Bandolier Forum 1

Independent evidence-based health care

On science and management

There is a terrific book [1] about why human civilisation started earlier and made more rapid progress in some places on the Earth than others. Why were the 'fertile crescent' around ancient Mesopotamia, or parts of China, favoured over south America, or Australia, or Europe?

One answer is grass. The world's 56 heaviest-seeded wild grass species (excluding bamboos) have grain weights of 10 to over 40 mg, about 10 times higher than the median for all world's grass species. These 56 comprise less than one percent of all grass species. And look at where they are found (Table 1). Almost two-thirds are found in the fertile crescent and the Mediterranean shores of Europe and north Africa. Australia has only two.

Many fertile crescent grass species are hermaphrodite self-pollinating species, which means they grow easily and reproducibly without sowing seeds. Projections of what would have been available in the ancient grasslands of Mesopotamia, without any form of agriculture are astonishing. Yields of up to 1 tonne of seeds per hectare would not be exceptional even 10,000 years ago.

To put that into perspective, grain yields from the most intensively farmed and most fertile fields of England in a good year would be about 8 tonnes per hectare. Organic farming without intensive use of chemicals and fertilizers would reduce that to 4 tonnes per hectare. Ten thousand years of technological progress has improved nature's bounty by just four to eight times.

Table 1: Occurrence of the 56 largest seeded grasses

Region	Large grass species
West Asia, Europe, North Africa	33
East Asia	6
Sub-Saharan Africa	4
North Americas	4
Meso-America	5
South America	2
Australia	2

I took the bucket upstairs

In the Radcliffe Infirmary in the 1980s, personal computers were banned, except for research. Out of my research fund I bought a £3,500 Superbrain (two 256k drives for the techies). The problem was that when it rained in a certain way and the wind blew at a certain strength from a certain direction, water flowed through a light fitting in the ceiling and all over my desk. So this enormously expensive computer (1980s don't forget) was sat next to a red plastic bucket.

By chance Frank, the hospital engineer happened to walk through just at the right time and promised to get the problem fixed. A plumber duly arrived, went off to the roof space, and returned about 20 minutes later. He explained that there was a vent in the roof, and when it rained in a certain way and the wind blew at a certain strength from a certain direction, water collected and came through the light fitting onto my desk.

"But could you fix it?" I asked. "What did you do?"

"No problem, sir." was the reply. "I took the bucket upstairs"

Budget-based medicine

Clinical budgets were first introduced in Oxford at the same time as an early screening programme for neonatal hypothyroidism funded by the RHA. The accountants running the budget exercise set an unrealistically low non-staff budget for the biochemistry labs, and we told them the actual figure, but they said not to worry, it was only an exercise.

A year later the third set of accountants wanted to know how we were going to deal with our "overspend" of £8,000. Conveniently, the RHA grant for neonatal hypothyroid screening was also £8,000.

"Take the money, but don't do the tests", was their suggestion. But what about the five or six children affected by neonatal hypothyroidism that we would **not** detect in the next year? We explained that they would, at best, be intellectually impaired.

"Ah", they replied, "that's the mental health budget!"

And those grains were also high in protein, which meant that they conferred real benefits on people who collected and used them. More time would be available for other activities than hunting or grubbing around for food.

But the conversion to farming and agriculture was no instant thing. The probability is that it was thousands of years of growing and harvesting before agriculture as we might recognise it today became the usual activity of these men and women. They had to learn, slowly, that selecting the best seeds, like Emmer wheat, increased harvests. They had to learn that seeds had to be stored, ground prepared, seeds sown at the right time and so on. Each generation learned important lessons from the previous one.

Standing on the shoulders of others

If any of us feel smug or complacent about our achievements, just think for a minute about all the things we depend on for those achievements. Start with clean water. Suppose there were no taps, where would you find it? How would you know it was clean? How would you transport it from where it is and you want it to be? How do you store it?

Now do that with bread, paper, metals, and think about your car, pen or computer. The simple fact is that since early men and women started harvesting grain and domesticating animals, and talking and writing, we have depended for some part of our everyday life and achievements on the achievements of our ancestors. We stand on the shoulders of others.

Hans Krebs

For the non-scientists who may read this, Hans Krebs was a brilliant German scientist who came to Britain in the 1930s, and made some of the most important contributions to our understanding of how cells get their energy, first at Sheffield and then at Oxford. He was awarded the Nobel prize for his work.

He wrote a fascinating book about his life [2]. Krebs makes a fascinating point about how he stood on the shoulders of others. He had worked with Otto Warburg, who had in turn worked with Fischer, who had in turn worked with von

Table 2: Hans Krebs' intellectual genealogy

Scientist	Birth-death	Main achievements
Lavoisier	1743-1794	Chemistry of burning
Berthollet	1748-1822	Combustion theory with oxygen, and chemistry chlorine, ammonia
Gay-Lussac	1778-1850	Laws of behaviour of gasses
Liebig	1803-1873	Founder of organic chemistry
Kekulé	1829-1896	Ring structure of benzene
Von Baeyer	1835-1917	Dye chemistry
E Fischer	1852-1919	Chemistry of sugars and purines
Warburg	1883-1970	Cellular respiration, including photosynthesis and cancer
Krebs	1900-1982	Intermediate metabolism, Kreb's cycle, urea cycle

Chief Executive's checklist

An interesting little game to play is to imagine yourself as the chief executive of a major pharmaceutical company for a day. Once you've got over the posh car and an office that works, the hard part begins. Your predecessor has left a single piece of paper with three questions for you.

- Question 1: What is the single critical action of a pharmaceutical company?
- Question 2: What is needed to support the critical action?
- Question 3: How much of what is needed is in place?

Being a chief executive (or should that be Chief Executive?) You have nothing else to do, so you think about it for a while. You consider (and reject) research, development, customer relations, financial management, manufacturing excellence and clinical trial organisation. They are all really important, but none of these quite hits the spot.

You've put you're feet up on the desk, had a really hot cup of coffee, and you realise the problem is that your company has only 10-14 years of benefit from any product because of patents. It comes to you that the single critical action of a pharmaceutical action is…. launching a new product. Tick question 1.

It's obvious, really. New product launches successfully done bring in the cash to fund the research for the next product, and so on. Screw up, and your future looks bleak. The new product launch begins well before launch, and extends well after it. It involves and integrates biochemistry and all that lab stuff with clinical trials, with regulatory requirements, with evidence-based medicine, and with health economics. Without effective new product launch, all the financial stuff is useless.

The answer to question 2 is a doddle. Your company needs a manual with the rights and wrongs of new product launch. It will have boxes of all the things you have to tick to know that you've looked at them, with case studies so that the average launch will be up there with the best. You need seminars so that people who have done one pass on their experience to those going to do one. You make sure that yours is an organisation with a memory.

Only one question to go. We make a few calls to find out how much of what we need is in place, only to discover that there's no manual, no seminars, and we never get experienced people to pass on their knowledge to the next generation. We really don't know how we do it!

That's why it is best to be chief executive only for the day.

The Esther project

"Esther" is not a real patient, but her persona as a grey-haired, ailing, but competent elderly Swedish woman with a chronic condition and occasional acute needs has inspired impressive improvements in how patients flow through a complex network of providers and care settings in Höglandet, Sweden.

Esther was invented by the team of physicians, nurses and other providers who joined together to improve patient flow and coordination of care for elderly patients of a six-municipality region in Sweden. The productive work done on Esther's behalf led the Jonkoping County Council, responsible for the health care of 330,000 residents living around Hoglandet, to become one of two international teams participating in the Pursuing Perfection initiative. This program, launched by the Robert Wood Johnson Foundation, was designed to help physician organizations and hospitals dramatically improve patient outcomes by pursuing perfection in all their major care processes. (From the Institute of Healthcare Improvement http://www.ihi.org/idealized/idpf/index.asp :IHI serves as the National Program Office for this initiative)

The Esther Project had six overall objectives:

1 Security for Esther
2 Better working relations in the entire care chain
3 Higher competence through the care chain
4 Shared medical documentation
5 Quality through the entire care chain
6 Documentation and communication of improvements

The Esther project team consisted of physicians, nurses, social workers, and other providers representing the Höglandet Hospital and physician practices in each of the six municipalities. They were divided into two subgroups: the strategy group, and the project management group.

To establish a clear picture of where the problems existed, team members conducted more than 60 interviews with patients and providers from throughout the system. Together they analysed the results, which included such statements as "patients in a nursing home rarely see their doctor," and "a patient getting palliative care at home was in contact with 30 different people during one week."

During the three-year project, they were able to achieve the following improvements:

- Hospital admissions for heart failure fell from approximately 580 in 1998 to 460 in 2000
- Hospital days for heart failure patients decreased from approximately 3500 in 1998 to 2500 in 2000
- Waiting times for referral appointments with neurologists decreased from 85 days in 2000 to 14 days in 2001

Baeyer. Nobel laureates all. Earlier members of the tree worked before the prize was instituted.

And it went back further than that, right back to Lavoisier 250 years before. Lavoisier worked on the chemistry of burning and oxidation, amongst many other topics. Krebs' work on intermediary metabolism was about intracellular oxidation, or burning, amongst other things. Over 250 years, chipping away at our ignorance, and providing more and better knowledge. And not one of them could have achieved what they did without the work done by their predecessors.

Management frustrations

Humankind is remarkably able. Give them a problem, and men and women will find a solution to it. They have been doing it for thousands of years, and problem-solving is one of the really fun things in life. If it wasn't, then crossword puzzles and TV game shows would not be as popular as they are.

Managing human activities so that all those involved can give of their best is one of the really big problems. One might imagine that there are standard ways of doing this, well understood rules that stand the test of time, that we have learned from our predecessors but modified for contemporary conditions.

One might imagine it, but it seems not to be so. Otherwise why would we now, in the NHS be experiencing so many changes all at once, building on so many other changes since 1974?

Is the NHS so bad that it needs so many changes? Sometimes it seems that way. One of the reasons I left the NHS was a succession of absolutely crazy management issues. Two are in the boxes on page 1.

Those of us who work in or with the NHS can be forgiven if we think that bad management is an NHS prerogative. It isn't. My own experience in industry is that almost no industrial concern, big or small, is managed well. The box on page 2 describes some simple observations about pharmaceutical companies.

Management successes

Yet when people put their mind to it they can do extraordinary things with the most simple tools. Two from Sweden and England make the point. Both the Esther project in Sweden and the pain management project from Warwick made real differences to patients, and to the health care services that serve them. Better services were delivered better and faster at lower cost.

One of the most rewarding things I have done was to work with Mike Dunning on ImpAct, finding people who had made something work in the NHS, telling others how it had been achieved, and putting those who wanted to replicate that success in contact with those who had done it. The lessons learned are summarised in the ImpAct bottom lines on pages 6 & 7.

Operational research

Operational research (operations research in the USA) is the application of scientific method to the management of organised systems. It attempts to provide those who manage organised systems with an objective and quantitative basis for decision. It is normally carried out by teams of scientists or engineers, from a variety of disciplines, and often working with people involved in the organisation and with detailed knowledge of it. The subject of operational research is the decisions that control the organisation, with how managerial decisions could and should be made.

It is easier to understand what operational research is all about with an example, and there is none better than the example that led to the creation of the disciple.

The origins of operational research are inextricably linked with the development of radar in the late 1930s. Radar was not 'invented' in Britain, and the first patent for a radar-like detection apparatus was granted in Germany in 1904. But in the mid-1930s the British developments under the leadership of Robert Watson-Watt meant that a practical radio detection and location (hence radar) system was developed.

But there was a problem. Though aircraft could be detected, fighter interceptors could not be brought into play in time for them to be effective. The RAF thought the answer was a "better" radar. But as a result of an initiative of AP Rowe, the superintendent of the research station involved with radar, a team of scientists showed military leaders how to use the system effectively. The answer was simple - better communications between radar station, RAF high command, and the fighter stations. It was the telephones, stupid!

Operational research was used by British and American teams throughout WWII for all sorts of purposes. After the war it became a central principle of much US industry. The British forgot about it, although there is a UK operational research society (www.orsoc.org.uk).

Operational research comes down to a few simple actions: formulating the problem, constructing a model, deriving a solution, testing the model and solution, and implementing and controlling the solution.

Operational research in healthcare

Where can we find examples of operational research in healthcare? Actually, that's not easy. There doesn't seem to be a readily-accessible literature, or places where operational research is used systematically in healthcare.

In retrospect, many of the examples featured in ImpAct were de-facto examples of operational research. Making pain control better in Warwick involved describing the problem, modelling different possible solutions, deriving one that seemed most likely to work, testing the solution and implementing it. Much the same was also true of the Esther project.

Do-it-yourself pain control

At Warwick hospital an audit in late 1996 involved case note review and interviews with 30 mothers. Although mothers generally expressed satisfaction when asked, the audit suggested that pain control was not always satisfactory. Pain limited function, stopping some mothers from feeding and bathing their babies. Pain was not being assessed routinely.

The audit prompted the formulation of a local protocol for the management of post-Caesarean pain. From the review of evidence, an oral regime was adopted based on the Oxford league table and Chesterfield system. This three-step approach relied on the appropriate use of paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs) and oral morphine. Key features of the protocol were the introduction of formal pain assessments, the use of pre-printed prescription labels to apply to drug charts and the introduction of self-medication by mothers.

A reaudit of 31 mothers one year later showed:

- Maternal function was much improved. Only seven mothers were not caring for their babies with just one giving pain as the reason (the other six were in SCBU). In the baseline survey, the numbers were 13 and 10 respectively.
- The incidence of severe pain at rest and on movement was down by about 30%.
- Mothers were more satisfied with their pain control. Over 40% (13) rating pain control as excellent compared with about 20% (7) in the baseline.
- Length of stay was down by an average of one day per patient – releasing 438 bed-days and £95,000 a year.

Searching the literature using PubMed and the words operational and research in the title gives little to look at. But there are a number of good examples from rural South Africa.

Rabies is an important disease in rural South Africa. The state provides vaccine and immunoglobulin to people after suspected exposure to rabies virus by bite, scratch or mucosal splash. A simple standardised telephone survey was used as a rapid tool for operational research into the reliability and effectiveness of the programme. Startling deficiencies in availability of treatment led to decisive corrective action [3].

Another paper from the same team examines a series of operational research initiatives for malaria treatment, again in rural South Africa. Part of the reason for developing a programme was the recognition that diagnostic services were a shambles, Methods were poor, agreement between centres was nonexistent, and some clinics never received any results from the samples they sent in.

This led to the introduction of a new diagnostic test for use in the field with excellent accuracy, field testing of different and better tests, and a confidential inquiry into malaria deaths, all as part of continuously improving the service and the treatment of malaria.

All this is referenced, but the interesting thing about this paper is that the subject was used for teaching a module for a masters degree in public health, with participants from South Africa and Australia. While there were some concerns from participants, the comments about using operational research were enthusiastic.

Comments and conclusions

Rural South Africa is a world away from the NHS, but the techniques of operational research would be more than useful in our NHS, or any advanced healthcare system. It would bring together evidence, health economics and change management (Figure 1).

We are not talking rocket science here, nor do we need a new tier of management. What we need is for ordinary doctors, nurses, scientists and managers to get to grips with a few simple tools. It needs no complicated statistics, nor any computer assistance more than a simple computer with Excel to do some sums.

Not doing simple planning can lead to much nonsense. For instance, it used to be DoH policy that cost effective treatment of reflux disease was by stepped treatment: dietary advice, alginates, histamine antagonists, and, after endoscopy to check there was no gastric cancer, use of proton pump inhibitors. Relatively simple operational research showed this to be nonsense [5]. The DoH got it exactly wrong. PPIs were more effective and cheaper. Oh, and in passing, endoscopy was associated with death in 1 in 2,000 people, far higher than with dyspepsia or even gastric cancer at any age.

Lack of operational research led to a policy that was bad for patients (who didn't get better, and put at risk of death), and for the NHS because it cost far more to do a far worse job.

So many decisions are made on the hoof, and without proper assessment of the consequences. And though it is easy to point to prescribing policies, it also applies to many others, including those made in the higher echelons of management. There is no simple answer, certainly not from this source. If this has made you think, then perhaps it has been worthwhile. Operational research may just be one way to begin to stand on the management shoulders of others. We want good, readable books, accessible to all of us (like Muir Gray's book on making health policy and management decisions [6]), that add to the tools we can use to make delivery of healthcare better.

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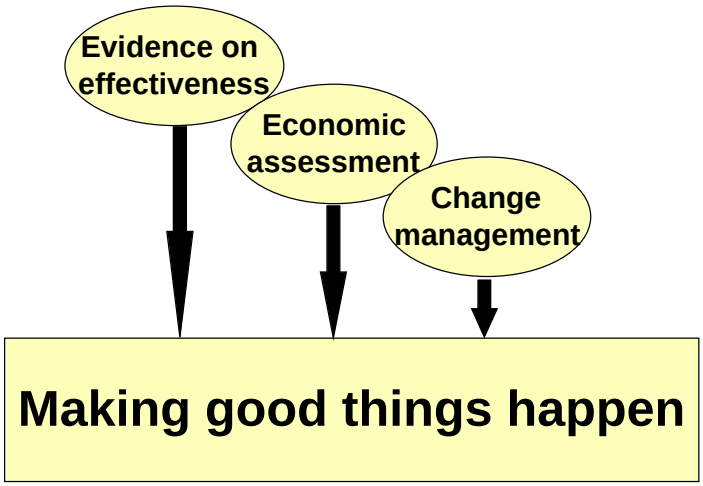
Figure 1: Change for the better



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About the writer

Andrew Moore took a degree in Biochemistry at Balliol, Oxford, and followed that up with a DPhil before working as a clinical Biochemist in the Nuffield Department of Clinical Biochemistry for 13 years. After leaving the NHS in 1986 he was managing director of a diagnostic company that grew from six to about 200 people before he left in 1994. His research background extends back to the early 1970s beginning with work on pulmonary surfactant tests, and working with clinicians in many specialties. Since the early 1990s he was involved with the use of evidence, and he has been editor in chief of Bandolier since it began. He has been involved with many systematic reviews and systematic review methods. He has a DSc and is a fellow of the Royal Society of Chemistry.

Bottom lines for success

Building experience from ImpAct case studies

What was learned by those involved? and *What are your 'tips for success' for others wanting to tackle a similar initiative?* These are two questions we asked when preparing ***ImpAct*** case studies. We tell people we expect them to be honest about what went right and what went wrong. We don't want a glossy picture that skates over the difficulties.

It often surprises us that local project teams have not systematically sat down and talked about these questions. It should be an essential discussion for all project teams: we all have things to learn. Experience suggests that setting aside time in the middle of a team meeting for 'reflection and learning' is the best solution. All members are then likely to be present, catching those who turn up late and those who 'have' to leave early!

After we have completed each case study we step back and identify ***ImpAct*** *bottom lines*, what seems to us to have been the key action/s to assure success. In the seven issues of ***ImpAct*** so far we have included 27 case studies. The ***ImpAct*** bottom lines fit into three groups: those about the impact of *patients* on the work, those about the *people* involved and those about the *supporting systems and process*. Here our aim is to draw lessons from the case studies that have general application.

ImpAct **bottom lines**

It has surprised us that there are only three ***ImpAct*** bottom lines about ***patient*** involvement (Box 1). Perhaps *'working with patients can be a learning process*' says it all. Despite several years of effort devoted to this issue we still seem to have a lot to learn. People now know that they should involve patients, both in their own treatment and in development work, but few know how to do it successfully. We'll keep this in mind as we prepare case studies.

Ways to encourage the innovation of and build on the enthusiasm of ***people*** working in the NHS are common features of the case studies (Box 2). We've noted four main themes. *First*, ensure that people have time to get involved in development work, though in ways that do not prejudice their clinical responsibilities. Space and time are essential to allow people to adopt new ideas and approaches. *Second,* find ways to ensure that the existing skills are used to the best effect. *Third,* initiatives to improve team working are time well spent. *Fourth,* leadership to harness the skills and release the energy of staff is essential. We understand that the Department of Health is making progress in a new series of initiatives to improve management and leadership in the NHS. The success or otherwise of these initiatives will be for history to decide.

Box 1. ImpAct bottom lines: About working with patients

- Working with patients can be a learning process – for both clinical staff and patients.
- Work with volunteers from the community to keep developments going but be sure that the community supports the endeavor
- Collaboration between primary and secondary care can impact significantly on little things that make a difference - like the number of patients who don't turn up for appointments.

Box 2. ImpAct bottom lines: About the people involved.

Time

- Time spent telling staff affected by initiatives what is going on is never wasted
- Make sure that people can get involved - change rosters so that they can attend training sessions.
- Make adopting change easy for clinicians: find ways to facilitate change, which do not unduly add pressure to clinical commitments.

Skills

- Practical training makes things happen.
- Just because people use the language of IT don't assume that they understand it.
- Find ways to value and make the most of the skills and experiences of staff locally - before you bring in 'outsiders.'
- Exploring ways to use therapy assistants offers practical and economic opportunities to improve the quality of care to patients.
- Don't rest on the status quo - encourage innovative ideas and the potential of new roles as ways to improve service quality.

Teams

- Devote effort and time to training and team building
- Achieving change can be hard work – share out the tasks – but make sure people know what is expected of them – and when
- Do not underestimate the positive impact development work can have on staff morale.
- Effective inter-disciplinary work requires understanding and communications between team members – it must be worked at – it will not happen by magic.

Leadership

- Active - senior - leadership is important when tasks require co-ordination across large (and small) organisations.
- Avoid the careless use of meaningless (job) titles.

Box 3. ImpAct bottom lines: About local systems and processes.

Simplicity

- Efficiency and effectiveness thrive on doing simple things well
- Small initiatives can lead to big savings
- Take time out to learn about developments elsewhere when developing new services: don't re-invent the wheel!
- Use pilot studies to verify potential benefits from change and remember - success breeds success
- Don't believe that complex solutions are bound to be the best – simple approaches can be effective
- Look for simple practical ways to use IT – don't be tempted by over elaborate solutions

Techniques

- Using a recognised development model can ensure that effort and resources are used to the best effect
- Tackling those parts of a process that dictate the pace overall may be the best way to achieve rapid change
- Don't be afraid to try new ideas - but have to the courage to stop if they don't work
- Look for practical ways to improve and build on existing systems – don't believe that you have to start afresh on everything
- Be patient and persistent - creating effective services for small groups takes time
- There are no quick answers
- Persistence is required if you want to overcome long-standing problems

Information

- Find novel ways of tackling problems: set standards but allow practices to find their own ways to deliver those standards
- Make sure that you know what needs to change before making detailed plans – don't rely on anecdotes. Make sensible use of questionnaires
- Investment in time may be worthwhile if it produces a uniform and efficient way of doing things - rather than major change
- Solutions have to be tailored to the particular problem. Solutions may be different but the process of solving them is the same

Communication

- Time devoted to communications and ensuring that staff affected by initiatives 'know what is going on' is never wasted
- Services that are outward looking and which care about how others perceive them are more likely to succeed. Influence is born of good relationships, not internal structures and systems
- Make new services work and be successful – so good that ways have to be found to resolve any funding issues

Finally, remember

- Solutions do not last forever - be ready to change systems when they start to show their age

The case studies remind us yet again that effective local development work needs good people and good systems. We've identified four themes about ***systems and processes*** (Box 3). *First*, value simplicity and don't believe that complex solutions are always needed. *Second*, build on proven management techniques as a framework for the work, such as EFQM, ToC and CQI. *Third*, recognise the importance of information and IT systems. These ensure a focus on what needs to change and allow progress to be measured. But it easy to forget in the hype about the 'dotcom' world that many people in the NHS may not be at first base in understanding and using information technology. *Fourth*, make sure that local channels of communications are open and used to keep people in touch with progress: ignorance breeds doubt.

Taken together the ***ImpAct*** bottom lines suggests that good practice thrives where five key activities are integrated, ie:

- *Information*: identifying the need for change, to develop new standards and monitor progress.
- *Communications*: keeping people in touch.
- *Training*: ensuring people and teams have space and time to develop and learn new skills, ideas and approaches
- *Involving patients*: ensuring that appropriate arrangements are in place.
- *Management*: ensuring that planned changes happen.