

## The Christmas Crisis – yet again!

Kate's New Year letter to her chums. 25/01/15

OK folks, from the news it sounds like the A&E'dpts. across this kingdom are falling over like nine pins.

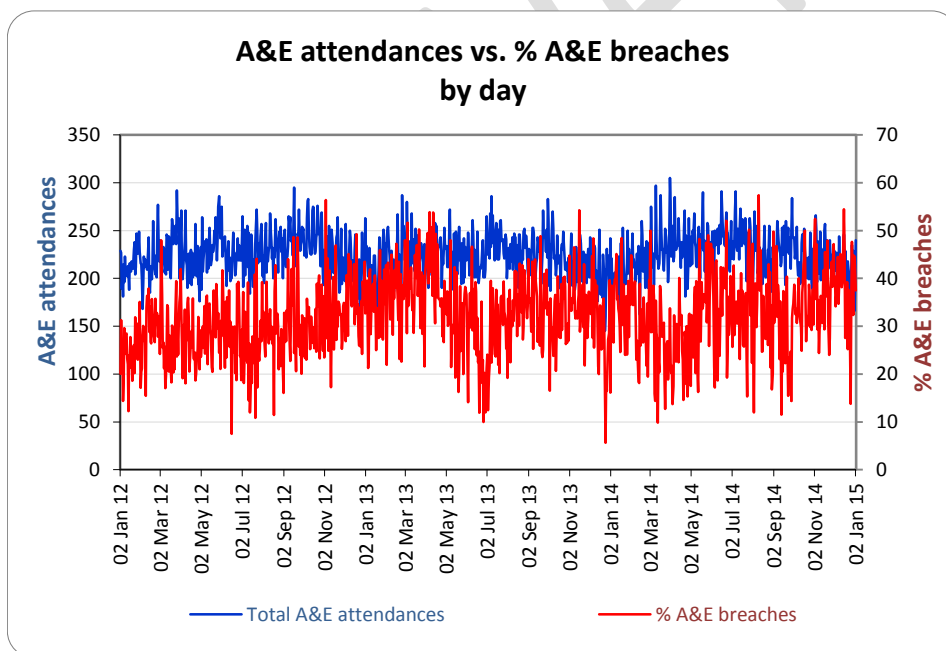
So what the hell (and it is hell for all patients, carers and staff in the A&E Dpts.) is going on?

Eminent professors are coming forward to tell us that it is an 'unprecedented' increase in demand.

But is it?

Only in God I trust, everyone else, including eminent professors, have to supply me with data. Why? Because I know that if I pick two numbers from the universe, e.g. the recorded A&E attendances for the same time last year and this year (when is the same time exactly? Even Christmas day varies by day of the week each year), there is a very high probability that one number will be bigger than the other. The question is 'Are the two numbers statistically different?' We recognise that A&E attendances do vary every day (up and down around an average), but is the variation between these two randomly picked days greater than the 'normal' daily variation?

**Figure 1** From St Elsewhere, shows the daily attendances at A&E and the % patients seen in A&E within four hours since 2<sup>nd</sup> January 2012 to 4<sup>th</sup> January 2015.



- The pattern of the A&E attendances at St. Elsewhere's is not reflected in the pattern of the A&E breaches,
- The 20 to 40% breach rate (% patient taking longer than 4hours in A&E) has been 'normal' for their system since Jan 2012,
- The emergency demand (attendances at A&E and all emergency attendances to the assessment units are logged in A&E) has not changed,
- There has been no 'unprecedented increase in demand' over the last 2 weeks,

- Spikes of 270 A&E attendances per day have happened before since Nov 2012,
- They are still and have been in this permanent state of 'crisis' since Jan 2012 (and before).

And so are many other hospitals when their data are plotted in this way!

So how come this state of crisis has gone 'unnoticed' or 'un-addressed'?

Unfortunately the eminent professors are handicapped by the comparative, static statistical methods we are taught at medical school. The comparative statistical methods allow us to compare two or more 'populations' at one point in time. So classically we can compare a group of patients who are not on treatment with another one who are. Comparative statistical methods are the only methods which we are taught at medical school and so all the experiments or performance monitoring has to fit this model. So this means whatever we want to know depends on setting up and artificial 'comparison': this hospital compared to another hospital; or this year compared to last year; or number of patient through A&E against an arbitrary target of 4 hours. (4 hours is actually a sensible and generous amount of time in which to make a diagnosis, prognosis and treatment plan for any patient – only the patients who would need their bowels cleaning out for a test would take longer than 4 hours).

Let me show you, in medical terms, how daft this comparative approach could be. As an eminent professor I could ask my houseman (junior doctor) to take all the records for all the patients under my care and calculate their average pulse rate for the week. Then I could announce, grandly, that I will only see those patients who have a greater than average pulse rate on my ward round.

Is this mad or is this mad? It is mad. 1) What has one patient's pulse got to do with another patient's pulse? 2) How much time is this going to take the houseman to do? Yet this mad state of affairs is exactly how the performance management system of the NHS is constructed.

This means that the eminent professors have to wait a very long time for the public health doctors to get a lot of numbers to compare one A&E with another or the average A&E – whatever that is. As a result the signal is so delayed and so distorted that A&E departments are collapsing under one's nose but the performance management system hasn't noticed.

#### **The first lesson:**

The comparative statistical methods used by the medics and data analysis in the NHS results in us being 'mad'. There is no relationship between the 'mad message' from the performance management system and reality.

#### **So back in reality.**

I am very lucky living here in the middle of the Kingdom. We have an airport and major arterial routes flow through our county spreading goods and people and, no doubt, germs too. Yes my family members – many of whom I am in touch at this time of year - report that there is a horrible flu is doing the rounds which konks you out for a week or so. There are also the usual nasty colds that take hold as soon as we busy people 'stop' - but there aren't significantly more people ill in my community this Christmas – unless they all trotted off to A&E once they had sent me their Christmas

card. However I am getting messages from my nursing and medical friends that A&E has been a nightmare to work in – far worse than usual ‘Christmas Crisis’.

### **So what is going on?**

Fortunately as doctors and nurses we are also taught a dynamic, real time statistical method which we use at the end of every patient’s bed. However this simple chart was developed by a nurse ('Pah!') and as a consequence the statistical methods that engineers use for monitoring the variation in one system over time, in real time, are unknown to eminent professors and unheard of by the data analysts and performance managers.

So the chart in Figure 1 comes as a bit of a surprise to the eminent professors. Being normal but exalted human beings they go through the well-recognised 'Nerve Curve' of first denying that this is going on at St. Elsewhere’s, then that St. Elsewhere’s isn’t representative of hospital in the country (even though they might work there) and then, like all normal human beings they get very angry and confused as their understanding of ‘reality’ comes crumbling down about their ears.

So here’s another thought – what if the crisis in A&E is iatrogenic? Iatro-what?

### **Iatrogenic.**

Doctors recognise that often the symptoms and signs that patient suffer from are due to the treatments the doctors and healthcare professionals are metering out. One only has to think of the awful side effects of chemotherapy which are often worse than the cancer itself. There are many treatments which result in side effects. Iatrogenic disease is one of the things I have to think about when I am taking a history from a patient who is taking one, or worse, many treatments recommended by many providers.

So could the crisis in A&E crisis have been caused by the multiple policies that have been enforced by the managers and clinicians in multiple agencies who responsible for the well-being of the NHS?

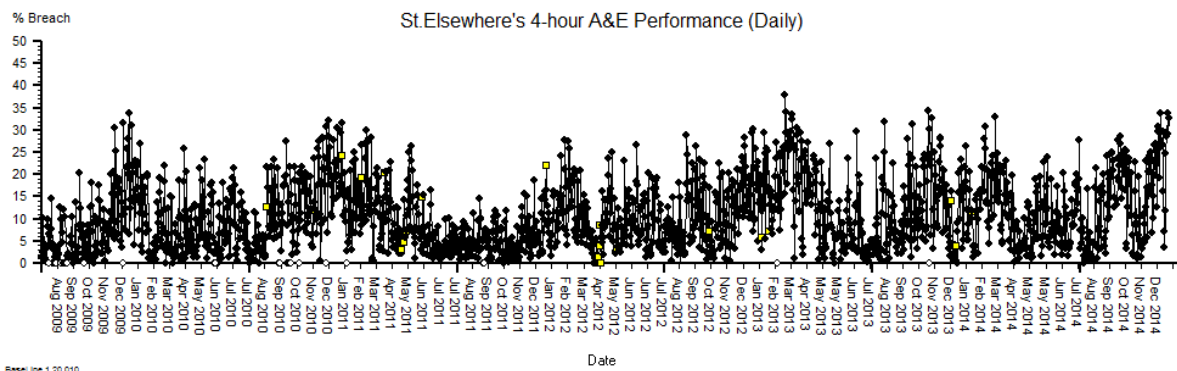
Let’s look at the performance of another 4 A&E dpts. in 4 hospitals from across the Kingdom. Let’s think of these hospitals as if they were patients – sick systems- lying there in Resus.

### **A&E at Hospital A**

For the A&E at Hospital A, I have plotted the % of patients who spend longer than 4 hours in A&E (y-axis) each day (x-axis). These are the data reported to the Board and Department of Health for every hospital in the Kingdom. The data are usually tortured further to fit an artificial RED AMBER GREEN (RAG) rating system and rendered even more meaningless as some of our executive population are red/green colour blind.

So I have just plotted the daily A&E breach performance over time since June 2009, in black and white.

**Figure 2: A&E performance at Hospital A: Daily % patients in A&E longer than 4 hours.**



Just look at the trace for these data and use the intra-ocular test of statistical significance.

Do you think that:

- A) 98% of the patients are getting through A&E in 4 hours or less?
- B) Do you think there has been any change in the pattern of the variation over time for the % of patients 'breaching' 4 hours in this department?
- C) How would you describe this pattern or variation to your Gran over the phone? Smooth, Stable? Unstable? Unstable with a sort of pattern in it? Yup, I'd agree, stably-un-stable-with-a-sort-of-varying-pattern-in-it is a perfect description of a chaotic system! Chaos is not random. There is an unpredictable-predictable pattern to the behaviour of chaotic systems. (Think of the flow over a waterfall).
- D) Do you think there has been any significant long term change to pattern of flow of patients through this A&E department?
- E) How would you feel as a patient if you knew you were about to enter a chaotic healthcare system?
- F) How would you feel to know that as a caring healthcare professional you are working in a chaotic system?
- G) What do you think a smoothly flowing un-chaotic system should look like?

Hospital A is part of recently disgraced highly performing Foundation Trust. Managers at this hospital (like many others) were spending hours 'distorting their system' and then 'torturing their data' in the futile hope that 98%, then 95% of their patients would get through their A&E in 4 hours.

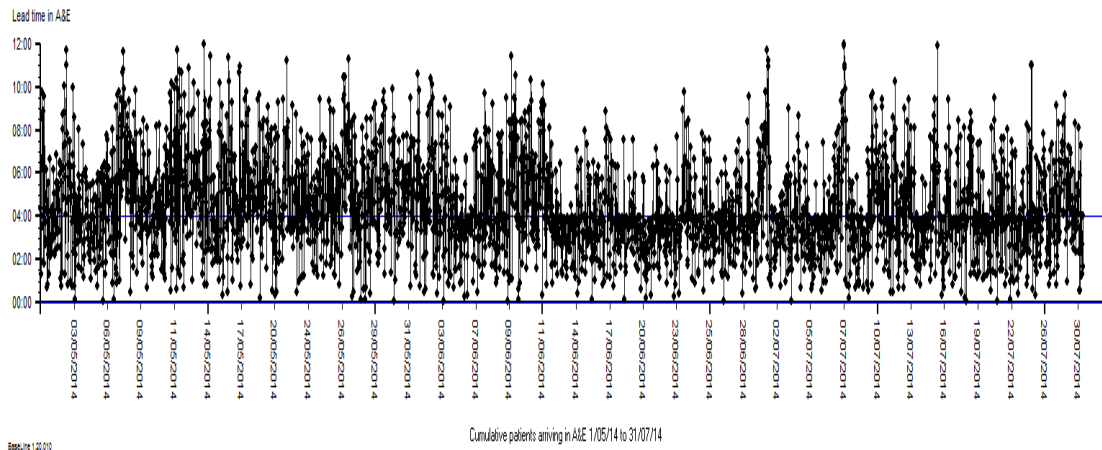
**The second lesson:**

All the time-consuming and very expensive shenanigans that have been going on to distort the emergency system and then the performance data to fit with what the performance managers want, has finally given out – we have been found out, and many of us, quite rightly, disgraced.

Why yet again, do we have another example of this 'willful-blindness'? Is this because NHS doctors and managers are inherently evil or unusually vain? Or is it because those that do blow the whistle are unable to offer an alternative approach?

## A&E at Hospital B.

Now for A&E Dpt. at Hospital B, I have plotted the time spent in A&E (known as a lead time) in hours (y axis) for each consecutive individual patient as they leave A&E (x axis). So what we have got here is an unadulterated picture of the flow of patients through the A&E department over a shorter period of time.

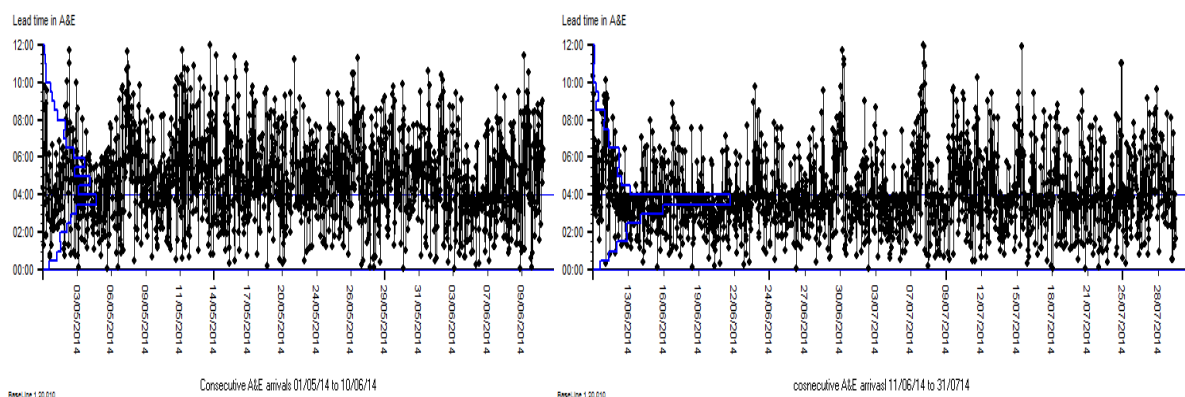


Now the trace from Hospital B's A&E department is very interesting. (Concentrate!). Using the intra-ocular test of statistical significance, what would you say about the pattern? Has there been a change? To me it looks as if a blunt lawn-mower appeared in the A&E department around about the beginning of June 2014. Would you agree with me? If you do, then this was when an improvement advisor advised this particular hospital to implement the Dpt. of Health and Royal College's recommendation for achieving the 4 hour target in A&E. Assessment units, or warehouses, were created downstream of A&E into which the patients could be dumped when their time in A&E was up – i.e. at 4 hours. When the assessment units were full, the blunt lawn mower failed to do its job.

It is very rare that you catch, on paper, the exact moment when a patient has a heart attack – when the heart goes from a 'normal' rhythm to a completely 'abnormal' rhythm. This is exactly what we have caught in this trace.

To illustrate this, I have split the trace into two and drawn in the histogram on the left of each of the two halves of the trace.

**Figure 3: Hospital B's A&E data split at the moment of the change:**



Prior to June 2014, the histogram is more 'normally distributed' (turn it on its side and you may recognise this inverted U pattern) around a mean of 4 hours. The histogram in the Right is not 'normal'. This histogram has a shelf or a cliff in it (depending which way up you have got it) at exactly 4 hours. This pattern is called a Horned Gaussian and is diagnostic of a system is being distorted by an arbitrary target and forced into chaotic behaviour. The system is now operating on a knife edge at 4 hours – one tiny butterfly flapping its wings will tip the system over into a perfect storm – and that is exactly what has happened for this hospital.

So now I can check my hypothesis that the A&E crisis is iatrogenic: has the implementation of the Dpt. of Health's and Royal College guidelines on meeting the 4 hour target in A&E made A&E dpts. in the NHS across the Kingdom chaotic?

So off I trotted to see one of my chums who should know. What he told me was he doesn't know. His team are called in to sort out 'failing A&E departments'. So they go in with their Plan and Do, but they are never around long enough to Study the impact of what actually happens and they don't get a chance to Adjust their mind-set of what may need to be done differently. As far as the hospital is concerned, the 'treatment' worked - they leave their 'A&E patient' hitting the A&E 4 hour target for 98% of the real-life patients who were attending A&E. Mission Accomplished.

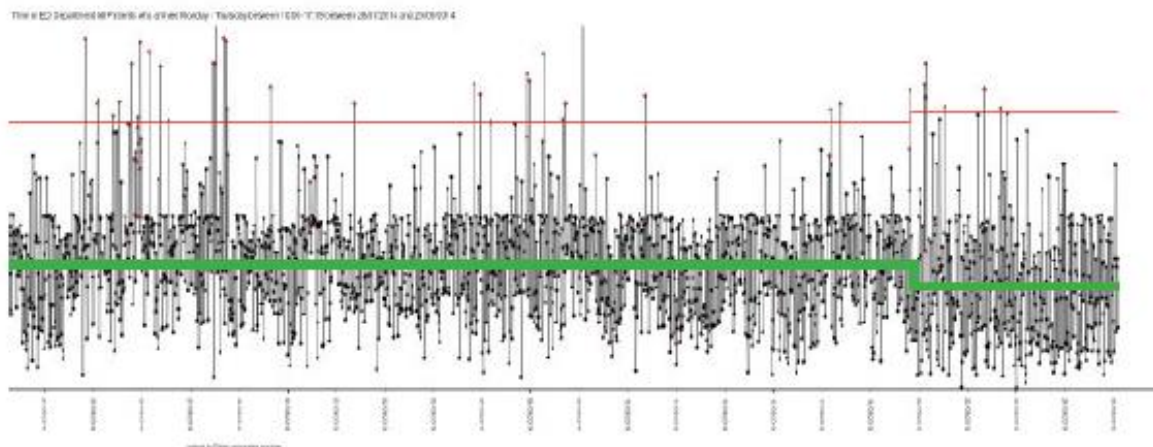
**Lesson four:** Hitting the target and missing the point.

The 'mad' comparative measure of a '% of patients meeting a target' masks the Horned Gaussian and they fail to see that they have left their 'A&E patient' in a critical state ready for 'a butterfly to flap its wings'. A tiny change in the demand; or the length of time just one patient was in the department; or the out-flow capacity from A&E changed e.g. just one member of staff off sick or on holiday; or the CQC closing an old people's home downstream of the hospital; or any one or more combinations of thousands of tiny changes– and the A&E system would tip over. And it has. Across the Kingdom, wherever these pernicious ideas have been implemented.

## A&E at Hospital C

Now Hospital C's A&E trace takes a bit more time and effort to understand. So please concentrate.

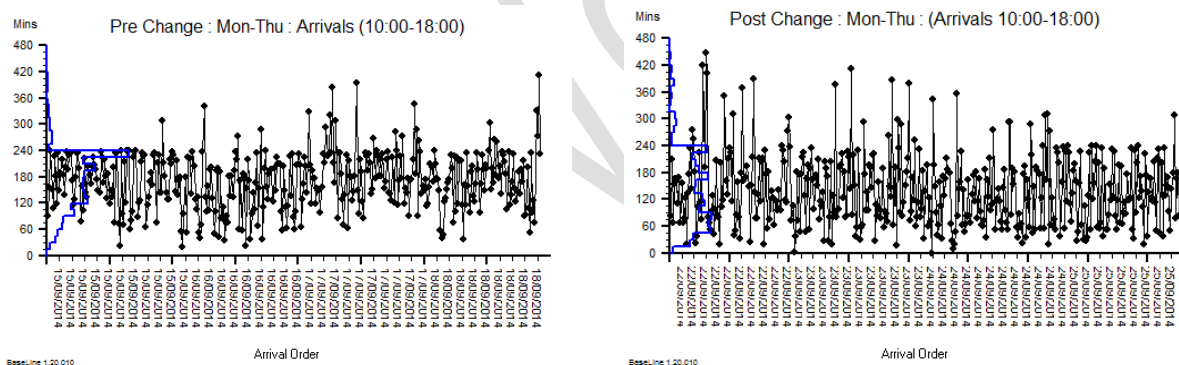
**Figure 4: Consecutive Individual patient lead times through A&E at Hospital C**



We can see the blunt lawnmower in operation at 4 hours, and despite the blunt lawnmower, the A&E system still can't rid itself of some of the patients out of A&E for up to 7 hours (Red line) (Apologies - the Y axis isn't very clear here). Hospital C is part of an unusually complex system of flows involving many hospitals all providing different specialist services. Hospital C is also unusual in that it has an uncharacteristically courageous team of managers who recognised the consequences for their sick relatives who were lying in their A&E department. With a great deal of pain and effort (and believe me, un-learning or changing one's mind-set is a very painful experience), they reconsidered the 'advice' they had received and implemented from the DH and the Royal Colleges. Now that is brave. What they learned to do was to design their emergency system to meet the demand being placed on it. This was achieved and tested for just 4 days (between 10:00 and 18:00 hours) in one week in September 2014. With their newly acquired skills, the team have used a software package to track and visualise the mean (average) time patients were in the A&E department (green line), and the range of the variation (red lines)\*<sup>1</sup>. So we can easily see that the average time has dropped by 20%, but the range of variation hasn't changed much – the staff are still struggling to get their patients transferred to other specialist sites. BUT have another look – please concentrate – what happened to the 4 hour lawn mower? It disappeared that week!

To confirm this I have split the trace into two: pre and post change:

**Figure 5: Hospital C's data split at the change:**



So now the sinister Horned Gaussian has disappeared and the flow through the A&E system is behaving more normally around a mean 2 hours! Well the staff couldn't believe it – the A&E Dpt. felt calmer. The patients - many of them frequent flyers – were delighted. A calm and therapeutic environment reigned for 4 days for the first time in 'working' memory! Their challenge is now to recover from the shock and really believe it and what's more explain to their as still uneducated masters that the problems in A&E have been the policies that they metered out and enforced.

### The Third Lesson:

It is possible to design a service to meet the numbers and needs of our patients. But this is not a job for amateurs – however professional they may consider themselves to be. Designing services requires a disciplined scientific approach to ensure that 1) we measure demand 2) we understand the sequence of clinical tasks (processes) that patients required to get a diagnosis, prognosis and

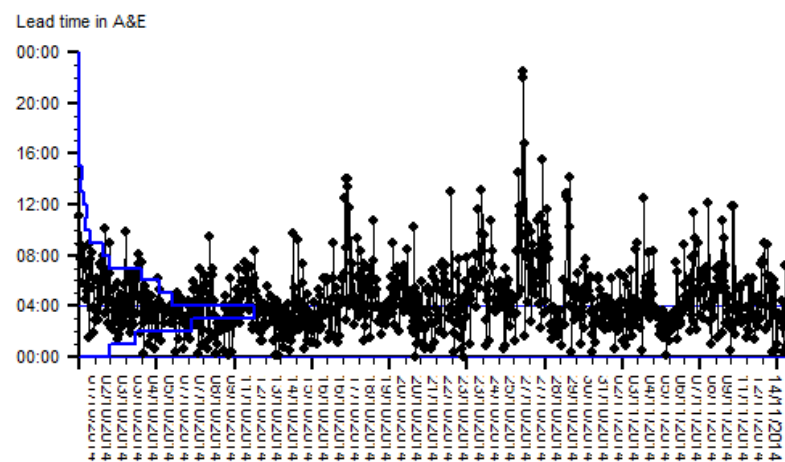
<sup>1</sup> Eminent professors beware! This is statistics, but not was we know it, Jim'.

plan 3) we measure the time it takes to perform these tasks and 4) we test and measure the impact of the change both quantitatively and qualitatively.

The recommendations by the Dpt. of Health and the Royal Colleges are not scientific but based on opinion. This opinion is further undermined by the unsubstantiated belief that the demand was ‘over-whelming’ or ‘unreasonable’ and as such ‘non urgent’ or ‘un-deserving’ patients should be discouraged from getting the care they needed. Therefore the emergency staff would be given ‘algorithms’ or rules to sort their deserving sheep from the underserving goats. Unfortunately it is these ‘simple rules’ that have generated the chaos.

## A&E at Hospital D

Figure 6. Consecutive patient lead times through A&E at Hospital D.



Consecutive A&E attendances who were admitted 01/10/14 to 16/11/14

Figure 6 is a short but reasonably recent A&E trace from little Hospital D perched at the very edge of the Kingdom. Its flow for patients admitted through A&E still demonstrates a more normal, but skewed distribution, of a non-chaotic system with a mean of around 4 hours. Fortunately for them the blunt lawnmower hasn't really got going there yet. If only they could learn to do what the Bravehearts at Hospital C did and be given the time to get on with it. And they could retrieve this precious time by refusing to waste their time torturing their data to please their inept masters who consume an astonishing amount of the wage bill.

So where do we go from here folks?

There are two broad areas that I am struggling with and I need your help.

### Psychology.

What is shocking to me is that 99% of the normal population are unable to recognise a gap between their rhetoric and impact. When we are presented with facts about that gap we will deny, vehemently, that there is no gap rather than face the gap. The gap, in this case, is the lack of understanding we have about how the system we are managing, works.

The NHS is a very complex system within a wider complex system. There are lots of different flows of varying volumes: patients with different conditions, information, supplies, equipment, money, all



flowing through the health and social care system at different speeds. All these streams share resources and patients have to 'compete' for these resources. What's more the system then adapts to the performance around these constraints. Sounds like a human body to me. In fact I have just been sent a lovely little video by the King's Fund which reminds me of the early anatomy books from before physiology (the understanding of flow) was 'invented'.

<http://www.kingsfund.org.uk/projects/urgent-emergency-care/alternative-guide-urgent-and-emergency-care-system-england>

So how much understanding do our senior managers and clinicians have of what goes on under the skin of the NHS? Do they spend the majority of their time in front of computer screens looking at pages of numbers coloured red, amber and green? Or do they spend their time out on the shop floor, following the patients, information, staff, equipment and money as they flow between the various organs in the system – i.e. the organisations and departments?

Next question: How much understanding do they have of the pathology of the system – the blocks to flow – the constraints – and how the physical and temporal constraints impact the flow up and downstream? Can they recognise that the majority of the constraints are temporal constraints caused by policies or their own local 'rules'?

Addressing this lack of knowledge – and Dr. Atul Gawande called it "ineptitude" in his excellent Reith lectures this year – is our most pressing challenge.

The distorted and delayed 'image' that is being displayed in red, amber and green on the computer screens, many miles from the shop floor – is so distorted and so delayed that it no longer represents reality for those on the shop floor.

So are those who believe this image represents reality deluded?

So any tips for dealing with deluded leaders, folks?

(Yeah, yeah – I'll keep taking the tablets too...)

### **System Science.**

Systems Science is a well-recognised and fast growing discipline which seems to have passed-by the senior leaders in one of the biggest organisations in world.

Healthcare professionals may have a head start in that they have learned to understand a system. As a medical student I spent 2 years learning the basic anatomy (physical structures), the physiology (flow between them), biochemistry (the minutiae of the flow at chemical level), and the pathology (the behaviour of constraints) within a very complex adaptive system before I was let loose on live patients for a further 3 years. For those three years I learned, with the help of those generous patients, to recognise the patterns of disease and the patterns of disease over time. Thus I learned to elucidate and treat the root causes of those diseases - the constraints. Then over the next 40 years I was expected to really learn by questioning my paradigm. The only way to do this was to ask my patients what did or didn't make them feel better.

However to learn how to design processes to meet demand and save my patients from going blind in the queues, I had to re-train as a production engineer. Only then was I taught how to 'balance the line' so that the raw metal flowed seamlessly from one end of the factory so that faultless aeroplanes left at the other.

So what is the equivalent training for healthcare system managers? Or do we just let the loose into a system, with no skills, no tools, no training in improvement techniques, process and system design and no feedback mechanism by which they can learn?

And what is the mental model of those that do the 'punishing' when the system collapses?

Fortunately, its good news folks! That training and the feedback mechanism are available and there are many more Bravehearts who, I know, will rise to this challenge.

Happy New Year!!

Final Version