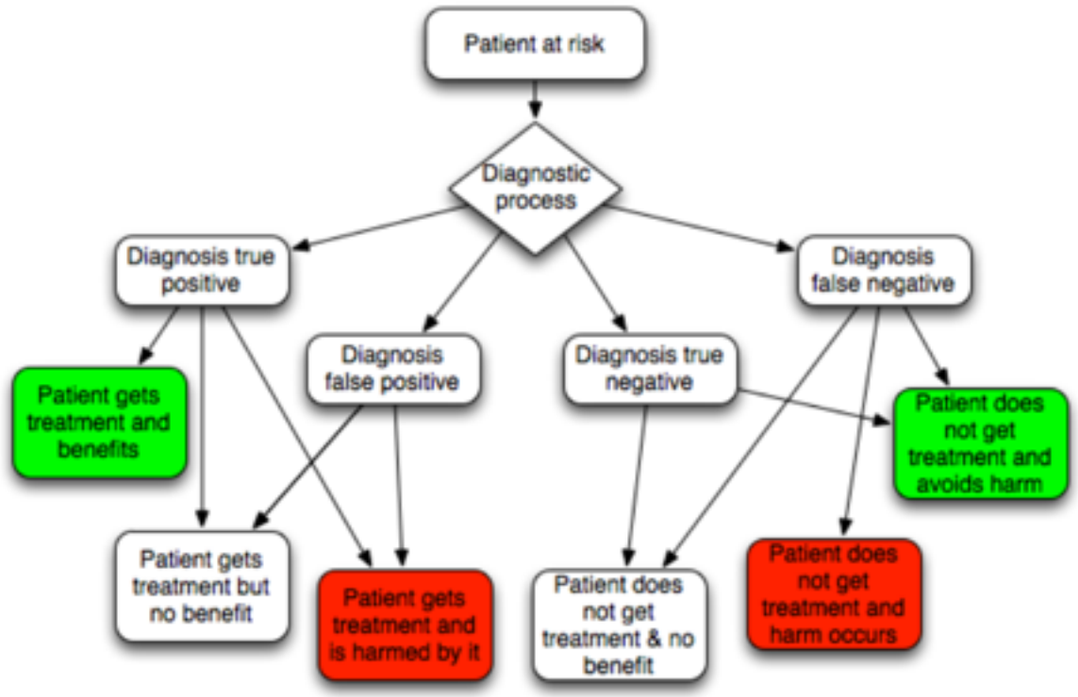
As an ED clinician this is an area where we just need to stop and think about how we, as clinicians view outcomes from therapy differently from how patients view outcomes. Our tendency is to look at populations of patients but patients don't really care that much about other patients (Ed – harsh but I think I know what you mean). Rather, patients want to know what's in it for them. As an example, we can return to the good old days of thrombolysis (still being used in remote settings of course) when I used to have a rehearsed and regular conversation with patients before starting thrombolytic therapy. The aim was to to explain that there were three possible outcomes from the proposed treatment.

- Thrombolysis could improve their outcome both in terms of survival and in terms of longer term cardiac function.
- It might make no difference at all.
- It might cause harm in terms of death, stroke or bleeding.



The patient had the opportunity to experience each of these outcomes with therapy, but interestingly there are also three potential options for those patients who declined therapy.

- They can experience an adverse outcome from their MI which might have been avoided by thrombolytic therapy.
- There would have been no difference either way. Treatment or no treatment would have made no difference.
- They can avoid the complication of therapy by declining the treatment.



In other words, there were potential risks and benefits regardless of whether a patient did or did not have therapy. As clinicians we do not typically consider all of these potential outcomes (well I don't anyway).

Now….stop and think back to those conversations….did you, or did you ever overhear, someone (it could have been you), say to a patient…

"If you don't have the clot buster you'll die from your heart attack"

I heard this many times, and still do, for a variety of different treatments, but the fact is that this is a lie. It gives an illusion of certainty that simply does not exist, as everyone who has ever visited the NNT will know (it may also interest you to know that at the time we were doing this the NNT for thrombolysis of an inferior MI was over 100).

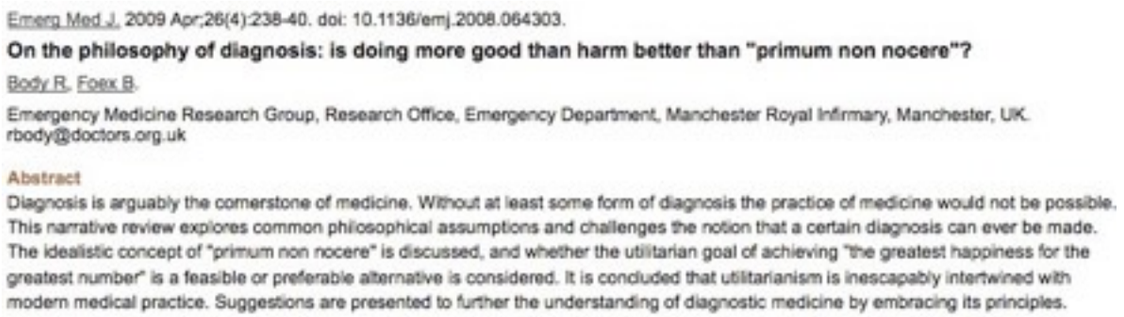
So how does this pan out graphically? We can put the various outcomes into a diagram that shows the complexity of the potential outcomes that are possible when we consider diagnoses where the diagnostic process is imperfect and where the therapy and/or the diagnostic process contains inherent harm. Examples in emergency medicine practice are very common with the investigation of pleuritic or cardiac sounding chest pain being perfect examples. All the potential outcomes described below are possible for your patients going through a diagnostic process for the investigation of PE or acute coronary syndrome.

Seriously?

Where does this leave us now? Do diagnostic tests work at all?

Well, yes of course. Diagnostics are important but it should now be clear that simply getting a result from a test is only the start of the process for patients. If we are to understand if patients are to benefit from the diagnostic process then we will be better served by taking a more utilitarian approach to diagnostics. Many diagnostic studies in the literature are designed to answer the simple question regarding whether or not the patient has the target disorder. The diagnostic cohort is the typical model and produces familiar data such as sensitivity and specificity. This is fine, but it does not answer the question about whether a diagnostic test actually benefits patients.

If you have never read the paper by Foex and Body from the EMJ on the philosophy of diagnosis then click on the abstract now.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On the philosophy of diagnosis: is doing more good than harm better than "primum non nocere"?

Body R, Foex B.

Emergency Medicine Research Group, Research Office, Emergency Department, Manchester Royal Infirmary, Manchester, UK.
rbody@doctors.org.uk

Abstract

Diagnosis is arguably the cornerstone of medicine. Without at least some form of diagnosis the practice of medicine would not be possible. This narrative review explores common philosophical assumptions and challenges the notion that a certain diagnosis can ever be made. The idealistic concept of "primum non nocere" is discussed, and whether the utilitarian goal of achieving "the greatest happiness for the greatest number" is a feasible or preferable alternative is considered. It is concluded that utilitarianism is inescapably intertwined with modern medical practice. Suggestions are presented to further the understanding of diagnostic medicine by embracing its principles.

But surely making a diagnosis is always good isn't it?

Most of the time, that is certainly the case. A diagnosis is usually a good thing to know, but perhaps not always, as testing becomes ever more accurate and our ability to pick up sub clinical disease rises. A good example here would be PE where we are increasingly able to pick up tiny PEs in the lungs. The clinical significance of this is being questioned for PE and in many other areas such as high sensitivity Troponin in chest pain (though I am convinced to be honest).

If we recognise and understand the link between diagnosis and therapy, and if we are able to balance the potential benefits and harms from the diagnostic process then we will be able to achieve better outcomes for patients.

But, surely making the diagnosis is enough.

Aren't RCTs nice but unnecessary?

This is a common complaint/theme/anxiety amongst diagnostic researchers who argue that diagnostic tests can be evaluated in simple trials, which are cheaper and easier to perform. Whilst that is true I increasingly believe that diagnostic cohort studies can only take us so far, and there are increasingly calls for RCTs to be used more frequently in the evaluation of diagnostic testing. There's a good open access review here from the Ottawa thrombosis program (who know a fair bit about this sort of thing). You can also have a look at the excellent paper from the UK Sheffield group on the evaluation of rapid assessment cardiac panels in the RATPAC trial as an example of an ED based study.

In summary, we really need to think carefully when considering how we use diagnostic tests, how we communicate information to patients and how we reassure ourselves that the diagnostic process actually leads to patient benefit.

Simon Carley

Section 6: Written by Simon Carley

How many steps to disaster

KEY POINTS

1. We all miss diagnoses.
2. The consequences of a miss are not always a disaster.
3. Some misses are good.
4. We need to find a balance between over and under diagnosis in clinical practice, there is no perfect point for many diagnostic tests, but there is a ‘best’ point.

Let's accept that most diagnostic processes 'miss' some patients, but what do we mean by a miss exactly? Is it always a terrible thing and why is it that if we constantly miss diagnoses (we do you know) we are not in court every week? Hopefully, if you have read the previous sections, then you are now absolutely convinced that error is an integral part of the diagnostic process. Arguably, it is so much a part of the diagnostic process that I don't really consider it error any more. It is inevitable that some patients will slip through the diagnostic net when you see them. You will not diagnose them, they will appear to you, to be free of disease and you will, no doubt, reassure them and yourself that all is fine and dandy. Both you and your patient will hopefully sleep well that night.

Just occasionally though, just once every so often, you will wake about 3am and wonder…., 'I wonder if that patient was the one that slipped through the net?', or 'I wonder if I might call them tomorrow to check they are OK?' I'll give a pound to any emergency physician who has never woken with such thoughts, and I'm pretty certain that the pounds will stay in my pocket.

But a miss is a miss isn't it?

Is a miss, like missing a penalty kick in the World Cup final (1994, Roberto Baggio) and handing the title to Brazil? You an watch the video here. I think everyone would agree that this was a huge miss with immediate and long lasting consequences.

What does this football analogy tell us as clinician in the ED?

If we don't 'make' a diagnosis, what are the potential outcomes for the patient who was missed? The natural assumption amongst most clinicians is that harm will then happen. A missed diagnosis surely means that we have lost the opportunity to make the patient better, but hang on a minute. In the last section we talked about how many therapies (such as thrombolysis) have an inherent harm within them, so it's not so clear cut as we might have thought. Diagnosis is, arguably, no guarantee of success.

Let's stop and think about what needs to happen for true patient harm to take place. Perhaps we can think of this as a series of steps. For serious harm to take place, a number of things need to happen.

Step 1. The patient needs to get worse.

Pretty obvious if you think about it, but not intuitive. Many conditions that we see in the ED are self limiting, even potentially serious ones such as DVT/PE or even some acute coronary syndromes (depending on your definition) can resolve spontaneously with no long term

sequelae. Infections such as pneumonia could go either way but a significant number of patients will get better spontaneously from a whole range of infectious diseases, cardiovascular conditions and trauma.

Step 2. The patient needs to not come back.

Most conditions get worse over a period of hours/days and the patient will develop new or worsening symptoms. Patients with infective disease are classic for this, even when they have significant disease. Almost all other conditions will 'usually' worsen, but sadly, not all. There is a proportion of patients with conditions such as ACS, PE, SAH where sudden, rapid and fatal deterioration may take place. There is little that can be done in these circumstances, but believe me, the incidence of this is rare in comparison to the number of patients we see. So basically, most 'missed' patients who get worse will come back.

Step 3. You need to miss it again.

Possible. It is possible to make the same mistake twice. Indeed there is something about our pride as physicians which is challenged by a patient returning with the same problem that we have already 'ruled out'. Experience has taught me that pride is not a good feature for an emergency physician. Any returning patient should be considered a 'red flag'. In general terms, I teach our juniors that a returning patient is an admit/senior review until proven otherwise. Returns are high risk patients.

Step 4. You have no treatment on return

So, when they do come back, for things to get really bad, there has to be nothing that we can do to make it better. A patient with a missed MI might come back in cardiac arrest and not survive, which would be awful, but those cases are rare. More commonly a patient will return with a worsening of disease. A missed chest infection may turn to pneumonia, a wound infection to an abscess. Whilst it would have been better for your patient to have been treated at the first opportunity, there are still therapeutic options and in the vast majority of cases they will get better.

In other words, even if a patient comes to the ED and you do not identify their underlying condition (and if you have read the other posts in this series you will know that this HAS to happen) then it does not mean that disaster will ensue. Most of the time there are either no consequences at all, or, the patient will deteriorate and return within a time frame that gives you opportunity to intervene and treat the condition.

The odds then are very much in your favour, even with the necessity of accepting the fact that we miss diagnoses we can find some solace in the odds that such misses do not lead to disaster. Most patients will safely traverse a number of steps to safely reach the other side of their illness. Does this relax you? Does this make you complacent? Well perhaps. It makes me a little more relaxed about the whole uncertainty

of the diagnostic process but I'm not sure that my patients see it that way. Thus far we've not really considered the patient, but they must surely feature somewhere and they do…..in Part 7.

Simon Carley

Section 7: Written by Simon Carley

Risk Proximity

KEY POINTS

1. If the outcome from a risky event is likely to happen soon, then we value it more highly than if it were to happen in the future.
2. Clinicians may make poor decisions if they think that they may be blamed for the inevitability of probabalistic errors.
3. Over investigation may protect the reputation of the clinician at the expense of harm to the patient.

Risk proximity is an important concept. In simple terms, it just describes the time from an event happening and the risk potentially occuring. It's not something that we often think about in the emergency department, but it's important and influences our decision making processes. In this post we begin to delve into why risk proximity may make some of our ED decisions a little less rational than we might hope.

Let's think of a few examples.

Mr X is a 35 year old postman. He goes to the gym regularly and competes in Triathlons. He has been training quite hard recently. He presents to the ED with left sided respirophasic chest pain. One of the junior docs asks you to talk through the case. You listen to the case and he appears to be low risk, in fact he is PERC rule negative. You suggest that he can safely discharge the patient without further testing when you hear…..'but I've just sent a d-dimer, do you think we should wait, just to be sure?'

Little Jimmy is an 8 year old boy who has been hit by a car. The description from the scene is that the car was moving slowly, maybe 10-15mph and that Jimmy was 'clipped' rather than fell onto the curb. He was not knocked out, has no external head injury and although he vomited soon afterwards and had a sleep in the car on the way in to hospital, he does not meet criteria for a head CT. You reassure the parents that no further imaging is required and suggest that he just needs observation at home. They look at you oddly and ask what the CT scan shows. You realise that a colleague ordered a head CT from triage. After a rather embarrassing conversation with the parents about the normal CT you ask why it was requested. Your colleague tells you that last week the department sent home a patient who then returned a week later with a skull fracture on CT. Apparently, an incident form was submitted and it's all being investigated.

Both these examples are arguably violations of routine practice but I'll bet a fine English pound that we've all experienced similar episodes. There are, of course, many reasons why this might happen, ignorance, error, bad medicine or laziness but another factor that I see in the ED relates to perceptions around risk proximity.

Risk proximity simply means how close we are, in terms of time, to a risk occurring. In project management this is used to ensure that focus on risks is balanced with a greater emphasis on those risks that are likely to occur in the short term. In medical decision making we see similar behaviours with a focus on those risks that are likely to occur sooner rather than later, but before we explore that further it's worth stopping and thinking about who's risks we are managing..

Who is really at risk when we make a decision in the ED?

Obviously, it's the patient. In the examples given above, the first patient may have a PE, the second might have a significant head injury. These risks are low but they are not zero and so the patient is at risk if they do not get an investigation. However, whilst we might frame the risk in terms of the patient, it is not the patient who typically makes the decision. It's the clinician who decides whether to proceed with a test and their decision is also influenced by a personal risk.

As a thought experiment we can consider Dr A who always sends blood tests, gets X-rays for everyone, and if a CT might be indicated he orders it. If you've got a sore throat then have some antibiotics, bit of a cough then more antibiotics, and if you have some pain this Codeine should sort you out perfectly. Is Dr A a great clinician? Well no, if you've read the rest of this series then you will know that there are major harms associated with overinvestigation. The paradox is that Dr A may appear to be a great clinician and his patients may love him. If we assume that there are good mechanisms for reading those X-rays then no injuries will be missed and no patient will return after a week with a quinsy or pneumonia, complaining that they were not given antibiotics at an early stage of their illness.

Dr A will have few complaints and a file full of thank you cards. Their practice will of course be expensive and much harm will come to their patients but that harm will be hidden from view.

None of us wants to be Dr A, but let's face it, there are temptations. If you've ever missed a diagnosis, or rather when you become aware that you've missed a diagnosis, you will know that your behaviour and investigation thresholds change for the following days, months, even years.

The bottom line is that overinvestigation protects the reputation of the clinician. In other words it's much easier to get 'pinged' for failing to investigate than for over-ordering tests which are not really indicated. As a result, the decision to order an investigation is determined by a combination of the risk to the patient (of having the disease) and the risk to the clinician (of missing an important diagnosis).

What about patient harm?

Patients can be harmed through the diagnostic process in many different ways as other articles in this series have described. In terms of risk proximity, time has a significant impact in how we understand and perceive risk within the diagnostics process.

In the short term, there are clearly the risks of missing an important diagnosis. In the examples at the beginning of this post we might miss a PE with our patient returning within weeks suffering from a big PE or even death (although this is really unlikely). Similarly, missing a skull fracture or small intracranial haematoma in a child may be perceived as a terrible miss (with the blame squad arriving mob handed to find out who is to blame).

The other risks of overdiagnosis are, rarely if ever, linked by patient or clinician. If I decide to CT all children with head injuries from this day forth I will no doubt cause many cancers and cataracts in my patients. However, these complications will take place many years in the future. I will never see them and it's highly unlikely that the patient will ever associate an unwarranted investigation with a future disease.

Similarly, overinvestigation can lead to an increasing number of false positives. In past posts we have discussed the problems of overdiagnosis in PE leading to an increased number of patients taking anticoagulants. If they then have a bleeding complication it is almost impossible to link that complication back to the original poor decision to overinvestigate the ED patient.

In managed health organisations, or where there is close oversight of clinical practice, it may be possible to see trends between clinicians and departments, but in the UK where staff are often transient and junior, it may be very difficult to see patterns in time to control them.

So what does this all this mean for the ED clinician?

It's complex. Emergency medicine is a speciality where the conduct and understanding of the diagnostic process is at the very core of what we do. We need to understand how the concepts of risk proximity may affect our own judgement and the judgement of others. It should be a factor when we consider how to structure our diagnostic strategies (clinical decision support guidelines are an obvious solution which can be audited) and can aid us when we investigate critical incidents and our reactions to them.

The bottom line is that risk is divided between clinician and patient. Risks are not always realised at the same time and many of the harms that can result from over-investigation (and subsequent unnecessary therapy) will not be temporally linked by either.

It's might be worth reflecting on this the next time you see an unnecessary test ordered in the ED.

Simon Carley

Chapter 2

Metacognition in EM

Metacognition is simply thinking about thinking. Arguably this is the core skill of emergency medicine: the ability to think, consider evidence and make decisions. In this chapter we explore some of the more complex elements of metacognition in emergency care.

Section 1: Written by Simon Carley

What is Gestalt?

KEY POINTS

1. Gestalt means shape or form.
2. The term originated in the psychological literature concerning our perception of the world.
3. In medicine the term is used beyond it's original derivation to encompass elements of practice such as clinical judgement.
4. Gestalt features in a number of supposedly objective scoring systems used in EM practice.

If you follow #FOAMed conversations on twitter then you will have come across the term Gestalt a lot. Many conversations about clinical decisions hinge around this elusive, slippery and somewhat obscure term. Perhaps it is in a rather circular manner something that is difficult to define, yet we know it when we see it….., or perhaps we are merely using the wrong term.

This section is an introduction to thinking about perception, interpretation, judgement and clinical decision making.

So for starters, do you agree with Linda?

It's time to find out.

What does Gestalt mean?

Originally Gestalt means 'shape or form'. It's a German term that has come to be associated with a theory of perception and understanding.

Where does the term come from?

Gestalt originated in the psychological literature towards the beginning of the last century. It was a counter to the structuralist arguments promoted towards the end of the 19th Century. Structuralist approaches suggest that everything can be broken down into individual components, thus by knowing the nature of constituent parts we can understand the whole. For example, a structuralist approach would suggest that by understanding all the aspects of automotive engineering, we can understand what a car is. Gestalt would argue that we perceive a car as a whole and not as components. Gestalt states that our minds organise information to a global perception rather than by assessing each individual element, in other words 'The whole is greater than the sum of its parts'.

Properties in Gestalt systems

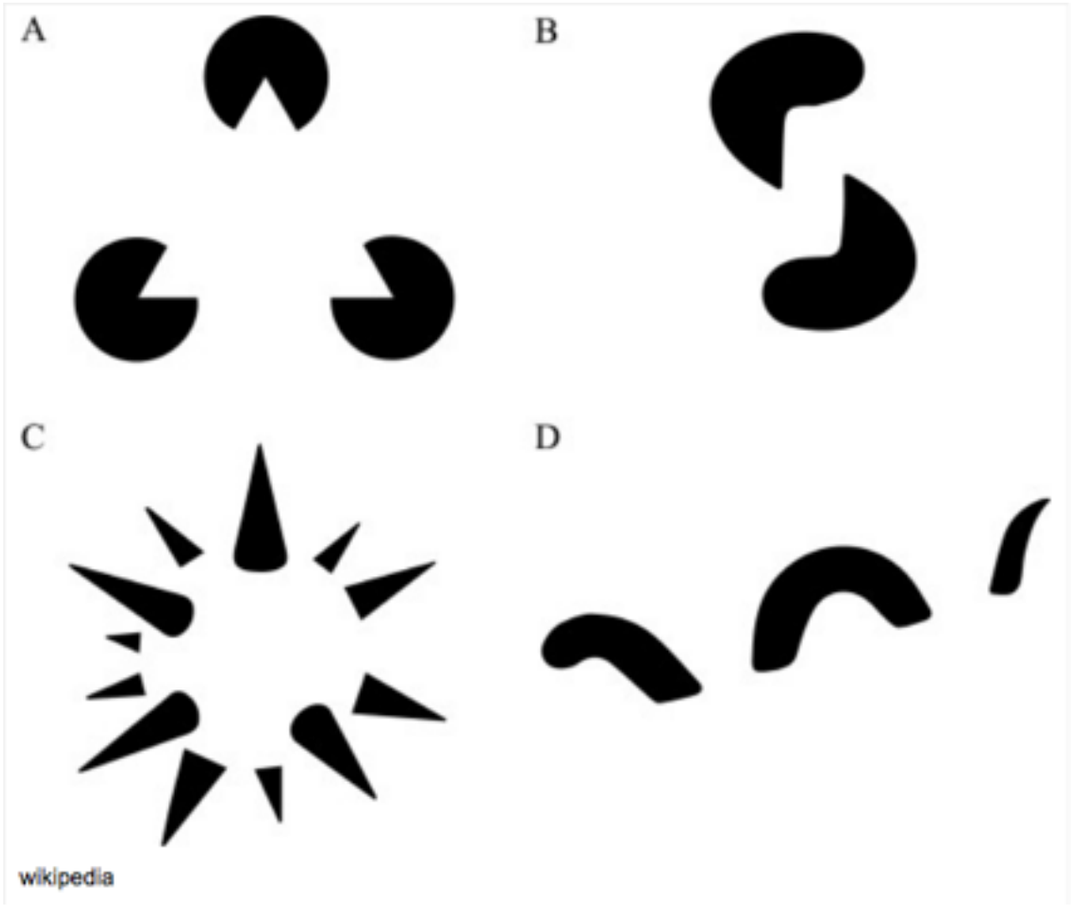
Much of the literature around gestalt focuses on visual perceptions and there are several examples around that you may be familiar with. There are four properties in gestalt systems, emergence, reification, invariance and multistability.

Emergence

Emergence is the phenomena where a complex pattern emerges from simpler forms. Perhaps the best known example of this is the following picture of a Dalmatian dog. There is clearly no picture of dog here, but our minds are able to form the final image from the component parts. None of the components in itself is dog like, yet the sum of the image gives a dog sniffing the ground

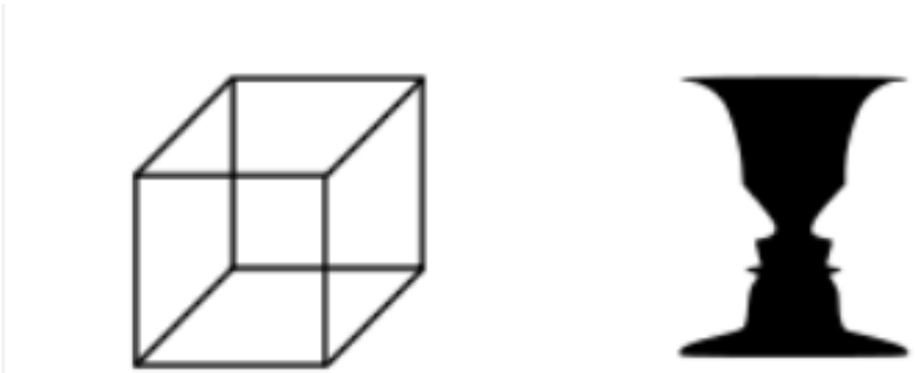
Reification

Reification is the process by where we construct spacial relationships from elements outwith those presented. Several examples are shown below where geometrical objects are perceived by the relationship with the components presented, yet they do not actually exist.



Multistability

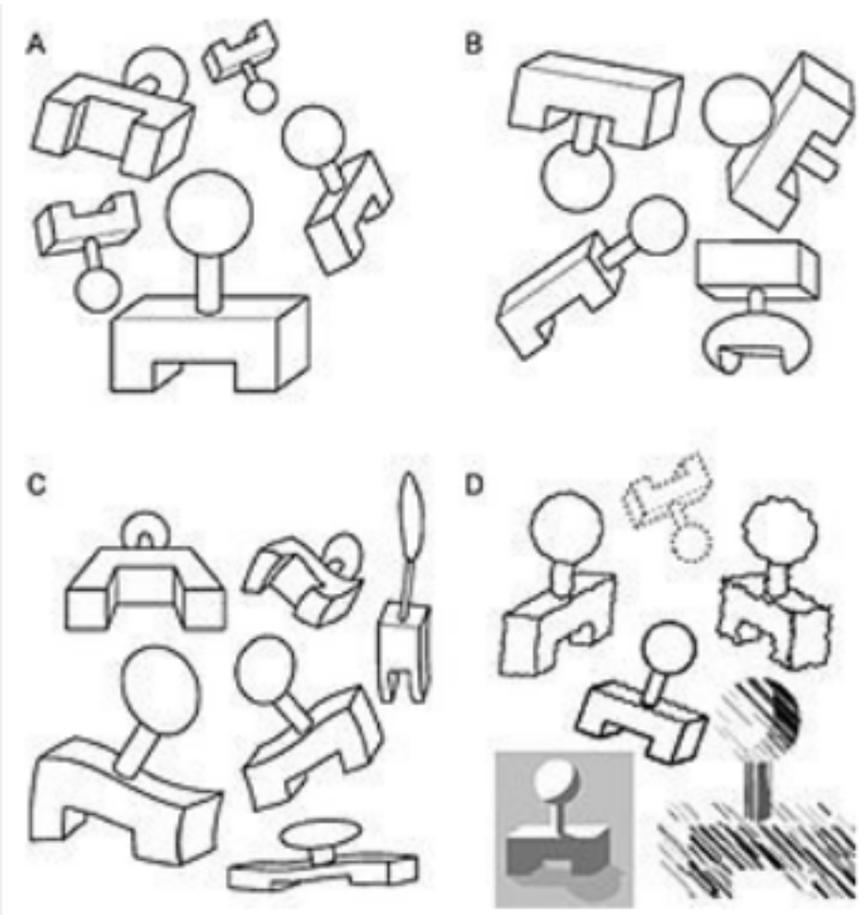
Multistability takes place when we can perceive an object in a variety of different ways; it's a common visual puzzle that you will be familiar with. Examples below include the Necker cube and the Rubin vase, but there are many others.



wikipedia

Invariance

Invariance is the property whereby objects are perceived as the same despite differences in relative shape, size, rotation scale or aspect. Similarly we perceive the same shape regardless of environmental effects such as setting, time of day, location etc.

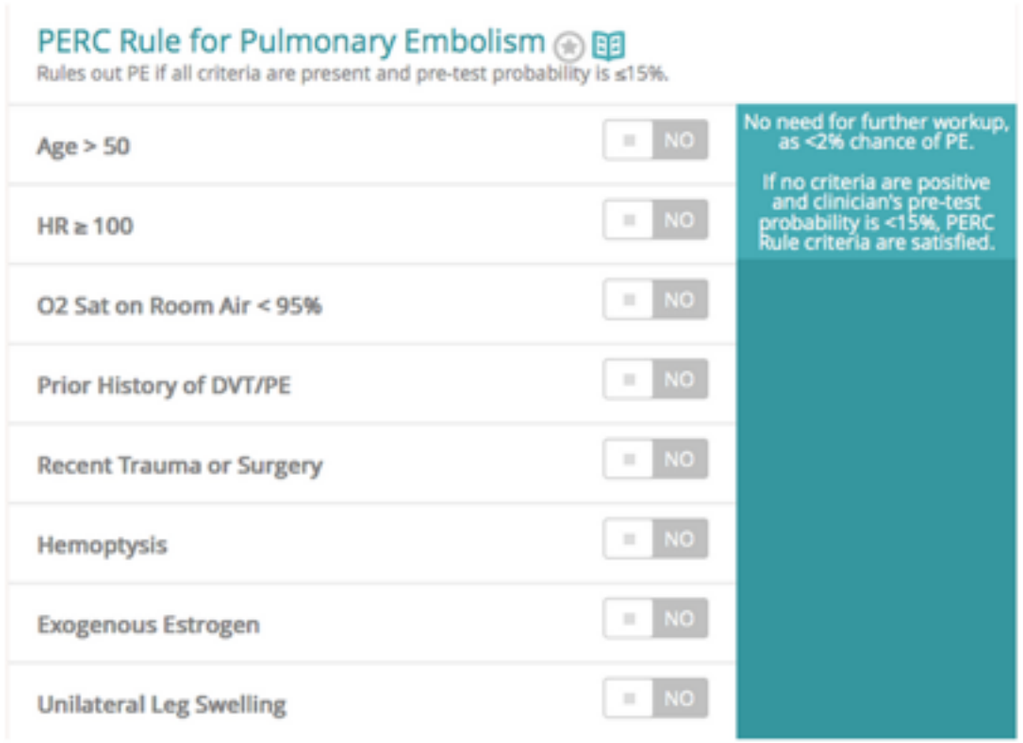


Invariance

Most work in Gestalt has focused on the visual aspects of perception but it can be recognised in other senses, such as through the interpretation of sound and music.

Do such visual elements of Gestalt exist in medicine?

Arguably, they do. We build towards a diagnosis from elements of its form rather than an entire picture or a consistent form. Diagnoses



emerge from individual components that we bring together to 'form' that which we recognise and subsequently label (emergence/ reification). We are often faced with constellations of symptoms and signs that may represent one condition or another. For example, you have probably met conditions like COPD, Heart Failure or Pneumonia, that all look very similar of fist assessment. Few patients are precisely the same yet, somehow we manage to make a similar diagnosis (invariance).

How do we use it medicine?

We seem to use it a lot. Gestalt is often thought to be similar to 'clinical judgement', though we need to think that through a little more deeply later. It is referred to in conversations between clinicians and also appears in a number of clinical decision rules.

Several clinical decision rules appear to encompass Gestalt. For example, the PERC rule is designed to be used in a population that the clinician believes to be low risk; it then goes on to list a number of other tangible features that also determine low risk. So, if the objective measures are evidence of low risk, what then is the original perception of the treating clinician that this is a low risk patient? Similarly, in the Wells DVT score, we assign a score of -2 for patients in whom we feel an alternative diagnosis is likely. This soft perception on the part of the clinician is again arguably embracing Gestalt within a scoring system.

If we are looking for a simple definition of Gestalt, then we can simply consider it to be a sensory interpretation that is greater than the sum of its parts (a concept which predates Gestalt and which dates back to Aristotle). In clinical terms, we can define it thus: 'A structure, configuration, or pattern of physiological, biological or psychological phenomena so integrated as to constitute a functional unit with properties not derivable by summation of its parts.'

So what might this mean in real terms? Well, I often use the silly walks example. You are walking through resus and you walk past bed 1, bed 2, bed 3, then suddenly turn on your heels and return to bed 2. Something is up…, but you're not sure what. Something about the noise, sight, smell, atmosphere tells you that something is not right. The observations/monitors are either irrelevant or contradictory. You just know…, the outcome is greater than the sum of the perception.

We also use Gestalt daily in the interpretation of ECGs in the ED. Whilst we may teach an atomistic approach to our medical students; calculate the rate, rhythm, size, relationship etc. As experienced clinicians though, we do not do this at all. A simple observation of a cardiologist or emergency physician reading an ECG is an example of heuristics, gestalt and judgement over a constructivist approach to

data interpretation. Only when pattern recognition and gestalt fails, do

Jazeen Hollings

http://commons.wikimedia.org/wiki/File:Silly_Walk_Gait.jpg

experts resort to systematic enquiry. There are many, many other examples within our practice that both help and hinder us as clinicians, but what is not in doubt is the importance to clinical decision making inherent within the realms of perception, interpretation and judgement.

Gestalt and the immeasurably measurable.

If Gestalt is truly greater than the sum of its constituent parts, then this can only be the case where all parts are perceived, considered and valued. That is not, however, a characteristic of medical education. In our patients and clinical studies we have a propensity to measure and value what is measurable. Blood pressure, heart rate, respiratory rate are quantative values which we can define and share. However, other elements of assessment which are arguably highly valued by clinicians such as agitation, sweating, distractability, attentiveness are difficult to measure, but are perceived by clinicians. Ask an experienced clinician to look at a patient in the resus room who has an abnormal respiratory pattern, sweating, agitation. They will comment and place value on these findings, however, they will not commonly feature in clinical scores (which favour objective data). This is referred to as Gestalt, but it is not. The signs are there, they are perceived, and indeed, articulated at handover between the resus teams, but they might not make it onto the nurses observation chart.

Beyond that, are more subtle clinical signs such as distractability and other responses that may be difficult to explicitly perceive and share, but a clinician may sense and use in formulation without perception.

Summary.

So Gestalt in its purest sense, is somewhat contrary to the positivistic pseudo-scientific view that many clinicians hold onto as a model for their practice. Gestalt is one element and pathway that links the acquisition of data to processing and ultimately to clinical judgement and decision making. In its simplest sense, it is an assessment that is greater than its parts, but in the world of emergency medicine the term is often confused with the wider realm of clinical judgement.

Simon Carley

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Section 2: Written by Iain Beardsell

When we are the diagnostic test

KEY POINTS

1. All Doctors are Jackasses.
2. Our personal state of mind influences our diagnostic performance.
3. Learn to focus your attention when faced with a difficult cognitive task.
4. Beware the patient you don't like.
5. Learn to recognise and adapt at times when you might not be performing at your best.

Simon's recent post about Gestalt, has, like many of you, got me thinking. What is that "end of the bed-o-gram" that we place so much value on? How do we know if it is accurate? Can we teach and learn these skills? What are the characteristics of this diagnostic test and can it be relied upon?

Perhaps, even more important for me, is how we know when our gestalt sensor is slipping, when we are not at our best and when other outside forces are subconsciously altering our own sensitivity and specificity. I, and others, have written at length about the circumstances we all have to work in: the never ending patient load; the overcrowding; the constant worry about making a mistake.

On the amazing trip to Fiji I shared with Nat May, Nick Jenkins and Anne Creaton in 2015, I accidentally came out with something more profound than my usual witterings (it must have been the Fiji Gold) *[Ed – one of my great twitter skills is making you sound smart! – Nat]*

Over my comparatively short career as an Emergency Physician, I can recollect many occasions when I haven't quite been at my best as a diagnostic clinician. Usually, these pass without incident and unnoticed to me as well as others, but I know there have been times when the extraneous stresses have influenced my decision making and the accuracy of my gestalt. In the #FOAMed world there have been many excellent talks about these "biases" and how we, as clinicians, think. One of the very best comes from Chris Nickson at the first SMACC conference – if you haven't watched this video yet, you really must. And if you've seen it before, you should probably watch it again. Click on the link below to watch the video on the SMACC site.

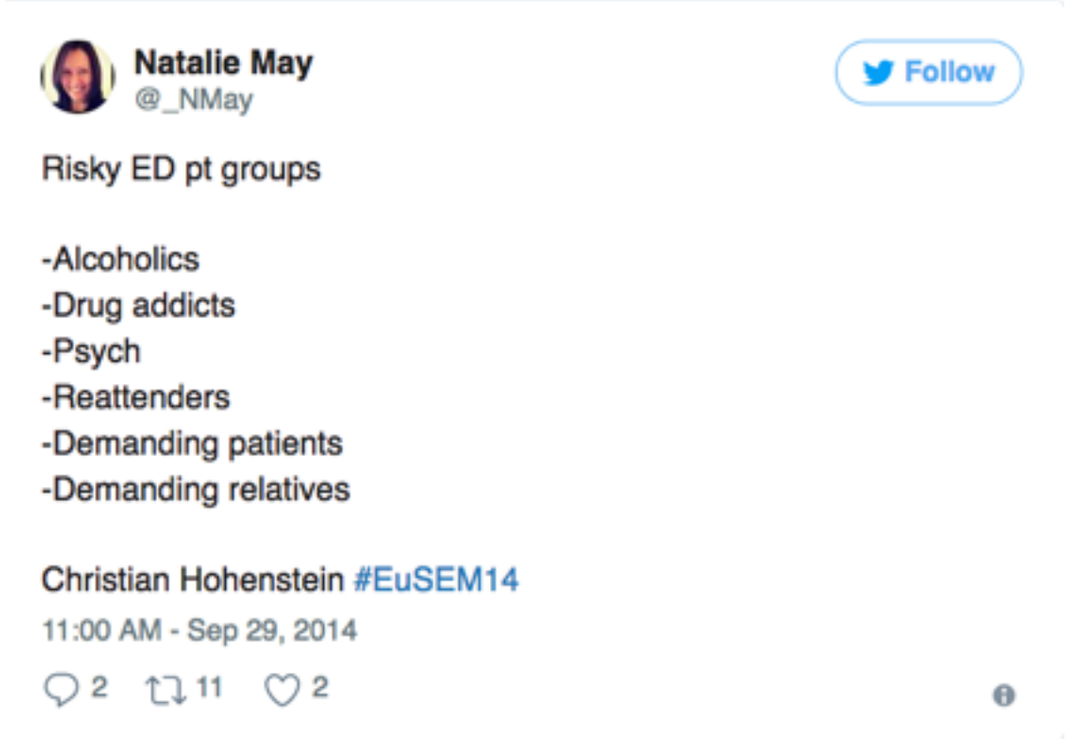
Chris Nickson Doctors are Jackasses

Social Media and Critical Care

In a busy ED there are many times when I rely on my gut instinct to tell me when something doesn't fit. It is that hard to define mix, that Simon describes so well:

"Something about the noise, sight, smell, atmosphere tells you that something is not right. The observations/monitors are either irrelevant or contradictory. You just know…, the outcome is greater than the sum of the perception."

What about when I am tired, hungry and distracted by external stresses: the worry about a family member's illness; a concern about your child's school performance; an upcoming birthday where you've forgotten to buy a present. The daily burdens of everyday life are sometimes hard to ignore. Add in the large numbers of patients in the ED all vying for your attention and the managerial pressure of a government target and you have a heady mix that inevitably alters your ability not only to sense when the pattern doesn't fit, but also to find the strength to do something about it.



It is vitally important that we recognise when this is happening to ourselves and those around us. Time constraints demand that we make quick decisions using efficient processes and for many of us that includes an element of gestalt. We must be vigilant and only use this diagnostic test when it is functioning at its best. After all, if you were told your blood gas machine wasn't calibrated properly and was giving less accurate results you would stop using it until it was back to the expected standard and we must regard ourselves as the same. We are a diagnostic instrument that needs to be cared for with internal checks and balances to recognise when it is not working before it is too late and a fatal error has been made.

There are a few techniques I have developed over the years to try to combat this cognitive fatigue when I recognise it and I would be interested to hear others' ideas:

- To avoid distraction when listening to a colleague present a patient I'll walk with them around corridors of the department, or even go outside into the ambulance bay. This helps me focus my thoughts on what I'm being told and give them my full attention.

- There are some patients who we instinctively don't like and I believe our gestalt is affected accordingly. As taught by a senior colleague, Mike Clancy, I spend twice as much time with them and deliberately remove emotion from the consultation (and gestalt is surely affected by emotion), perhaps depending more on objective testing than would normally be my practice.

- Beware of any patient whom you see near the end of a shift. Reducing the patient load for your colleagues may seem to be a help, but you are not going to be as thorough when the shift clock is against you and handovers of partially completed assessments present a danger of their own. Use the last minutes of your shift wisely.

- Festive holidays, especially Christmas, can alter our judgement. All our patients would like to be with their loved ones at these times, but serious disease is no respecter of the urge to open presents and eat turkey.

- Admit to others when you are not at your best. This could be due to a poor nights sleep or a difficult situation outside work, but asking a trusted colleague to keep an eye on you and make sure you decision making is sound can be very reassuring.

Undoubtedly, gestalt is a valuable tool in the Emergency Physician's armoury, but like all diagnostic tests we must only use it when it is functioning at an acceptable level and we have a duty to all to recognise when it is not.

Iain Beardsell

We are defined and judged by our decisions

Section 3: Written by Simon Carley

Do risk factors really factor?

KEY POINTS

1. Risk factors do not predict pathology in the way that we think they do.
2. Acute coronary syndrome diagnosis in the ED is inversely proportionate to the number of risk factors the patient has.
3. The importance of many risk factors may not be as significant as we think.
4. Use this section to reflect on how you use risk factors in your diagnostic processes.

We've been involved with the SMACC conference from it's inception in 2013. We believe it's the best conference in the world for anyone involved in resuscitation, and it's not just about the latest and greatest bits of kit, or the latest airway technique. There is plenty of science, encompassing cutting edge clinicians in emergency medicine, critical care, prehospital care and education. At St.Emlyn's we sometimes take a more philosophical view, taking pride in thinking deeply about what we do and why. That's why I was asked to speak in 2015 on the Gold Coast on risk factors and how we use them in emergency medicine.

This section links to a talk about thinking about our thinking, meta-cognition if you prefer. As emergency physicians our practice is based on our ideas, interpretations and beliefs and in this presentation I hope that by talking through the importance of chronic health disease risk factors in emergency medicine it might give you pause to think and reflect on why we make the decisions that we do in the resus room and emergency department.

Click on the link below or picture above to visit the SMACC website and watch the video.Simon - Carley Do Risk Factors Really Factor? Social Media and Critical Care

Hopefully this presentation will make you stop and think about how we use risk factor information in the ED. The bottom line is that the strength of risk factors in the ED is perhaps not as powerful as we think. That's a problem if they have too much influence on our decisions. In practice it's more risky for us when we ignore clinical symptoms because risk factors are absent. In cardiac disease it's pretty clear that this would not be a great plan.

Simon Carley

Section 4: Written by Rick Body

How accurate is clinical judgement for acute coronary syndromes?

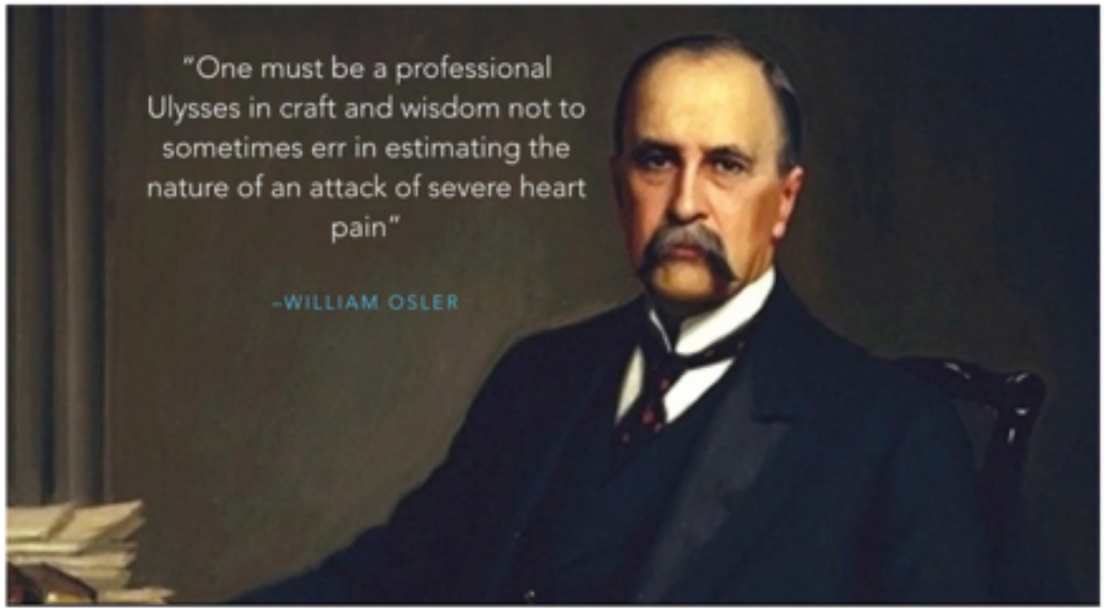
KEY POINTS

1. Lots of risk factors do not rule in ACS.
2. The character of pain is a useless test in ACS.
3. Doctors are a bit rubbish when it comes to the Gestalt of ACS.

Anyone who's worked in Emergency Medicine for any length of time will appreciate that an acute coronary syndrome (ACS) is one of the most difficult diagnoses to rule in or rule out in the Emergency Department. We've probably all seen the old stat that 2% of all acute myocardial infractions (AMIs) are missed in the ED. You might also have seen the stat that up to 7% of patients discharged from the ED have prognostically important myocardial damage, which by today's standards would be considered as acute

myocardial infarction. Perhaps that's why missed ACS is one of the leading causes of medical litigation.

What William Osler, King of Gestalt, had to say about clinical judgement for acute coronary syndromes

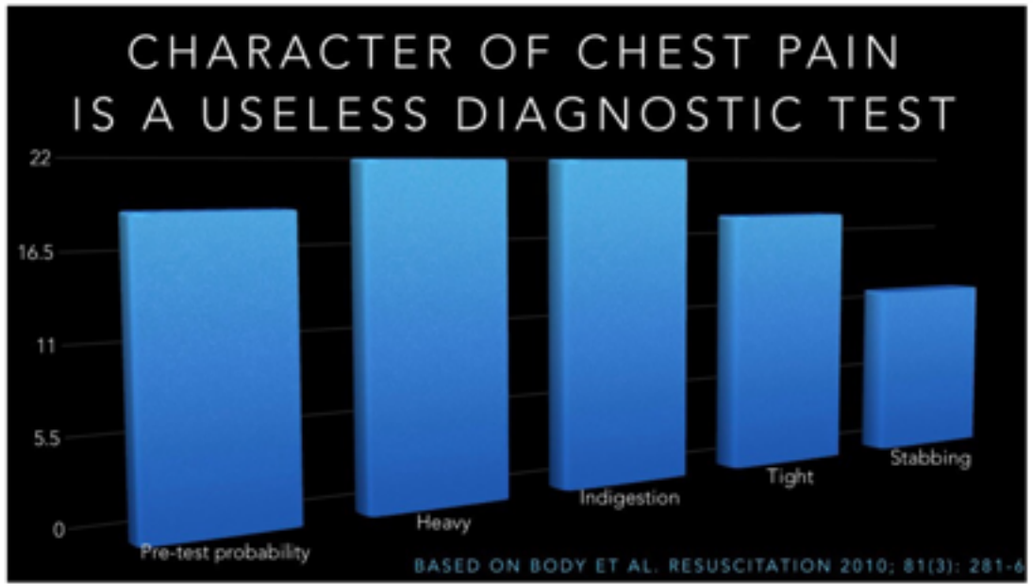


What William Osler, King of Gestalt, had to say about clinical judgement for acute coronary syndromes

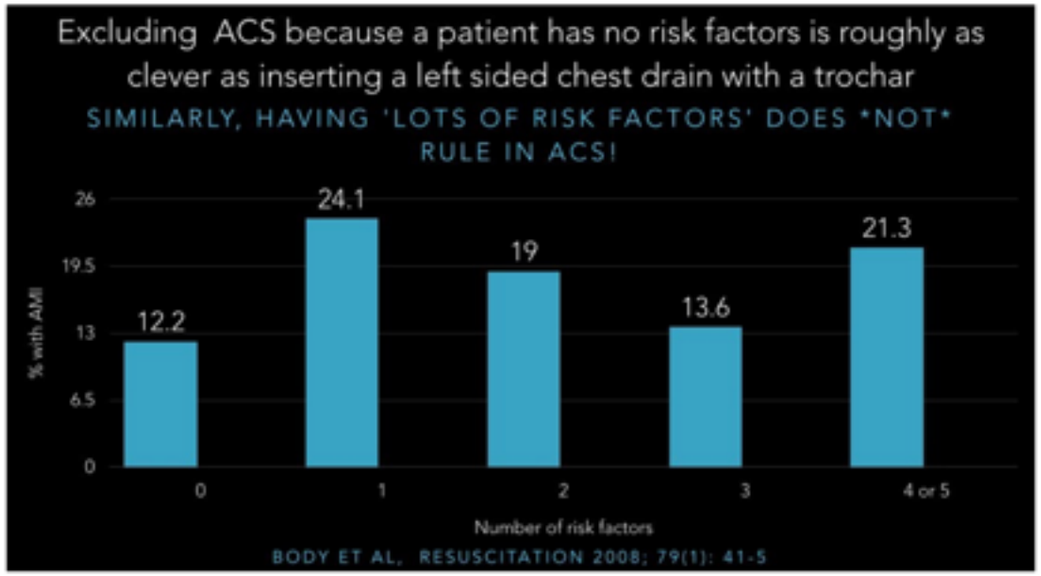
Why is this such a hard diagnosis to make in the ED?

Maybe we struggle because, as doctors, we like to use our clinical judgement. We like to think that we can use the clinical information we have to make diagnoses without having to rely on tests. Perhaps we also feel like we lose face if we admit patients for investigation, when patients don't actually have the diagnosis we investigated them for. Don't you hate it when someone from an admitting team catches you in the corridor and says something like, "Hey, you remember that patient you referred to me yesterday with query ACS? We sent him home – it was just gastritis"? It makes you feel inferior – like you should have been able to know that if your gestalt had been a bit better or if you'd have been just a bit bolder.

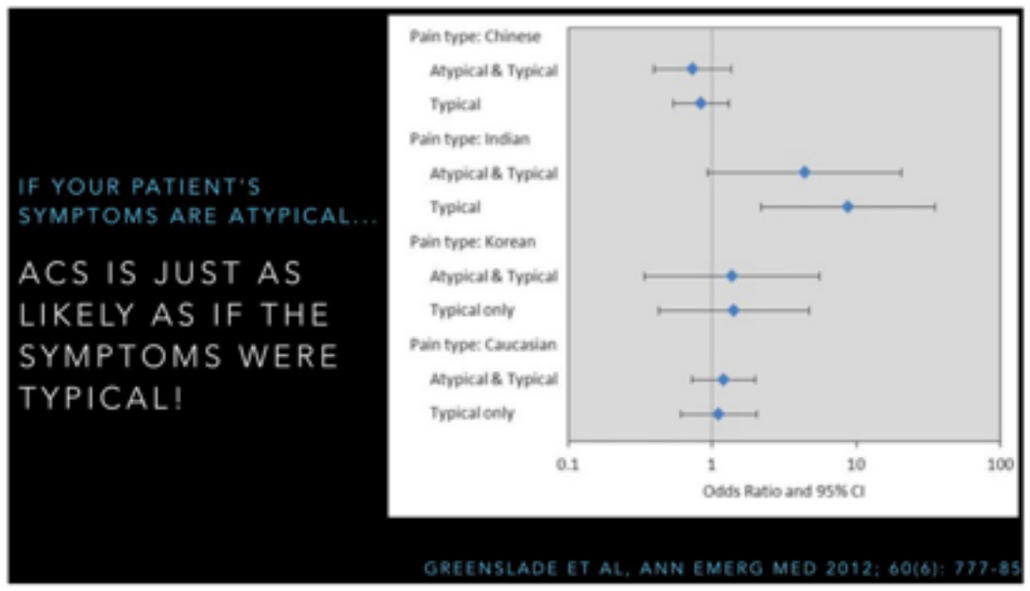
However, the literature is quite clear about this. If the patient's symptoms consist of acute discomfort or pain in the chest, epigastrium, jaw, neck, throat or arms and you haven't otherwise explained it, you're right to consider ACS – even if the symptoms may not seem so convincing. This is based on good evidence that patients with ACS often have atypical symptoms. Taking individual symptoms, for example, the character of the pain, the radiation of the pain and the number of risk factors a patient has don't affect the probability of ACS to any significant extent, as you can see from these slides taken from my talk at SMACC Gold (based on our own research – which you can find here).



Percentage of patients with AMI stratified by pain character



Even grouping symptoms together as ‘typical’ or ‘atypical’, the patients with atypical symptoms are no less likely to have ACS than those with typical symptoms – as shown this great study from Louise Cullen’s group, which I was honoured to be involved with.



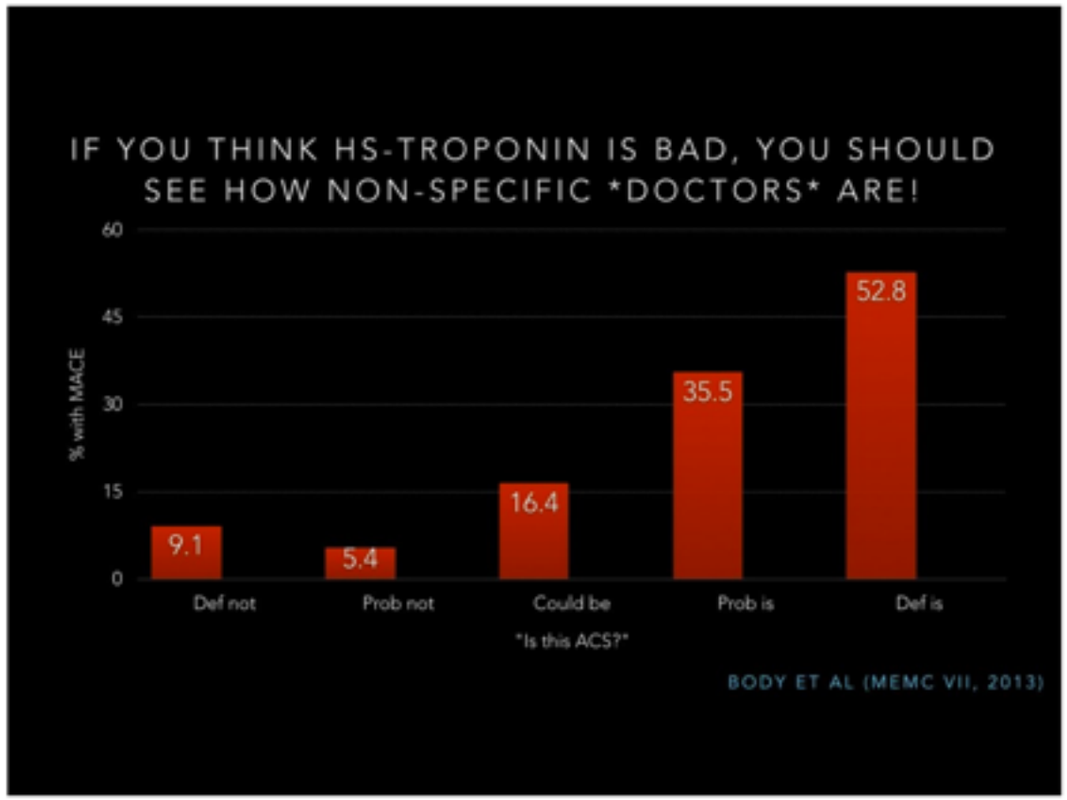
So what did we do in this research?

We ran a cohort study. The main aim of the study was to validate the MACS decision rule but we also ran several substudies using the data collected. In this one, we wanted to know about the diagnostic accuracy of emergency physicians’ clinical judgement for acute coronary syndromes – both alone and in combination with the tests available on arrival – troponin and the ECG. To be honest, we didn’t expect to find a useful ‘rule out’ strategy – we simply wanted to quantify the accuracy to better inform our practice and to find out whether we might be able to refine and improve the MACS rule by incorporating gestalt.

In this study, we asked emergency physicians to record their ‘gestalt’ or overall clinical judgement for ACS using a 5 point Likert scale (from ‘definitely ACS’ to ‘definitely not’ ACS. We then cross-tabulated this with the patients’ outcomes – and the outcomes we were interested in were a diagnosis of AMI and the occurrence of major adverse cardiac events (MACE) within 30 days.

What did we find?

The bottom line is that, for patients in whom we’ve already considered the possibility of ACS as a diagnosis, our ‘gestalt’ regarding the overall probability of that diagnosis can’t be relied upon by itself to rule out that diagnosis. Nor can gestalt be used to ‘rule in’ the diagnosis – only half of those whom clinicians felt ‘definitely’ had ACS actually had AMI or developed MACE within 30 days. Here’s another slide from my SMACC Gold talk to illustrate that.



Is that all there is to it?

No, wait, there's more. And here's where the story gets really interesting. Nobody in their right mind would consider the possibility of ACS without doing an ECG, right? So it's probably unfair to assess clinical judgement alone without at least taking account of the ECG. We're unlikely to want to discharge these patients if they have ischaemic ECGs, even if we do think that ACS is still unlikely. What's more, we have another amazing test that we'd always run in these patients – troponin. We run that test on arrival too, and again we wouldn't send the patients home if they had a positive troponin on admission – even if we did think that ACS was unlikely. So we looked at the overall diagnostic value of gestalt combined with the ECG and initial troponin level.

What we found may seem surprising. If we discharged patients who had a *normal ECG, a normal troponin and we felt that the diagnosis was 'probably not' ACS*, then we wouldn't have missed a single case in this cohort – the **sensitivity was 100%**. Almost a quarter of patients could have been discharged using that strategy.

If we used a *high sensitivity troponin* assay rather than a standard contemporary one, we could also have discharged patients in whom we felt the diagnosis 'could be' ACS without missing any cases – 100% sensitivity. ***Using this strategy, over 40% of patients could potentially have been discharged – without missing a single AMI in this cohort.***

And one of the really great things about this strategy, is that it didn't seem to matter if it was an experienced consultant or a junior doctor giving their gestalt – we still achieved 100% sensitivity.

What does that mean for our practice?

Before anyone gets carried away by these promising findings, it's important to recognise that there are some limitations to this work. The 95% confidence intervals for sensitivity extend down to 95.6% and the first reports of new diagnostic technology often overestimate performance (commonly due to reporting and publication bias). Therefore we need to validate these findings – first in observational studies and then, if they still show promise, in interventional trials. Of course, doctors might be slightly less bold when it comes to stating

their gestalt if they knew that they'd have to send patients home based on their estimates. We can only find that out by evaluating the strategy in practice.

Maybe emergency physicians are as good as House after all

This means that you shouldn't use gestalt to rule out ACS right now, even in combination with the ECG and troponin. But you can rest assured that the probability of ACS in patients with normal troponin and ECG on arrival is extremely low if your clinical judgement suggests that the diagnosis is unlikely. This can affect your practice – because we often treat patients with possible ACS on the assumption that they have that diagnosis, before further tests can confirm or refute it. Those treatments have risks (especially bleeding). If the diagnosis of ACS is extremely unlikely, the patients really aren't going to benefit from early treatment overall. So hang fire with your prescribing pens – and rest assured that your judgement is probably right, even though you do still need to rely on those serial troponins (at least for now!)

Rick Body

Can emergency physicians 'rule in' and 'rule out' acute myocardial infarction with clinical judgement?

Richard Body[1,2], **Gary Cook**[3], **Gillian Burrows**[3], **Simon Carley**[2,4], **Philip S Lewis**[3]

Author Affiliations

Correspondence to
Dr Richard Body, Emergency Medicine and Intensive Care Research Group, Emergency Department, Manchester Royal Infirmary, Manchester Academic Health Science Centre, Oxford Road, Manchester M13 9WL, UK; richard.body@manchester.ac.uk

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Abstract

Objective To determine the diagnostic accuracy of emergency physician gestalt in emergency department (ED) patients with suspected cardiac chest pain, both alone and in combination with initial troponin level and ECG findings.

Methods We prospectively included patients presenting to the ED with suspected cardiac chest pain. Clinicians recorded their 'gestalt' at the time of presentation using a five-point Likert scale, blinded to outcome. Troponin T and high-sensitivity troponin T (hs-cTnT; both Roche Diagnostics Elecsys) levels were measured in admission blood samples. All patients underwent troponin testing at least 12 h after peak symptoms. The primary outcome was acute myocardial infarction (AMI).

Results 458 patients were included in this study, 81 (17.7%) of whom had AMI. Clinician gestalt alone had an area under the receiver operating characteristic curve of 0.76 (95% CI 0.70 to 0.82) for AMI. Immediately discharging patients with normal initial troponin and ECG in whom the clinician felt the diagnosis was 'probably not' or 'definitely not' acute coronary syndrome (ACS) would have avoided admission for 23.1% (95% CI 19% to 28%) patients with 100% sensitivity (95% CI 95.6% to 100%). With hs-cTnT, 100% sensitivity could have been achieved even if only patients with 'probable' or 'definite' ACS were investigated further, which would have allowed 41.7% patients to be discharged immediately.

Conclusions Gestalt alone cannot be used to 'rule in' or 'rule out' ACS. By combining clinician gestalt with the admission ECG and troponin level, we found 100% sensitivity without the need for serial troponin testing. These findings have the potential to reduce unnecessary hospital admissions for suspected ACS but must be prospectively validated before considering clinical implementation.

EXCLUSIVE ADDITIONAL #FOAMed ANALYSES, ADDED ON 20TH AUGUST 2014

We recently had an offline request from Anand Swaminathan (@EMSwami) for some extra data from this study. Swami was keen to know how much high sensitivity troponin really adds once the physician's gestalt and the ECG findings are taken into account. He asked if we can also report the sensitivity and specificity of the gestalt + ECG – i.e. without high sensitivity troponin. So here we go, in what I believe could be a first in the #FOAMed world – new data being presented as #FOAMed outside of a traditional medical journal. Thanks for the request, Swami!

Strategy	Sensitivity	Specificity	PPV	NPV
AMI 'ruled out' if no ECG ischaemia and 'probably not' or 'definitely not' ACS	95.1 (87.8 – 98.6)	30.0 (25.4 – 34.9)	22.6 (18.3 – 27.4)	96.6 (91.5 – 99.1)
AMI 'ruled out' if no ECG ischaemia and 'could be', 'probably not' or 'definitely not' ACS	82.7 (72.7 – 90.2)	61.8 (56.7 – 66.7)	31.8 (25.5 – 38.5)	94.3 (90.7 – 96.9)
AMI 'ruled out' if no ECG ischaemia and anything other than 'definitely ACS'	56.8 (45.3 – 67.8)	79.1 (74.6 – 83.0)	36.8 (28.4 – 45.9)	89.5 (85.7 – 92.6)

The table below shows the diagnostic accuracy of the combination of gestalt + the ECG (i.e. the presence or absence of acute ischaemia on the initial ECG in the treating physician's opinion) for the adjudicated diagnosis of AMI (as described in the paper). AMI 'ruled out' if no ECG ischaemia and 'could be', 'probably not' or 'definitely not' ACS.

The table shows that this approach isn't sufficient to rule out AMI. The bottom line, is that clinical judgement alone isn't sufficient to rule out AMI (as reported in the main paper). Even if you combine that with ECG findings, you still can't rule out AMI (or rule it in). It's only when you start to incorporate troponins that you potentially get the rule out (pending validation, of course).

So, is troponin a friend or a foe in the Emergency Department? We'll be posting more on that (from SMACC Gold) imminently, but here's some good evidence to suggest that it may well be a pretty good friend.

Thanks again for a great request, Swami!

Section 5: Written by Richard Carden

I’m all about the Bayes, ’bout the Bayes, no treble

KEY POINTS

1. The Reverand Thomas Bayes described his theory of probability in the 1700s, and yet we are still struggling to grasp it’s importance in clinical medicine.
2. Bayes theorem underpins much of our thinking around probabilities.
3. Bayes links posterior (post test) probabilities to prior probability (pre test)
4. Simply put: Initial belief + new objective data = new and improved belief.

Who knew that the Reverend Thomas Bayes would be such a prominent figure in pop culture? Not sure what we’re talking about, then follow this link to listen to Meghan Trainor sing. Ignore the spelling error in the title of the song, we know who she is really singing about. I haven’t gone crazy, and hopefully I can explain the

inspiration behind this post in due course. Thomas Bayes was a Presbyterian minister back in the days (1700s) when church and science began to butt heads. Despite writing some mathematical papers, he never published his eponymous theory. It was a friend, Richard Price, who discovered Bayes' manuscript after his death, rewrote the document and submitted it for publication. It was further elaborated upon by Laplace (of Laplace's Law fame) who got wind of the Theorem when Price visited France. Over the years it has been shunned and been the subject of intense scrutiny but nonetheless has had a huge impact, especially during wartime (Turing, in part, used Bayesian techniques to crack Enigma!).

Laplace described his version of Bayes' Theorem as "inverse probability". By this he meant that the Theorem looked at effects to infer the causes. Bayes' Theorem uses the terms 'prior', 'likelihood' and 'posterior' to describe probabilities. The prior is the probability of an initial belief, the likelihood is the probability of other hypotheses and the posterior is probability of the revised belief:

Prior times likelihood is proportional to the posterior.

Prior probability x likelihood ∝ posterior probability

Or very simply interpreted: Initial belief + new objective data = new and improved belief

There are very few things, if any, that we can have 100% certainty about, and as McGrayne says in her excellent book (The Theory That Would Not Die): 'probability is the mathematical expression of our ignorance'. I would really recommend reading the book!

You can watch a great video of McGrayne in her own words following this link

Why is any of this relevant?

One could argue that a lot of medicine is a practical example of Bayes' Theorem, but none more so than Emergency Medicine. We have a prior probability, which we update, when new information is found and develop a posterior probability. We do this all day every day, albeit without realising it, on a subconscious level. I think the real importance is being aware of how this theorem applies to us and how it can help us to avoid pitfalls. I am going to propose that by not using this theorem, or using it incorrectly and incompletely leads to missed diagnoses and other errors.

Let's imagine you see a patient with chest pain. You take a brief history and by the end of doing so have applied probabilities to what you believe the cause to be; let's say ACS for the sake of

argument (essentially your differential diagnosis is a list of Bayesian priors!). You then examine the patient and increase or decrease the probabilities depending on your clinical findings, in this case there are none. You send a Troponin, fortunately it is within an appropriate timeframe for your particular assay, and maybe a couple of other bloods and eagerly await the results. The results all come back normal….bingo! You can discharge the patient confidently having ruled out your differential diagnosis.

This is is an all too familiar scenario, and if scenarios like the above are happening often, then it is no wonder that we miss other pathologies (i.e aortic dissections). I believe an all too common pitfall in EM, amongst other specialities, is a failure to update our probabilities once we have our posterior. I am not endorsing the over-investigation of every single patient with chest pain, but rather challenging whoever is reading this to take an extra minute or two and re-examine their probabilities and differentials when receiving a bundle of negative results.

Research

Bayesians and Frequentists have a long-lasting feud over the superior approach to probabilities. The NEJM recently published an article, around breast cancer therapies, but also had a discussion around the future of clinical trials and the applications, strengths and weaknesses of using Bayesian and Frequentist study designs. The I-SPY 2 Trial uses Bayesian statistics to identify which combination of breast cancer drugs has the highest probability of being efficacious, and using this outcome will progress certain drugs to the next round of clinical trialling. This is an efficient means of research, in that it reduces the unnecessary cost and time in investigating all the potential medications in all stages of clinical trial, and limiting it to those that are the most *likely* to be efficacious. The data to form the initial probabilities is based on small study populations.

A great clinical application of Bayes' Theorem is work done by the Centre for Trauma Sciences that used Bayesian modelling to predict the risk of individuals developing acute traumatic coagulopathy (ATC). You can see and use the model here. The

Table 1. Bayesian versus Frequentist Approaches in Clinical Trials.

Variable	Bayes	Frequentist
Differences		
Main goal of inference	Predict outcomes of future trials and absolute risk for future patients.	Estimate population average effects.
Assumptions	Requires explicit specification of prior distributions of unknown population parameters. Incorporates a priori knowledge and clinical judgment formally. May be sensitive to specification of prior distributions.	Does not require explicit specification of prior distributions of unknown population parameters. Incorporates a priori knowledge and clinical judgment informally.
Interim monitoring	Only the data actually obtained are relevant for final conclusions (e.g., a credible interval or predictive probability). Whether or not a clinician examines accumulating evidence with the possibility of stopping the trial does not affect inference.	Both the data actually obtained and the probabilities of data not obtained are relevant for final conclusions (e.g., a P value). Whether or not a clinician examines accumulating evidence with the possibility of stopping the trial does affect inference.
Ease of use	Often computationally complex; careful modeling often requires simulation-based calculations.	Often computationally simple, though careful modeling may require simulation-based calculations.
Similarities		
Adaptation	Can incorporate adaptive designs, multistage trials, early stopping, and adaptive randomization.	
Role of statistical judgment	Options for data-driven analyses are available. Skill and substance-area knowledge of the data analyst are important in drawing correct conclusions.	
Compatibility	It is feasible to combine a Bayesian design with a frequentist analysis or a frequentist design with a Bayesian analysis.	
Prior knowledge	Both approaches rely on prior knowledge and clinical judgment (though they incorporate them in different fashions).	

model combines existing data from studies looking at the causes of ATC with expert knowledge.

You can also read lots of Bayes related work in the #FOAMed world – Casey Parker at Broome docs is a great place to start.

This article is intended as a very inadequate primer to Bayes' Theorem. I believe it is integral to our practice and is gaining a position in our research activities. My take home message: 'Always update your priors', i.e. don't ignore new information!

Rich

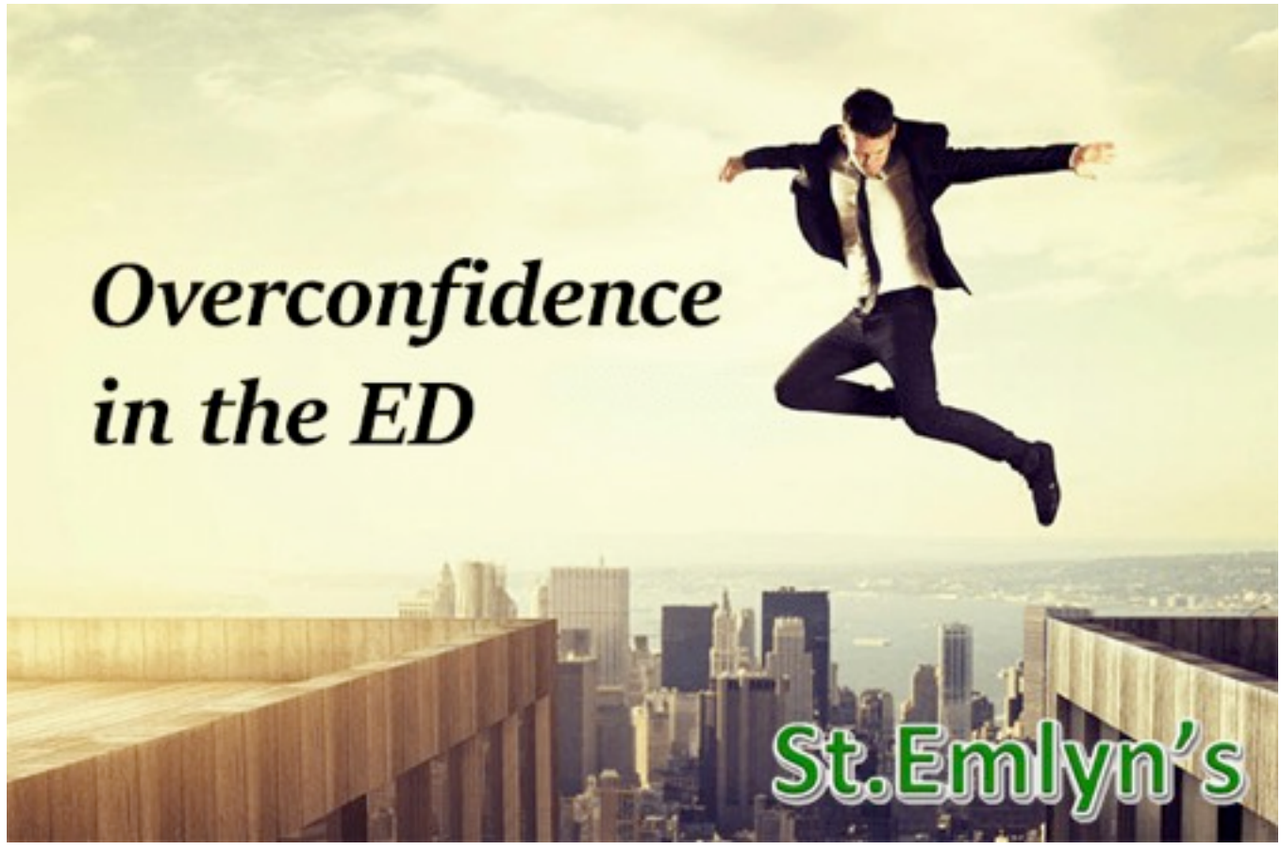
@richcarden

Section 6: Written by Chris Gray.

Overconfidence in clinical decisions.

KEY POINTS

1. No one wants to be perceived as over confident.
2. We are not good at assessing our own performance
3. Good quality feedback improves your ability to know how good you really are.
4. Seek out colleagues and trainers who can give you fair, honest and regular feedback.
5. The Dunning-Kruger effect is not always what you think it is from the graphs you see on Twitter.



If you have ever worked as or with a doctor, you've probably encountered something called a multi-source feedback form, or a "360 appraisal". It is part of the process for junior doctors to progress to the next stage of our training, and is often a valuable tool as an anonymous insight into what our senior doctor, nursing, and allied health professional colleagues think about us, both good and bad.

On my most recent feedback form whilst on a rotation outside of the emergency department, there were two comments with mention that I was bordering on overconfidence. The rest of the feedback was very positive, but it was these comments that really stuck with me. I wasn't sure what I was doing to give the impression of overconfidence. Was I actually overconfident? How would I know? What could I do to improve? And really, the most important question – was it affecting my patients?

This post brings together my reflection over the last few months.

Overconfidence

It's important to be aware that confidence can be a good thing. In an emergency situation, for example, you want to know that the team leader has control. If they appear confident, they instil confidence in those around them, and this can make the team work more effectively and efficiently towards a common goal. Confidence is formed with knowledge, and gained with experience. It can fluctuate; you may have had a run of successful, first pass lumbar punctures, but fail one and your confidence diminishes. This can affect how a situation is managed the next time it presents. The more experience you gain in a particular setting, the less likely it is that your confidence will shift in this way. A consultant anaesthetist is unlikely to be fazed by a failed epidural, but a junior trainee may be – particularly when the consultant then proceeds to make it look easy!

Overconfidence is an excessive belief in something succeeding, without any regard for failure. This can lead to mistakes. An overconfident person can be so focused on the path that they are taking, that they are blinded to other possibilities, also making it more difficult for other team members to challenge decisions. They might miss clues that point towards a different answer. Confirmation bias can play a role here, as they may be more actively seeking evidence to back up their conclusions. Poor follow-up can reinforce behaviour through not knowing whether the right decision was made.

Arrogance takes this a step further, involving active dismissal of others' opinions, and lack of humility. It also differs from overconfidence in that usually the person *is* competent, whereas in overconfidence their confidence is greater than their competence.

The line between confidence and overconfidence is fine. Too confident and your team may feel they can't challenge you and mistakes might be made. Important details may be missed, lessons not learnt for the future. Not confident enough and you may lose faith in your own decisions, or not attempt something due to fear of failure. The line is also difficult to define as it is largely based on the perceptions of other people. A more experienced person may be able to spot overconfidence in a colleague, where others with less experience just see confidence.

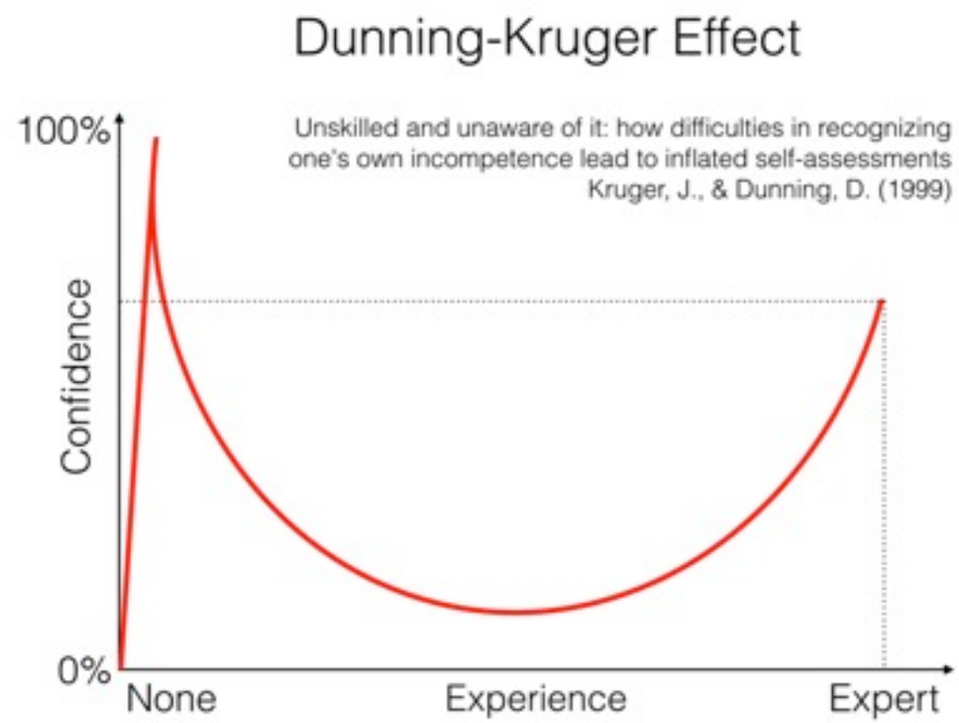
Does it exist in medicine?

Of course. Doctors are no less vulnerable to overconfidence than the rest of the population. Unfortunately, due to the nature of the job, errors made by healthcare professionals can have life-changing consequences for the patients.

A review of the literature by Graber and Berner (pdf) in 2008 found that diagnostic error exists at a rate of less than five percent in perceptual specialties such as radiology and pathology, but that this can rise to 15% in others. Overconfidence is a contributing factor; studies reviewed by the paper found that physicians often don't use available information resources to aid diagnosis, and where guidelines or protocols were in place to manage specific conditions, these were only followed around 50% of the time.

Physicians know that error exists, but seem to believe that it is less than it really is. Despite an error rate of around 5-15%, research by Friedman et al. comparing confidence and accuracy in diagnosis by medical students, residents and attending physicians gained some perhaps unsurprising results. The medical students were the least confident and accurate, the attendings the most, and the residents were more confident but less accurate than their attendings. We have seen this highlighted before in the Dunning-Kruger effect where less skilled individuals overestimate their ability.

In the emergency department, decision making is complex. Time and resources are limited, the environment is busy, and physicians are often looking after multiple unwell patients. In many cases, a diagnosis may not be made, and the decision comes down to whether the patient needs to be admitted for further management, or discharged home to benefit from time passing with the potential for follow up at a later stage. In such instances, the issues surrounding confidence do not reflect confidence in a diagnosis, rather on where the patient should go after they leave the department.



(See Footnote on this diagram at the end of this section)

It is rare that we get feedback though. The patient we send home today may well return tomorrow. If something bad happens, we might hear about it in one of those heart-stopping "do you remember that patient you saw last night?" conversations, but due to the varied shift nature of the emergency physician, it's unlikely we will be there to see them the second time around. If we don't hear anything, it is easy to assume that what we are doing is right. We become more confident in

our management, but that doesn't mean we *are* right. Often we will seek advice on unusual presentations, but we can become overconfident in the routine.

How can we avoid the dangers of overconfidence?

Know your limitations.
Being aware of the extent of your own knowledge and skills is valuable. It allows identification of gaps in knowledge, and therefore the potential to fill these. If you do something often enough, and nothing bad happens, your confidence is increased. Incompetence is also reinforced, leading to overconfidence, and it may be that one bad outcome is viewed as "unlucky" despite the fact that actually you were lucky the rest of the time. Continue to learn. Minimise the unknown unknowns.

Ask advice.
A second opinion is useful to either confirm or correct an initial diagnosis. This can be gained from a more senior doctor or a specialist. The latter is done whenever we refer a patient into hospital, but how many times do we actually find out what the specialist thought? Without knowing the result of the consult, confidence increases in our management of the patient, whether it was right or wrong. For those of you that *are* the senior opinion – create an atmosphere which enables advice to be easily sought.

Follow your patients up.
If you don't know whether your diagnosis was the right one, you can't change your practice for the next patient you see. Make a note of patients where you were sure, unsure, had to ask for help, where you had to be honest with the specialty you referred to and say "I don't know what's going on, but this person is unwell and needs admission". See them on the ward the next day or find the ward doctors and ask what happened to the patient. What treatment did they give, what could have been done differently? In emergency medicine, the majority of the time you don't get closure in the department, so it's important to seek this out later on and compare how confident you were with the eventual outcome.

Seek feedback.
Be it immediate feedback on a case from a senior, or more generalised feedback from the team as a whole in a multi-source appraisal, one of the most useful determinants of confidence against overconfidence is how you are viewed by others. Ask for it often, meet with your supervisor regularly, and utilise anonymous observations from a wide range of colleagues to inform your clinical and non-clinical practice.

Revisit.
Once you have your feedback, process it, then think about it again a few days later. Some situations are emotional, stressful, and advice from colleagues can get lost at the time. Going over the event and the feedback you received a few days later can make it easier to take on board, and easier to reflect on. This could be done on your own, or with a colleague.

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Final thoughts

The feedback process has helped me to be more mindful of how I make management decisions for my patients. I'm more conscious of my ability to make mistakes, and measures I can employ to try to minimise overconfidence, without taking it too far and losing confidence. I know there will still be times when I'm more confident than I should be, but hopefully will be able to recognise this when it happens.

Chris

Footnote on Dunning Kruger.

The graph in this paper was discovered to be a cartoon illustration of the original work. This was discovered by our good friend Ross Fisher and announced at the Don't Forget the Bubbles conference in 2017.

Although the illustration here never appeared in the original 'IgNobel' winning paper it does speak to the principles in the paper.

We have kept it here as it is the one that is seen across social media, and it makes the point well. If you want to know more about the Dunning-Kruger effect, and arguably if you want to quote it then please follow this link for the original paper with more accurate graphs.

Section 7 Written by Natalie May

When is a Door Not a Door? Bias, Heuristics & Metacognition

KEY POINTS

1. Clinical decisions are prone to a range of predictable (and not so predictable) biases.
2. Expert clinical decision makers realise when clinical information is contradictory and understand how to deal with this when it happens.
3. Expert clinical decision makers use a combination of objective knowledge combined with an understanding of uncertainty and risk to come to a clinical decision.
4. Understanding bias, heuristics and meta-cognition can make you a better clinician (and educator).

This is an amended version of a talk on metacognition I gave at the Royal North Shore Hospital Grand Round. The clinical scenario has changed but the content remains the same. The purpose of this talk was to help our colleagues in the hospital specialties appreciate the mindset of the Emergency Physician and the difficulties intrinsically associated with the job we do.

Picture the scene:

It's early October and the ED is already busy. You're on the morning shift and one of your first jobs is to clear out the patients from the short stay ward to make space for the inevitable admissions of the day. One patient is a 19-year-old student, male, who presented the preceding evening with vomiting and fever. He's normally well (only taking olanzepine for schizophrenia). The overzealous registrar failed to diagnose Freshers' 'flu *before* doing bloods at 0200 (which were reassuringly normal – WCC 5, CRP 4). For some reason he's been on the ward all night for a dose of ondansetron and two litres of Hartmann's. His fever resolved immediately with IV paracetamol and his observations have been normal all night – currently HR 92/min, NIBP 110/68mmHg, RR 18/min, SpO2 97% on RA. The nurses tell you he had some profuse diarrhoea at around 0600 and you dread having the ward closed if it's norovirus…

As you approach the bed to kick him out of your unit before infection control arrives, you notice he's barely visible underneath the mountain of sheets and hospital blankets – apart from a left shoulder, which sports a cracking bruise.

You wake him up, explain to him that he will feel much better being ill in his own student flat, and reassure him that the blood tests were all normal and he'll feel better in a few days. He nods sheepishly.

Then you ask him how he got the bruise.

"Bruise?" he asks, looking for it. "I didn't know I had a bruise."

Suddenly alarm bells ring in your head – what if it's not a bruise? What if it's purpura? But the blood tests are normal…

What can we do when we are faced with contradictions in our diagnostic processes?

Well, as emergency physicians we spend a great deal of time in this state. With the work of eminent EPs like Prof Pat Croskerry (check out these audio and video lectures which cover much of the first part of this talk), we are increasingly aware of our own thinking processes, so called "metacognition".

When we make any kind of decisions, our brains rely on the information available to them. We think we tend to process this information in one of two ways, known as dual process theory as described by Nobel prize winner Daniel Kahneman in his book "Thinking Fast And Slow". System one thinking is fast and intuitive – these make up around 95% of the decisions we make. System two thinking is slow, deliberate, reflective, measured – and this is much less common.

To demonstrate, let's try a small quiz – grab a bit of paper and a pen. There are no tricks here – just answer the questions.

- On a standard fire engine, there are two drivers up front, one at the rear and three additional staff – how many do you need for five standard trucks?
- How many turtle doves did my true love send to me on the 2nd day of Christmas?
- A bat and a ball cost £1.10 in total. The bat costs £1 more than the ball – how much does the ball cost?
- It takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?
- In a lake there's a patch of lily pads and every hour it doubles in size. If it takes 48 hours to cover the entire lake, how many hours would it take to cover half the lake?

The answers are 30 (5 x 6) and 2. These questions are just to warm you up. The others are 5p, 5 minutes and 47 hours. Think about them for a while and feel free to tweet me if, after a bit of a think, you can't figure out why those are the correct answers.
This is known as a cognitive reflexive test: your intuitive response is to get these wrong but if you take the time to reflect you can get yourself to the right answers. It has little to do with intellect/intelligence, instead it tells us about your ability to suppress the intuitive response, to overcome the System I thinking and engage System II.

We tend to think in one of these two modes: fast, reflexive and intuitive or slower, reflective, analytical and deliberate. It's really useful, if you've seen a lot of sick patients, you get good at recognising patterns. Imagine a 55 year old man with chest pain, he's grey and sweaty, what are you expecting on the ECG?

Heuristics

But sometimes, we need to overcome the automaticity of System I, otherwise we can make errors. Many of our patients can be approached in a very simple way. When we first start in medicine and particularly in EM, everything is new, everything is difficult. Thought processes are conscious. But we naturally reduce the complexity of our decision-making to simple pathways: if this, then this – these processes are known as heuristics. Defined as "a practical problem solving approach not guaranteed to be perfect but sufficient for the immediate goals", these are mental shortcuts which may be generated subconsciously.

As doctors, we like them. It appeals to us to think we are superhuman and infallible. There's even a word for "I just know" , the word "gestalt". Sadly, so far attempts to validate clinician gestalt alone against other clinical scoring systems have failed to show that we are really as brilliant as we think.

Dunning & Kruger described this in learners, that as we accrue knowledge we enter a phase of blissful ignorance. Educationalists

call this “unconscious incompetence”; you might hear it referred to as being “at the top of mount stupid”. We certainly see this in doctors who are new to medicine and especially new to Emergency Medicine. In some places it’s the way we teach medicine. Occam’s razor states that ‘the simplest explanation is usually the best’. Consider the patient with RUQ pain, fever, jaundice. Acute cholangitis, right? Except that the specificity is 93.2% and the sensitivity is 36.3% . This is very much an imperfect test, probably not good enough for ruling in or ruling out in isolation.

Eventually, we get burned, we make a horrible error and we get away with it – or we don’t – and we come crashing down the other side. And with experience comes wisdom, so we can learn to plug in cognitive stopgaps. For example, I have a programmed cognitive stop to convince myself that any young woman with abdominal pain or syncope does not have an ectopic pregnancy. When we shortcut and rely solely on heuristics and system I thinking, we leave ourselves open to errors in our decision-making.

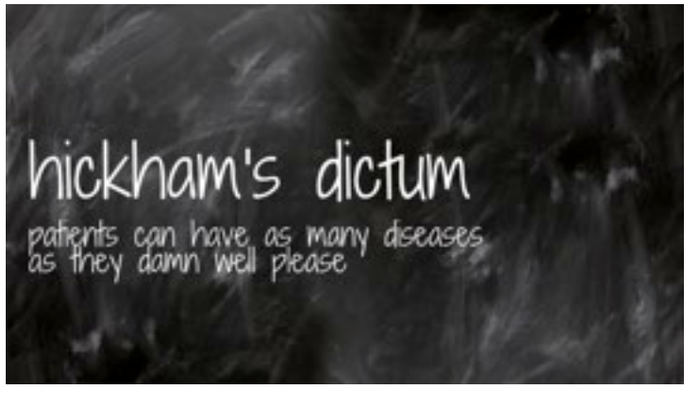
We have to work hard to deliberately employ system II to ensure we don’t make diagnostic errors. It’s very hard. What’s this picture, of a dermatomal painful rash consisting of numerous tiny blisters?

How long did it take for you to know the diagnosis? Did you even need to click on the link to know it was shingles? There was a time, hard to believe it, when you saw this for the first time and you didn’t know what it was. But when we undertake deliberate practice regularly, it will become subconscious (we can switch things over to system I, which is why we use simulation and we regularly attend life support courses) so that when we don’t have time to sit and slowly employ type II thinking, we are equipped to take action.

Other biases

There are other factors at play here too. We all have intrinsic biases that shape our decision-making, many of which we might not be aware of. Think about our patient. Is anyone willing to admit that they thought his symptoms might have a psychiatric cause? Bias against obese patients is particularly common and especially powerful. I strongly recommend that you each undertake the implicit association test online (Harvard’s is freely available). The concept of framing, that is, the context within which information is presented to you, either by the patient themselves or by the referring clinician, will shape the way you receive it. Contextual information matters. We tell ourselves that the risk factors patients have increase the probability of having

certain disease processes, which is true, but it doesn't mean that patients without any risk factors at all can't have those exact same disease processes. This is Hickham's dictum, the counterargument to Occam's razor. Patients can have as many diseases as they damn well please (with or without whichever risk factors they have or don't have)!



There are a host of other biases that play into our decision-making processes (see this great summary at First10EM) things like:

- availability bias (we judge the likelihood of disease by the ease with which examples come to mind, so we are more likely to diagnose diseases we've had recent experiences of, or are particularly attuned to [a subtype called significant case bias])
- base rate neglect (we ignore the prevalence of a disease in our diagnostic reasoning, such as the "worst first" approach to diagnostics)

- anchoring (seizing a diagnosis based on early information and failing to adjust as new information becomes available)

- confirmation bias (giving more weight to information which seems to align with what we already think)

- search satisfaction (stopping once we have found something – the reason we miss the second fracture)

- premature closure (stopping too early in the diagnostic process because we think we have an answer)

- hindsight bias (forming opinions about early decision-making based on what happened later "it was obvious… I can't believe they missed it").

I probably also need to mention blindside bias; the tendency to hear a talk like this, to nod your head in agreement throughout thinking about all the people this stuff applies to and thanking God or the tooth fairy that you're exempt (you're not).

Emergency physicians do a huge amount of decision making and it's something we aren't really trained in. When we ask medical students the areas they think they need to focus on to be good doctors, they say things like, "knowledge", "practical skills".

Diagnostic error doesn't always lead to bad things happening. If we diagnose sinusitis and it was a viral URTI, it doesn't really matter. The majority of our patients will get better in spite of what we do to them (we know this through placebo-controlled trials).

The answer must be more tests!

We must order more tests: more CT scans, more bloods, troponins and d-dimers and CRPs for everyone!

Well, no, not just because of cost and radiation exposure, because the results of tests depend on the questions we are asking. All tests have false negative and false positive rates and for many, the performance of the test is dependent on the prevalence of the disease within the tested population, not within the entire population.

We have to play off our own cognitive processes against an understanding of probability and in order to understand probability better we have to appreciate Bayesian statistics.

Bayes theorem states that

- The tests are not the event
- Tests are flawed (false positive and negatives occur)
- Tests give us test probabilities, not real probabilities
- False positives skew results (especially for rare diseases)
- People prefer natural numbers
- We need to convert test results into real probabilities for our patients
-

By working as Bayesian practitioners, we try to add meaningful information to improve our probability of getting the right answer.

One of the helpful components of information we can add, is time. We see patients comparatively, very early in their disease

trajectory; there are very few diseases that fully manifest in an unequivocal way immediately. Most develop slowly; the problem is that patients decide when to come to the ED.

We work in a decision-rich, information-light environment. By nature, some of our decisions and diagnoses are going to be incorrect as disease processes manifest themselves which might be why our excellent general medical colleagues always seem so wise and knowledgeable on the post-take ward round the next day.

Let's go back to our case

Having thought about all these things, what should we do?

We don't have a ready diagnosis to tie things together nicely as Occam's razor. We have several concerning features: the fever, the "bruise", the vomiting and a potentially treatable, potentially fatal possibility of meningococcal sepsis. We can make a decision to push the schizophrenia and the Freshers' 'flu, common as it is, out of the picture until we are satisfied there isn't anything else going on.

We decide to give antibiotics and refer to the inpatient medical team. They repeat his bloods, finding his WCC now more than 20 and CRP in the 200s. We feel justified, ah, the power of confirmation bias.

Two days later, the blood culture taken by the very thorough registrar overnight at the same time as the WCC of 5 and CRP of 4 grew – *N. meningiditis*. It's all so easy in hindsight

So thanks for indulging me on this journey into metacognition. I thought this was a great case for exploring the way that we as medical practitioners think and in particular the challenges of thinking in Emergency Medicine. That's always in our interest because our job can be pretty tricky. That's the message I'd like you to take away from this: Emergency Medicine decision-making is often decision heavy and information light. We will get things wrong and sometimes we pass some of that decision-making responsibility on to our inpatient colleagues, because we believe that time will help us to make sense of what we see.

All this does not really answer the original question of course.

When is a door not a door?

When it's ajar

Nat

@_NMay

Want to know more? Try these

All Doctors Are Jackasses

First 10 EM on Cognitive Errors – Part One, Two, Three & Four

Search Satisficing/Satisfaction at LiTFL

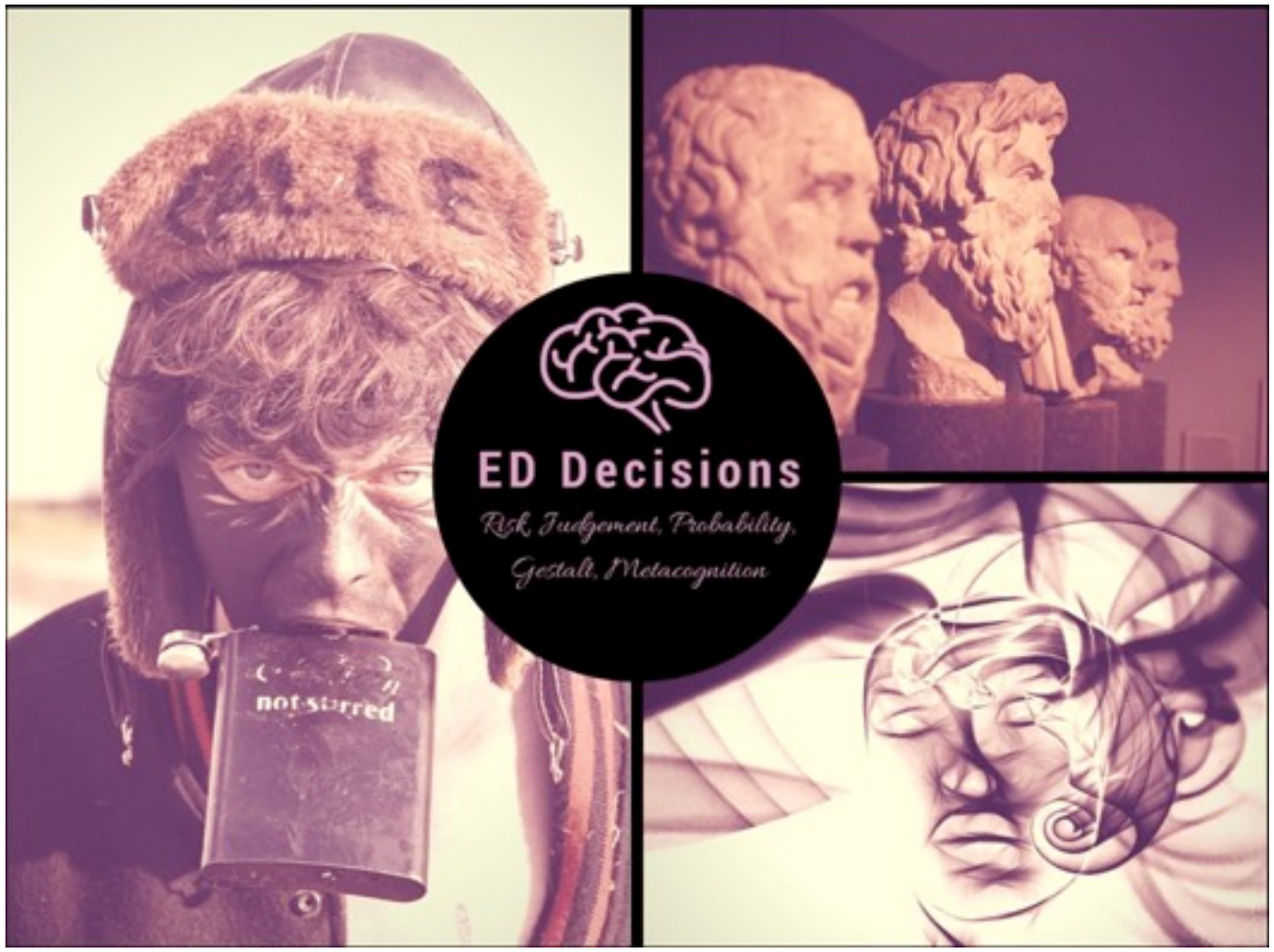
Monty Hall problem explained (including simulator)

Section 8

Making good decisions in the ED.

KEY POINTS

1. It's difficult to judge your own decisions without information and we often lack this.
2. Looking at outcomes is good but not enough. Judgement is about process not outcome. Nobody wants the lucky doctor, they want the good doctor.
3. Normal flight is the best place to develop and train judgement. Make sure that you spend time in the middle and not at the extremes of practice.



This section is based on a talk I gave at the Royal College of Emergency Medicine conference in Manchester, and a similar talk on Metacognition in the ED delivered today in Torino at the EuSEM conference.

The title of the talk is ‘Making Good Decisions’ and in reality that could include many things. Life as an emergency physician is crammed full of decisions and therefore full of judgement. The world of the emergency physician is an uncertain one, where we are required to make difficult decisions on a daily basis. If you want to get the quick version of the talk watch this short summary from the Royal College youtube channel on making good decisions in the ED and then ,if you’re interested in knowing more, read on.

Interactive 2.1 Slides on ED clinical decisions

The slides for this talk can be seen below.

What do we mean by ‘judgement’?

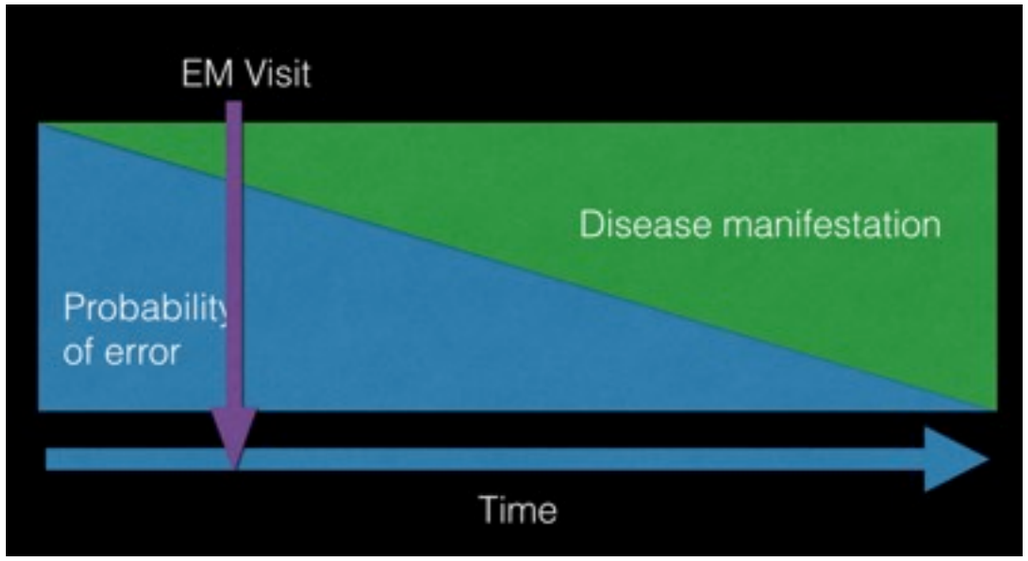
There is a risk that we can get bogged down with semantics and definitions so we should define what we we are talking about. For the purposes of this section, we consider judgement as a term that describes a range of techniques, psychological processes and ideas that we use in the emergency department to make decisions. These include concepts such as risk, probability, gestalt, reasoning and uncertainty. These are topics that we have looked at over the years in EM and there are a few reasons why that is particularly relevant to us as emergency physicians. It’s worth reflecting and reviewing why this is such an important topic for us.

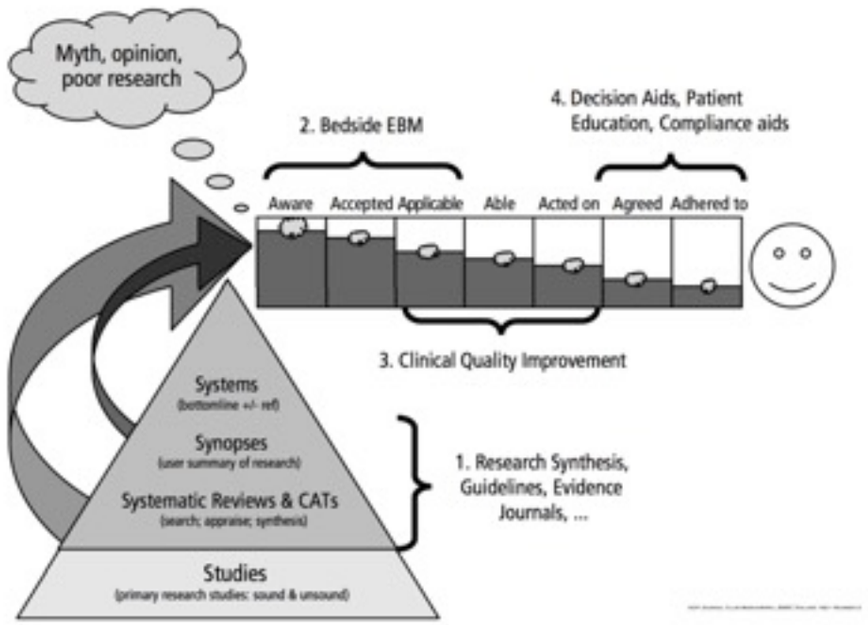
1. Emergency medicine is often considered to be a risky speciality, in that we deal with a population of patients who may go on to have adverse consequences of their disease. We also operate at the admission/discharge interface and so every time

we see a patient (or at least in my experience every shift), we take a risk. Is discharge the right decision or are we sending someone home who might have an adverse event?

2. We, arguably, treat populations as much as we do individuals. This can cause difficult realities in our practice as probability underpins many of our decision making processes. If we take something like pleuritic chest pain and the risk of PE we have great evidence that the tools we use have a sensitivity of 98% which sounds great. That does of course, mean that we miss 1:50 patients with PE, and this is still good practice. In essence, our diagnostic tools have an acceptable failure rate. Therefore we need to be wise in when to use clinical decision rules, and also when not to.

3. We frequently see patients at an early stage of the disease process when clinical information may be unavailable or at least only minimally manifest. At our initial assessment, in the ED, with only that information that we can glean at the bedside the level of uncertainty can be high. As time passes, results come back, trends in clinical course become apparent and uncertainty reigns. It is only after information flows, time passes, investigations are returned that diagnoses are refined and that uncertainty falls. We, as emergency physicians, operate in this zone, the zone of uncertainty, the zone of judgement, the zone where it is the mind of the emergency physician has primacy.





4. I've been a proponent of evidence based medicine for many years, but in the last 5-10 years, it has become increasingly apparent to me that evidence is not enough. Nearly all evidence is filtered through something before it reaches a patient, and that something is you and me. It is a holy grail for researchers and health services that when high quality evidence appears, it will reach the bedside rapidly and effectively, but we know that this is not the case. The average time for new knowledge to reach every day practice for our patients is 14 years. Everything we do is filtered through awareness, judgement, opinion and belief and this is a theme that we have been exploring within St.Emlyn's for many years. Knowledge translation and transference remains a problem in all aspects of health care and is a reason why we blog and podcast at St.Emlyn's.

So let's think about judgement in a little more detail and perhaps consider how we could know whether we are good at it.

·***You can have a great outcome with bad judgement***

A patient comes into the ED with a severe sudden onset headache associated with a collapse. He is 32 years old and is well when seen by the ED clinician. He has no neurology and only has a mild headache. He is discharged from the ED, as his symptoms have resolved. Three months later, he is fine, nothing happened and he came to no harm. Sixty years later, he dies having never developed significant cataracts or a brain tumour. Great outcome – bad judgement.

·***You can have a bad outcome with good judgement.***

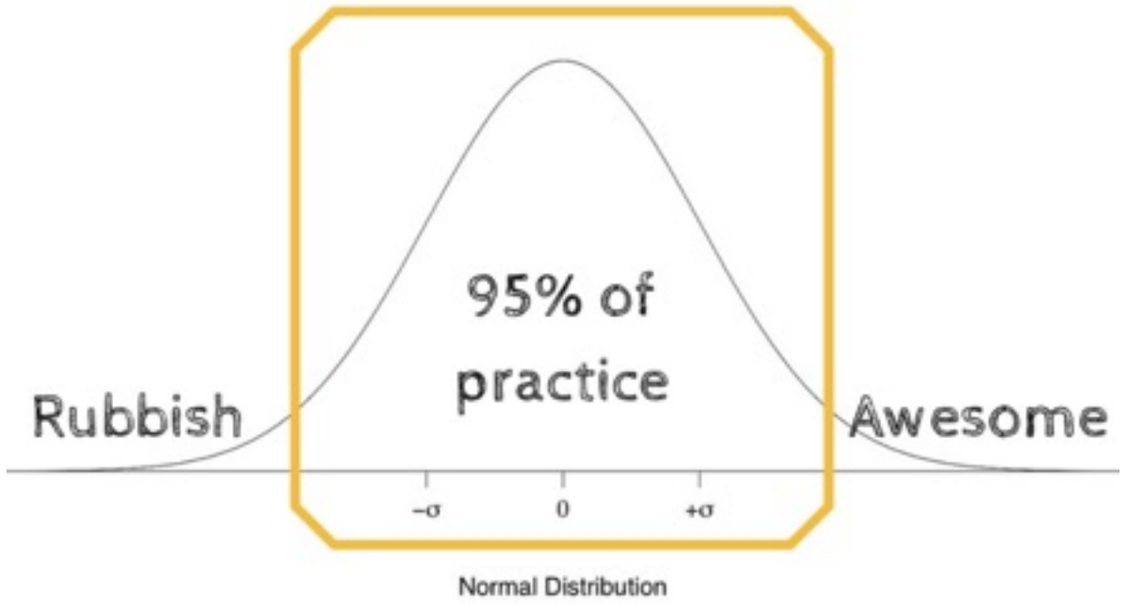
A patient visits the ED on a Friday night with a swollen leg. They score 2 on a Well's score and so a d-dimer is taken. This comes back elevated and so the patient is placed on low molecular weight heparin over the weekend pending an ultrasound scan on Monday. Sadly, he returns on Sunday evening with a raging compartment syndrome requiring a fasciotomy and months of rehabilitation. Great judgement – bad outcome.

When thinking about judgement then process is not the same as outcome.

So how do we know if we are making good judgements?

Let's have a think about some of the mechanisms that we, or others, use when considering this question of clinical decision making. Let's consider five fallacies of feedback, reasons why we might not make good judgements about our judgement.

1. You might think that you have great judgement because you don't hear about complaints, coroner's inquests, or sued. The fallacy here is obvious, if you think about it. There is no doubt that adverse events are great learning experiences. They tell us why things go wrong and can help us identify individual and systematic failings in our health care systems. They are really important but they do not tell us what we need to know about the entirety of our practice. An analogy from the airline industry comes to mind, which we appear to be in awe of when it comes to systems and safety. There is no doubt that work transferred from the airline industry around crash investigation, human factors and patient safety has made profound and important differences to the way we practice medicine. I am am advocate of this, but it's a bit like judging whether someone is a good pilot by analysing their crashes. That's a bad idea for many reasons ,most notably, that harm has to take place before wisdom arises. It would clearly be insane to spend a long time training and learning about how to crash, and then not crash a plane into a mountain in the hope that by doing so we would then be capable of flying a 737 from London to Manchester. Learning from error is great, but we must also recognize that most of our practice is normal care. From an airline perspective, we need to consider our performance in normal flight and not just when it goes wrong.



2. You might think that you make great decisions because you can recall a case where you made a fantastic decision. Perhaps you even saved a life. I recall a case where I made the decision to perform an ultrasound in a shocked 30 year old that we thought had sepsis. Turned out the patient had a ruptured AAA. Was that great judgement or luck? Does it mean I'm a

great doctor. No. Just as with the assessment of error in isolation we cannot judge our practice on extremes.

3. Perhaps you have a department that functions well and has great outcomes. Does that mean you have great decision making? Probably not. Most of our patients pass through many hands and processes so drilling down into the effect of individual decisions can be difficult. System wide outcomes lack the fidelity to tell you about your decision making. Similarly, if you work in a department with poor outcomes that may not be a result of your decision making.

4. Perhaps nobody has taken you to one side to discuss your judgement in many years. This is an issue for all, but perhaps mostly for those of us who are getting on in our careers. At junior level, there are mechanisms to help understand progress and to ensure that we at least consider the breadth of the curriculum. The more senior you become, the less likely it is that you have a formalized mechanism to assess your performance. That is unless you have already been referred to the GMC for poor practice, or if you find out through an HLI or SUI in your practice. Sadly, unless you keep on top of your decision making and thought, the first time you might find out about a hidden error is when disaster happens.

5. Perhaps time will help you. It's been said (by Gary Player amongst others) that the more I practice the luckier I get. It's a great quote from a great player, but we are not playing golf and in medicine, it's different. In sport, luck gets you to the top, in medicine it protects you at the bottom. Let's assume that you're not completely hopeless as a physician but you're not very good. Let's say you have fallen into the trap of not examining children with potential sepsis properly. Maybe you don't look for rashes routinely. Sure, you can spot the moribund patients with a widespread rash of meningococcal septicaemia, but the more subtle cases you're rubbish at. Well luck is on your side because very few kids with fever have meningococcal septicaemia. Luck and probability are on your side and so you can go on sending them home without looking for a rash for days, weeks, months, in fact years before you will miss something important (and you will miss it). Luck is very much on your side as a diagnostician and as such, it is a fallacy of feedback. You can make poor decisions for a very long time before your luck runs out.

6. Perhaps you make great decisions, but it's on the premise of poor knowledge. This is also known as the unknown unknown

problem. This is characterised by you doing what you believe to be correct, but the world has moved on and what you are doing is historic medicine, it may even be harmful. In those circumstances everyone blissfully carries on regardless without highlighting any poor practice because you simply don't recognize what you are doing as poor practice. If I were to think of an example, let's consider using peripheral vasopressors in the ED. Some of you may think that you need to get a central line in to deliver these and your patients may hang around, potentially with an adverse outcome, whilst you wait to achieve it. You may well be working in an environment where you would be criticized, even incident reported for starting a peripheral noradrenaline infusion. The evidence is there that they are safe, and you and your colleagues would be unconsciously incompetent about this.

The theme in all of these issues is around feedback, and you might think that I'm suggesting that feedback does not work well. In fact, I believe the opposite. Feedback is fantastic, and it's the key to making good decisions, but we don't do it well.

Does feedback work?

Well, there is evidence that it can. It comes from an area that you are very familiar with, that is very important for us here in Manchester and it's something that impact on you every day.

Any thoughts on what it might be?

It is the weather. When weather forecasting started out it was a little hit and miss. Meteorologists would look at information coming in from weather stations across the world. Maps would be created and predictions would be made for the weather the next day. In the early days, predictions were better than flipping a coin, but there was clearly room for improvement and that's exactly what has happened. Today, weather forecasting is excellent. If it says it's going to rain tomorrow in Manchester then it probably will – although that's a fairly easy prediction. What we now have is the ability to predict the probability of weather with a high degree of accuracy and reliability.

This change has come about through feedback. However, it's not the feedback of tornadoes or snow. It's regular, repeatable, routine feedback. In airline terms, it's an analysis of normal flight rather than acrobatics or crashes.

In medicine do we do this? Well, in many specialities it does happen. Many surgical specialities have outcome and process data (e.g. cardiac surgery, ophthalmology). Similarly, pretty much

every other speciality gets feedback on their decisions in some formalised way. Clinic patients come back. Referring patients from one in-patient service to another, triggers a process that produces a letter of opinion, which (mostly) returns to the referring doctor. This creates an effective feedback loop that helps the clinician learn about their own decision making and judgement.

In many emergency medicine systems it's different. With few exceptions, we do not get regular, routine feedback on our patients. Most of the time we see patients in the ED, make a diagnosis and then fire and forget. The patient leaves with a label or a treatment but we remain ignorant of whether it was right or wrong unless it is an exceptional case. We may learn about the extremes of our practice through normal mechanisms but what do we have to learn about the generality of our practice?

This is wrong and counterintuitive to good learning. There is no doubt that examining exceptional events can produce positive outcomes and I'm not suggesting that we should not do this. However, if it's the only learning we do, then it's the equivalent of examining shark behaviour by only looking at shark attacks. Our views would be skewed if we did and we might never go back in the water, or we might cause major damage by changing behaviour to avoid such rare events.

So how do you know if YOU make good decisions?
What does your feedback loop like?
How do you follow up the routine patients in your practice?

Perhaps we do need to follow patients up and find out what happens to them, and not just the exceptions. It's not difficult for some of our patients. Those we admit to hospital will inevitably get a discharge letter and in most hospitals, these are available on your desktop computer. There is no reason, apart from inertia, that prevents you from doing this and it's interesting when you do. I've found some interesting cases that have made me think about my practice. In the majority of cases, this process validates what I do, but occasionally cases make me stop and think. The patient with my diagnosis of ACS, turning out to have pericarditis. That's not the sort of case that would comeback as an error, but it is the sort of case that I can learn from.

So what can we do to train our judgement and decision making?

Case note reviews

1. Full notes review. You could ask your admin team to pull all sets of notes that you have seen and then follow them up, but in all honesty this is unnecessary and you could end up in paralytic reflection.

2. Discharge letters. Let's remember that every admitted patient will get a discharge letter. These are easy to find and can be looked at 1-2 weeks post an on call shift. Keep a record of patients you see in a notebook, a digital entry, a photocopy of the ED record or whatever. Follow up, initially, with the discharge letter and then delve where you think you need to.

3. For those patients who are discharged from the department it's trickier. We could phone patients, though this is not something I've tried. We would need to get clear agreement from patients to do this and so don't try it until you have considered the confidentiality and logistic issues in your health system.

4. It may be possible to get feedback from GPs,but again this is difficult as systems between hospital and primary care are not geared up for this.

How much should I be doing?

That's a good question and it rather depends on what else you are up to at the moment. I would suggest that you can get by with 5-10 cases per week. If you keep something like an NHS number and have electronic records or discharge summaries this will take you less than 20 minutes. So that's quite a short investment in time for potentially an important return.

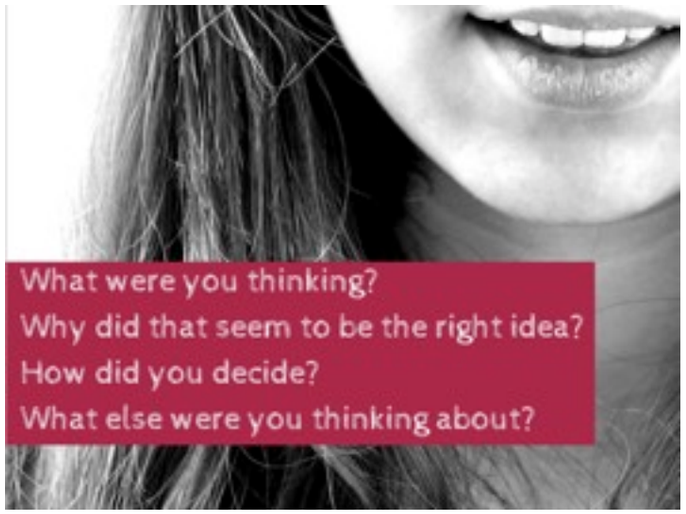
Peer review

Although I've talked about some of the disadvantages of working in the ED in terms of getting feedback from inpatient teams or family practitioners, in some ways we have the potential advantages. We work in teams. We often work alongside our consultant colleagues in the resus room and thus we have amazing opportunities to use them as a spotlight on our judgement. Think about it, a fellow physician, with the same training and requirements as yourself, in the same space and time.

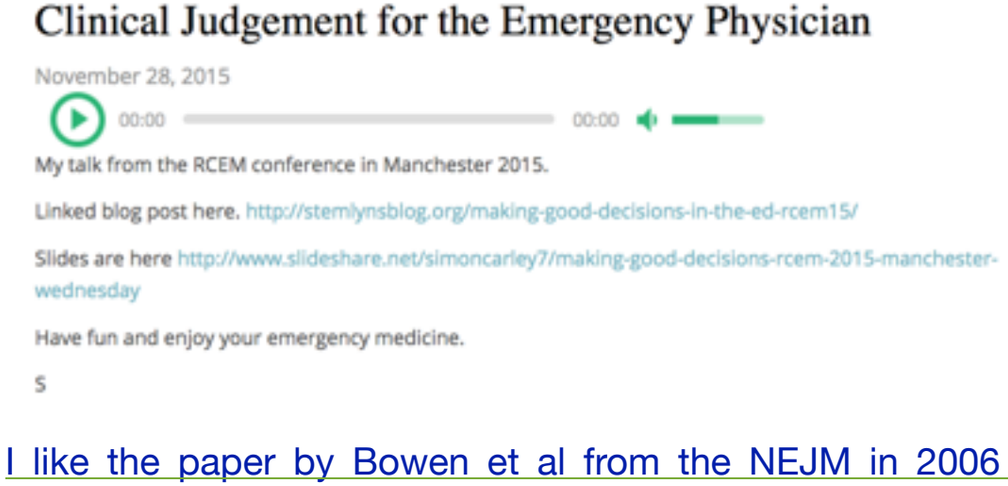
It's what I call a process of internal, externality (we have an internal resource that can give a degree of external feedback). This does not have to be complex, and can be as simple as peer review/observation. We've looked at this before at St.Emlyn's describing a peer review process for trauma team leaders. Interestingly, this usually results in more learning for the observer than the observed, perhaps tackling questions of unconscious incompetence.

Asking the right questions.

One of our most important roles as a clinical leader and trainer is to give advice on patient care in the department. When times are busy and the department overworked it's all too easy to just tell people what to do, but that is a missed opportunity for exploring clinical decision making.



Remember that outcome is not the same as process, so when a colleague asks whether they should do something (eg admit a patient as an ACS) don't just agree or disagree. Learn to explore how your trainee came to a decision, not just what the decision is. This allows both of you to understand and even diagnose their thinking, and from there you can even deliver therapy. By therapy, I mean that if you understand why someone came to a decision, you can then suggest why they may have come to the decision.



I like the paper by Bowen et al from the NEJM in 2006 which outlines a number of strategies to diagnose and treat clinical judgement. It's a good paper and a fairly straightforward read.

Summary

In summary, we need to recognise and value clinical decision making as a core skill in the ED. We must learn how to understand our own decisions and those of our colleagues. Where abnormal thinking arises, we should be able to understand why and to assist colleagues and ourselves in improving it.

1. I'm going to think about my thinking

2. I'm going to do as much A&A as M&M

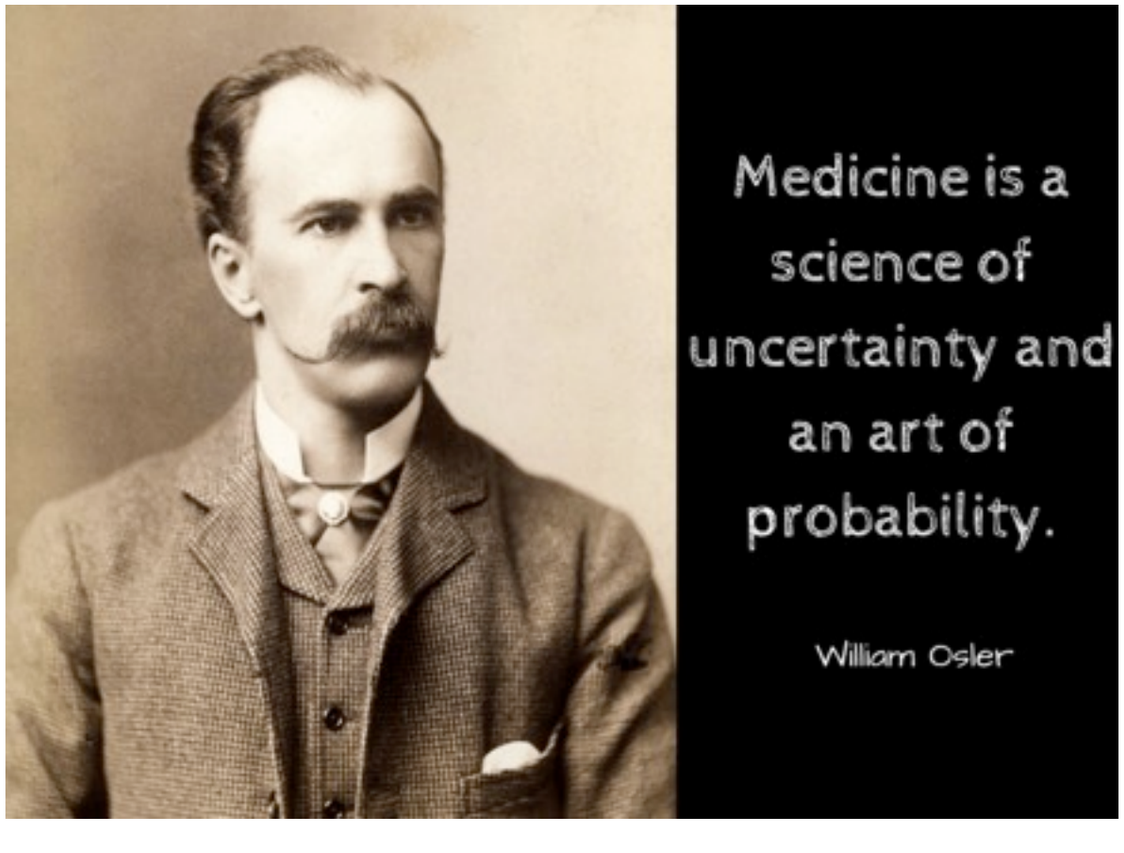
3. I'm going to arrange some peer review

4. I'm going to ask myself if I'm lucky, skillful or maybe both

5. I'm going to ask why things happened, not just what.

6. I'm going to follow up some of my routine patients

7. I doing nothing as I'm already totally awesome & deluded



Major learning points.

1. It's difficult to judge your own decisions without information and we often lack this.
2. Looking at outcomes is good but not enough. Judgement is about process not outcome. Nobody wants the lucky doctor, they want the good doctor.
3. Normal flight is the best place to develop and train judgement. Make sure that you spend time in the middle and not at the extremes of practice.

Finally, you can listen to a podcast on the topic by clicking on this ling to the St,Emlyn's podcast [Clinical Judgement for the Emergency Physician]

Simon Carley

Further reading

- Unskilled and unaware of it: how difficulties in recognizing one's own incompetence lead to inflated self-assessments. Dunning & Kruger.
- Illusory Superiority Bias
- Svenson, Ola (February 1981). "Are We All Less Risky and More Skillful Than Our Fellow Drivers?" Acta Psychologica 47 (2): 143–148. doi:10.1016/0001-6918(81)90005-6.
- The Short Coat (Lauren Westafer) on we don't know what we don't know.
- http://shortcoatsinem.blogspot.it/2014/03/we-dont-know-what-we-dont-know.html – some really good medical references on Lauren's blog
- Scott Weingart's path to insanity lecture and links cover similar topics.

On the next page choose an option for something you can do in the next month to improve your clinical decisions.

There is an option for everyone.

Chapter 3

Podcasts & Friends

A selection of podcasts from the St.Emlyn's podcast on risk, probability, uncertainty and diagnostics. Links to other #FOAMed friends who think like we do.

Section 1

Podcasts.

KEY POINTS

1. **Diagnostics give us a real insight into the uncertainties in medicine.**
2. **The St.Emlyn's podcast covers a range of topics related to emergency medicine including the uncertainties, risks and probabilities inherent to emergency medicine practice.**
3. **The podcast series challenges the illusion of certainty that typically surrounds clinical decisions.**

Over the last few years we have covered a number of topics relevant to risk and probability on the St.Emlyn's podcast. You can find a selection of these below.

Click on the links, or even better subscribe to the podcast via iTunes

1. Understanding diagnostics. SnOUT, SpIN and uncertainty in emergency medicine.
2. Beyond simple yes/no diagnostics in emergency medicine.
3. Understanding diagnostics. Why prevalence helps keep us in practice.
4. Delving into NNT, ARR and RRR.
5. Making good decisions in the ED.

Section 2

#FOAMed friends.

We are not alone in maintaining an interest in the complexities of clinical decision making.

Here are a selection of links to other excellent resources from our friends in the #FOAMed community.

Broomedocs. The Broomedocs site is run by Casey Parker in North West Australia. We love this site, as it explores decision making using clinical cases relevant to a rural practitioner. You might think that this is not relevant to you, but it is precisely by seeing how decisions are affected by location and resource that you can understand and explore why you make the decisions you do. Broomedocs can be found here.

EMCRIT. Scott Weingart is well know in the #FOAMed community for his work in resuscitation medicine. He has also covered complexity and decision making in several of his blogs and podcasts. Highlights to start with would by Scott's podcasts with Gary Klein and on OODA loops in critical care. Try An interview with Gary Klein and OODA loops with Scott Weingart

IM Reasoning. This podcast takes a fairly lengthy approach to clinical decisions in internal medicine. It's useful if you are interested in acute medicine. The episodes are quiet long, but there is some pretty good content in there. You can find the podcasts here.

ALiEM. The Academic Life in Emergency Medicine team have a range of resources on clinical decision making. Start here with an excellent article on clinical decisions by Javier Benitez.

Taming the SRU. has some great cases that explore clinical decisions. You should also check their great post on the cognitive autopsy, something that we should all be doing.

Emergency Medicine Cases commonly explore clinical decisions through case based narrative. Start with this episode on cognitive error and process.

Chapter 4

About St.Emlyn’s

The St.Emlyn’s team are an international team of clinical educators who specialise in emergency medicine, critical care and prehospital care.

Contributors

Editors

Simon Carley

Professor of Emergency Medicine. Emergency Department, Manchester Royal Infirmary, Manchester, UK

Ashley Liebig

Chief Flight Nurse, Travis County STAR Flight, Austin, Texas, USA

Authors

Professor Simon Carley. Professor of Emergency Medicine. Emergency Department, Manchester Royal Infirmary, Manchester, UK

Dr Chris Gray: Emergency Medicine trainee in Manchester. Interested in pre-hospital care, trauma, & critical care.

Dr Iain Beardsell. Consultant in Emergency Medicine. University Hospital Southampton, Southampton, UK

Professor Richard Body. Professor of Emergency Medicine. Emergency Department, Manchester Royal Infirmary, Manchester, UK

Dr Richard Carden. Emergency Medicine Registrar. Emergency Department, Royal London Hospital, London, UK

Dr Natalie May. Ambulance Service New South Wales Rescue Helicopter Base, New South Wales, Australia

Thanks for reading.

Thanks for thinking.

Thanks for sharing.