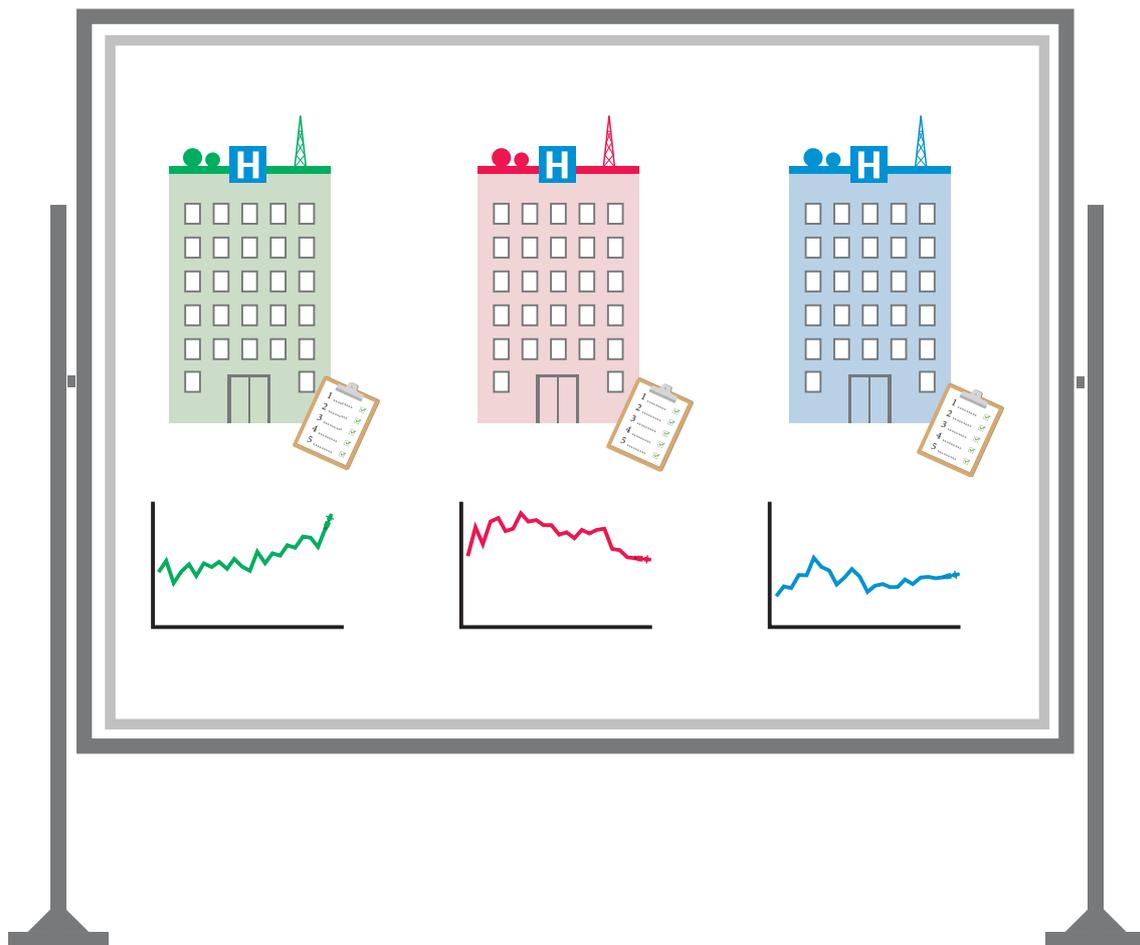


Lining Up: How do improvement programmes work?

Lessons from an ethnographic research study of interventions to reduce central line infections



Acknowledgements

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The research was commissioned and funded by the Health Foundation to help identify where and how improvements in healthcare quality can be made.

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This learning report is based upon interviews and the following journal articles:

- Dixon-Woods M, Leslie M, Tarrant C, Bion J (2013). Explaining Matching Michigan: An ethnographic study of a patient safety program. *Implementation Science* www.implementationscience.com/content/8/1/70/abstract
- Bion J, Richardson A, Hibbert P et al (2013). 'Matching Michigan': a 2-year stepped interventional programme to minimise central venous catheter-blood stream infections in intensive care units in England. *Quality and Safety in Health Care* 22:110-123.
- Dixon-Woods M, Bosk CL, Aveling EL, Goeschel CA, Pronovost PJ (2011) Explaining Michigan: developing an ex post theory of a quality improvement program. *Milbank Quarterly* Vol 89 No 2, pp167-205.
- Bosk C, Dixon-Woods M, Goeschel C, Pronovost PJ (2009) Reality check for checklists. *The Lancet* 374: 444-5

More details about the *Lining Up* project are available at www.health.org.uk/liningup

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Health Foundation commentary

With the health service under immense pressure to deliver improvements, there is an understandable tendency to seek out good ideas and try to put them into practice across the wider system. Yet too often potentially promising programmes fall short when implemented in a new setting.

This report explores the reasons why this might be the case. It is the second report highlighting lessons from a large research study commissioned by the Health Foundation: *Lining Up*.^{*} The researchers set out to identify the essential factors behind the successful *Keystone* programme conducted in the US state of Michigan, and then explore what happened when a programme it inspired, *Matching Michigan*, was launched in England.

By studying the *Keystone* programme, the researchers were able to hypothesise a range of factors that contributed to its success. Reporting of successful improvement interventions often focuses on superficial, easily described practical components. However, the *Lining Up* researchers show the need for a more sophisticated understanding of the factors that support successful improvement. These include an understanding of both the mechanism(s) through which change is delivered and the context in which it is being made.

In exploring what happened when *Matching Michigan* attempted to replicate *Keystone*'s success, the *Lining Up* researchers discovered that responses to the *Matching Michigan* programme varied across participating intensive care units. They found that the application of the programme's technical practices were generally very good, but that implementation of the broader set of factors

shown to be relevant in *Keystone* was highly variable and depended on national, local and internal context.

One of the strengths of the NHS is that, with the right learning and support systems, it has the potential to spread good practice across the system to the universal benefit of patients. However, as this report shows, realising this potential is not straightforward. It depends on two things. First, those making improvements need to develop a deeper and more structured approach to understanding what has contributed to the success of an improvement intervention in any given setting. Second, those trying to adopt successful interventions must pay attention to more than simply the technical components of effective improvement programmes.

If improvement programmes are viewed as vehicles for supporting culture change and building capability, they have the potential to have broader and longer lasting impact. If viewed as a technical solution to a single aspect of quality and safety, they risk becoming just that. Hitting one measure at a time will not deliver the transformation needed across the NHS identified by, among others, Don Berwick's recent review into the safety of patients in England.[†]

The Health Foundation will continue to contribute to this agenda by conducting detailed evaluations of improvement initiatives, looking at all the factors at play and drawing out lessons that increase the probability of delivering successful improvement.

Dr Jo Bibby
Director of Strategy
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* The first report, *Lining Up: How is harm measured?*, looked at lessons from the project about measuring, collecting and reporting data. See www.health.org.uk/publications/lining-up-how-is-harm-measured.

† <https://www.gov.uk/government/publications/berwick-review-into-patient-safety>

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Introduction

Summary

This is the second report examining aspects of the Health Foundation's *Lining Up* project – an investigation into interventions to reduce central line infections.

***Lining Up* looked into how and why an infection control initiative in intensive care units (ICUs) in the United States achieved outstanding results, and investigated attempts to replicate the same success in the English NHS.**

Researchers found that not only were there differences in the design and implementation of the programmes, but also that an array of contextual influences, including local factors and the legacy of previous initiatives, had a major impact.

Unless we understand the mechanisms of change of a successful programme, and adequately take into account specific history and context when adopting and adapting an initiative, it may be difficult to reproduce its effects.

Programmes to improve quality and safety are a well-established feature of modern healthcare systems. When examples of successful improvement programmes are found, attempts are frequently made to replicate them in other settings. Effort is routinely invested in assessing their effectiveness. However, much less research has investigated precisely how and why they work and many programmes fail to reproduce initial positive effects when transposed to new settings.

Without understanding the ingredients of success, efforts to reproduce an improvement programme risk mimicking its superficial outer appearance, but not replicating the essential processes that actually make it work. The *Lining Up* research project, therefore, set out to identify the essential factors behind a successful improvement initiative – the *Keystone* programme in the US state of Michigan – and to explore what happened when a programme based on it was introduced in England.

The Health Foundation commissioned a team from the Universities of Leicester and Birmingham to investigate efforts to reduce the rate of bloodstream infections (BSIs) linked to central venous catheters (CVCs, often referred to as 'central lines') (see Box 1 on page 6).

The highly successful *Keystone* programme reported a dramatic reduction in CVC-BSIs in over 100 Intensive Care Units (ICUs) across the US state of Michigan. Following its example, in 2009 the National Patient Safety Agency (NPSA) launched *Matching Michigan*, a two-year programme for ICUs throughout England.



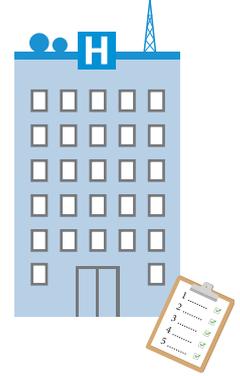
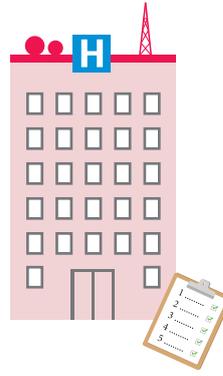
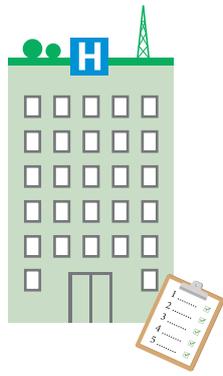
The *Lining Up* researchers first worked with the original team that led the *Keystone* programme to identify the mechanisms that appeared to explain the effects of the programme in Michigan. They then followed the *Matching Michigan* programme in real-time, conducting observations and interviews in a sample of English ICUs. They found that *Keystone* and *Matching Michigan* did not appear to work in the same way because of important differences in context and some differences in design and delivery between the two programmes.

Box 1: Why CVC-BSIs?

Central venous catheters (CVCs), also known as central lines, are narrow tubes inserted into large veins, with the tip lying close to the heart. They allow vascular access for purposes such as administering drugs and fluids, taking blood samples, measuring venous pressures and providing haemodialysis. An estimated 200,000 CVCs are inserted in patients in the UK each year, mostly in ICUs. Some patients may have several CVCs.

CVCs can increase the risk of serious bloodstream infections (BSIs) by providing a conduit for bacteria and fungi to enter the patient's bloodstream. This may result in death, other serious complications, prolonged hospitalisation and increased costs of care. Research evidence strongly indicates that many CVC-BSIs are avoidable.

The single most important contributor to CVC-BSIs is the way the catheter is inserted and subsequently managed in terms of infection control. This suggests that changing healthcare staff behaviour is a critical target for reducing CVC-BSIs.



Background: Understanding how and why improvement programmes work

Improvement programmes are startlingly variable in outcome across similar settings, with initial positive effects often difficult to replicate. It is frequently hard to isolate the particular aspects of an improvement programme that caused a change, and even harder to decide whether they can be successfully replicated elsewhere.

Adopting the superficial aspects of initiatives to improve healthcare, but not the underlying processes and mechanisms that really matter, may risk ‘cargo cult’ improvement.

This refers to Richard Feynman’s description of people living on an island in the South Seas where aircraft had landed during the Second World War, bringing many desirable goods. They wanted this to happen again.

*So they’ve arranged to make things like runways, to put fires along the runways, to make a wooden hut for a man to sit in, with two wooden pieces on his head like headphones and bars of bamboo sticking out like antennas – he’s the controller – and they wait for airplanes to land. They’re doing everything right. The form is perfect. It looks exactly the way it looked before. But it doesn’t work. No airplanes land.**

Reproducing all the apparent precepts and forms of a scientific investigation while missing something essential amounts to what Feynman called ‘cargo cult science’.

To avoid the cargo cult phenomenon, those seeking to learn from a programme need precise information about:

- its components: what the programme comprises
- its mechanisms: how the programme’s activities are linked to its results
- its context: how the programme interacts with the specific environment, policies and historical context.

Without this information, what to do to make a programme work once it is transferred from its original setting may be unclear, and it may not be easy to judge where efforts and resources should be directed. Yet studies of improvement programmes are often very poor in providing details of all three of these elements.

Professor Mary Dixon-Woods of University of Leicester, who led the *Lining Up* research, says: ‘We need to fully understand the mechanisms for change. It’s not enough simply to replicate the technical components. You need to do the things that make the programme work. What merely looks the same may not have the same success.’

A detailed and methodical approach to documenting how and why a programme has worked initially – ideally tracked and evaluated as it happened – will help those seeking to adopt it in new settings avoid false assumptions, prevent mistakes in implementation and improve the chances of patients benefiting.

* Feynman, RP 1999. Cargo cult science: some remarks on science, pseudoscience, and learning how to not fool yourself. In *The Pleasure of Finding Things Out*, by RP Feynman and J Robbins, 205–16. Cambridge, MA: Perseus Books.

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The *Lining Up* research project

Rationale

In 2009, the Health Foundation commissioned a team from the Universities of Leicester and Birmingham to carry out the *Lining Up* research project. The aim of the project was to illuminate the factors crucial to how and why improvement programmes work by analysing how the *Keystone* programme (see Box 2 on page 9) achieved the success it did, and comparing that with implementation of *Matching Michigan*.

The NPSA launched *Matching Michigan* (see Box 3 on page 13) in England in 2009. The programme offered the *Lining Up* team a rare opportunity to study the implementation of – and response to – a major quality improvement initiative as it happened. The Health Foundation and *Lining Up* team members hoped that, by comparing *Matching Michigan* to the *Keystone* programme on which it was based, there would be the opportunity to study the influence on quality improvement of the local environment, history, staff culture and behaviour.

Methods

Explaining *Keystone*

To understand how the *Keystone* programme worked, the *Lining Up* team interviewed two of its leaders, examined their original plan and, using social science theory, produced an interpretation of how and why the programme had been successful (see Section 3).

Studying *Matching Michigan*

Lining Up used ethnographic techniques to observe the culture and behaviour related to CVC care in ICUs in England. Seventeen adult

ICUs across England participating in *Matching Michigan*, as well as two ICUs that did not take part in the programme, were chosen for inclusion in *Lining Up*. Researchers spent 910 hours in the 19 ICUs, averaging 48 hours per unit. This involved observations of care on the units, including CVC insertion.

The team conducted face-to-face interviews with 98 ICU nurses and doctors of varying grades, as well as microbiology staff. Researchers carried out 29 further telephone interviews with staff who had attended *Matching Michigan* training events. These interviews involved a wide range of grades of staff, including senior managers and executives from different hospitals. The *Lining Up* team attended all *Matching Michigan* training events and a selection of the programme's team and external reference group meetings.

Further details

The *Lining Up* team has published a number of journal articles about the research, including:

- Dixon-Woods M, Leslie M, Tarrant C, Bion J (2013). Explaining Matching Michigan: An ethnographic study of a patient safety program. *Implementation Science* www.implementationscience.com/content/8/1/70/abstract
- Dixon-Woods M, Bosk CL, Aveling EL, Goeschel CA, Pronovost PJ (2011). Explaining Michigan: developing an ex post theory of a quality improvement program. *Milbank Quarterly* 89(2): 167-205.

For more details about the project, visit: www.health.org.uk/liningup

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The findings

How and why *Keystone* worked

The *Keystone* programme attracted worldwide attention when in 2006 it reported a dramatic reduction in CVC-BSI rates in 100 ICUs in the US state of Michigan.

Infection rates fell from a mean of 7.7 per 1,000 catheter days when the programme began in 2004 to 1.4 after 18 months. In the same period, the median rate fell from 2.7 per 1,000 catheter days to zero.

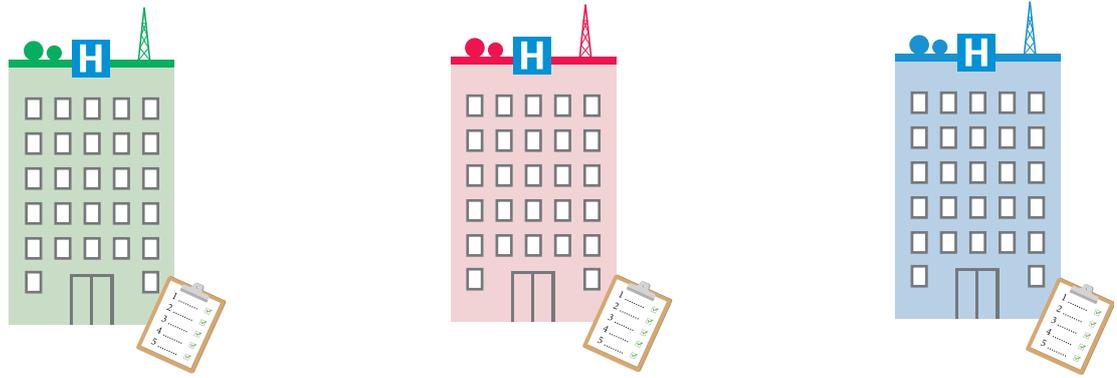
Box 2, below, describes the *Keystone* programme's key components.

Popular accounts of what *Keystone* had done were partial and simplistic, suggesting that the programme's achievements could be traced to a simple checklist. But the *Lining Up* research showed that a description of the components alone does not provide a full explanation of why the *Keystone* project worked, demonstrating that it was a complex rather than a simple intervention.

Box 2: The *Keystone* programme

The programme comprised the following:

- A **technical component**, which aimed to ensure staff consistently used five evidence-based interventions known to reduce the risks of CVC-BSIs. These were summarised into a checklist that comprised:
 - appropriate hand hygiene
 - use of chlorhexidine to prepare the patient's skin
 - use of full barrier precautions during CVC insertion
 - avoiding the femoral (groin) route
 - removing unnecessary CVCs.
- An **adaptive component**, which included education on the science of safety, monthly learning from defects, partnering between units and executives, and empowering nurses to intervene in the event of non-compliance with the technical items on the checklist.
- A **data collection component**, which involved ICUs reporting data on CVC-BSIs to a centralised system. The data were then fed back to ICUs so they could identify their own rate of infections and see the anonymised rates for other units.



The *Lining Up* analysis of *Keystone* identified six key features that seemed to explain its success.[†]

Social pressures to join the programme

Initially 40 ICUs accepted the Michigan Hospital Association's invitation to join the programme but, as word got round, others asked to sign up and eventually 85% of the state's ICU beds were included. ICUs came to perceive that it was unacceptable and damaging not to participate or adopt the programme's policies, especially once it reached a 'tipping point' where most hospitals were taking part. For some ICUs, participation came to be seen as an ethical obligation.

Infections are a problem with a solution

Improvement programmes must ensure the problem they are trying to tackle is perceived as a genuine problem. This can be a major challenge. At the outset of *Keystone*, a commonly held view was that CVC-BSIs were largely unavoidable when caring for very sick patients on ICUs. The *Keystone* programme changed this perception. It showed that central line infections were not a technical problem, but a social one capable of being solved.

The programme achieved this by first telling personalised, hard-hitting stories of lives blighted by CVC-BSIs and then using hard data to show that infection rates were variable and that infections were avoidable.

Some staff initially resisted, arguing that their practice was already good so they had no need to change. However, when asked to produce infection data supporting their position, they were unable to do so. Their resistance was challenged when data collected for the programme showed they were not as successful as they had imagined.

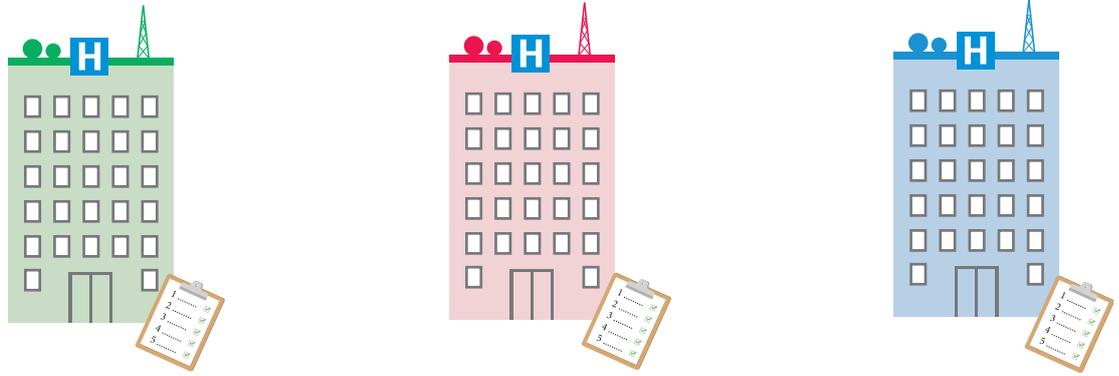
Programme leaders were able to persuade clinicians that something had to be done about the problem of CVC-BSIs, and that the proposed technical solutions were scientifically credible and likely to work. They were helped in this by their being ICU 'insiders' that participants could identify with.

'At the time, *Keystone* was fairly novel as it was bottom-up and driven by clinicians rather than quality improvement administrators or infection preventionists,' says Dr Christine Goeschel of Johns Hopkins University, one of the programme leaders.

Creating a sense of community

For six to eight weeks, participants came together in weekly teleconferences with hundreds of callers. After five months, a two-day residential workshop helped build rapport within and between teams, and with the *Keystone* programme team. Then monthly teleconferences and face-to-face workshops every six months – attended by up to 500 people – continued for the programme's duration.

[†] It should be noted that the *Lining Up* team were unable to collect evidence to verify these theorised mechanisms, as the programme had been completed some years before their research began.



A cocktail hour and networking session became a feature of the workshops, as did distribution of project tokens such as a wristband, mirror and t-shirt. These events were opportunities for learning, but also created a networked community of people committed to the programme's goals. Participating teams increasingly led most of the agenda, and were encouraged to present success stories and openly discuss problems and solutions.

The programme began to generate the energy and momentum of a grassroots movement. It provided sufficient leadership and resources to ensure focus and direction, while securing the inclusion and co-operation of all relevant groups. Hospital chief executives were encouraged to support *Keystone*. Local teams in ICUs were designed to avoid domination by any single profession. Programme leaders asked local team leaders to make sure staff understood the programme's purpose, what they could do to help and what progress was being made. Participants trusted and respected the programme leaders, who combined scientific expertise with the ability to engage emotionally with those taking part.

The programme, though it was clear about the essential components, allowed for some local variation and thus enhanced the sense of local ownership and commitment.

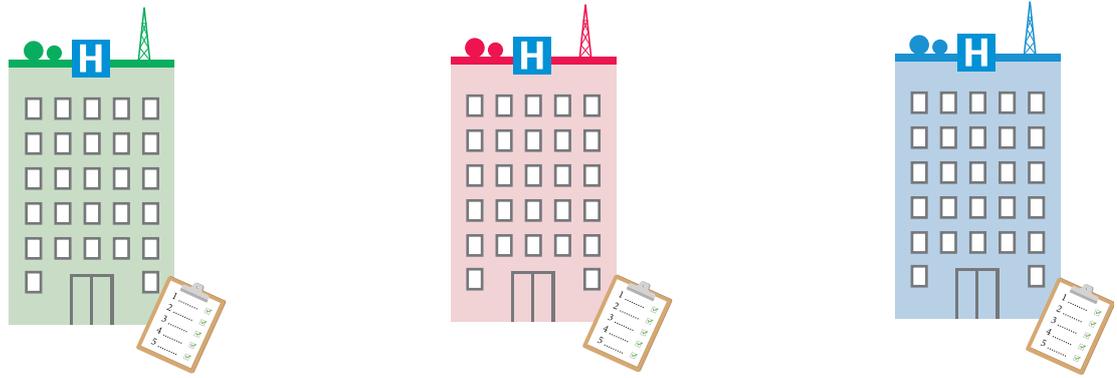
'These ICUs have continued to work on improving aspects of care important to them,' says Dr Goeschel. 'They have formed something that's much bigger than the small piece of work we did.'

Interventions that work in more than one way

The programme's interventions worked on different levels. For example, ICUs were asked to create a dedicated CVC trolley containing all the items required for inserting a CVC successfully. This averted delays and encouraged aseptic techniques by ensuring everything was to hand when needed, so reducing the risk of infection. But it also signalled that the organisation was committed to supporting good practice, heightening awareness of the priority attached to it.

The checklist of five evidence-based interventions known to prevent CVC-BSIs (see Box 2 on page 9) acted as more than a mere roster of actions to be performed. The programme asked that a nurse witness every CVC insertion and record the doctor's compliance with the checklist. Nurses came to feel safe in speaking up if a doctor did not comply, because the evidence so clearly showed the five interventions were in the patient's interest. 'We all understood if there was a breach in sterile technique, there was an exponential risk to the patient,' says Dr Goeschel.

By exposing discrepancies between actual and ideal practice, the checklist highlighted each individual's responsibility for infection control – something easily overlooked in a complex organisation where it is not always obvious who is responsible for what. The checklist institutionalised good practice by making correct CVC insertion into a routine, even a ritual, to which people became so habituated they could no longer conceive of an alternative.



Data as a disciplinary device

The programme team collected infection rates centrally and fed them back to ICUs with anonymised rates for other units taking part. This encouraged self-monitoring and stimulated action where needed, motivating ICUs to match the performance of those with the lowest rates. ‘Soon many teams got to zero,’ says Dr Goeschel. ‘Others challenged themselves when they saw some units could do this.’

Many ICUs reported sharing the data throughout their unit, often posting performance reports on bulletin boards, in staff lounges or conference rooms. Some routinely reported their data at staff, management and board meetings. They displayed posters showing weeks without an infection; moving a counter to show infection-free weeks became a ritual on many units. Some ICUs identified themselves to others so they could discuss the data. As more teams’ infection rates fell, social pressure, reputational incentives and hope for further improvements rose.

‘Hard edges’ and tougher tactics

Though much of the programme was based on consensus and self-determination, it did make some judicious use of harder, authoritarian tactics. For example, recording an individual’s compliance with the checklist meant they were open to external scrutiny: therefore ‘going by the book’ would be the safest defence in the event of a challenge to the quality of care provided.

Programme leaders contacted hospital chief executives if their ICUs failed to submit data, telling them they would be asked to withdraw unless it was forthcoming; none withdrew. Nurses were encouraged to contact the programme team if they were unable to prevent a doctor inserting a CVC without conforming to the checklist; no nurses called, though some revealed they used the threat of calling to great effect. Some doctors complained to the programme that it was fomenting revolution among nurses, but were told its aim was to ensure patients got the best care; all appeared to accept this.



Box 3: *Matching Michigan* – different time, different place, different programme?

Matching Michigan aimed to equal or better the *Keystone* programme's reduction in infection rates. The *Matching Michigan* programme included:

- standardising definitions and ways of measuring CVC-BSIs
- creating an online data collection and reporting system for CVC-BSIs in ICUs in England
- minimising CVC-BSIs in ICUs by supporting best practice
- promoting technical and behavioural interventions to enhance patient safety.

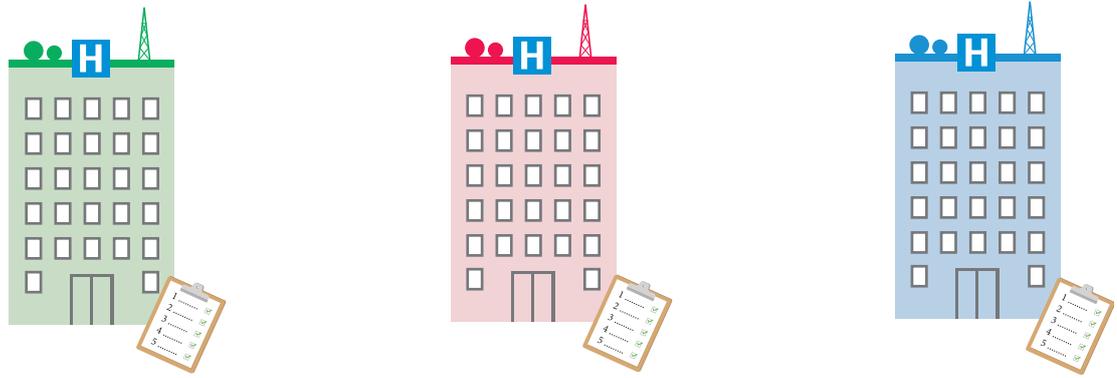
It was envisaged that producing evidence of CVC-BSI rates would reveal to ICUs how well they were doing and, where necessary, provoke action to improve. Modifying culture and behaviour would, it was hoped, promote adherence to the technical interventions, and have an impact on patient safety generally.

Each participating trust was asked to form a *Matching Michigan* safety team and attend two training events. They were also asked to return monthly data on infection and exposure rates to the data collection system, and complete surveys on infection control and safety culture.

Participation was not compulsory, although the NPSA invited all 223 ICUs in NHS acute hospital trusts in England and recruited 215, of which 196 were adult ICUs. The programme was rolled out in four clusters, beginning in May 2009. It concluded in April 2011.

Although it was modelled on the *Keystone* programme, it was not an exact replica: the interventions were mostly the same, but differed in some details, such as the length of time to introduce the programme, the frequency and timing of meetings during the programme and whether it was perceived to be led and owned by the local participants. The *Matching Michigan* study design also permitted analysis of infections acquired outside the ICU, and of secular trends, which allowed a more sophisticated analysis of impact

Early evidence suggested that initial infection rates reported in the English ICUs were half those of the *Keystone* ICUs at the outset of the US programme. As *Matching Michigan* was the latest of several initiatives in England tackling CVC-BSIs, the technical interventions were already established as good practice, but it was unclear how well or consistently they were implemented.



How and why *Matching Michigan* worked

The English ICUs taking part in *Matching Michigan* were also successful in reducing infection rates: they reduced their CVC-BSIs overall to 1.4 per 1,000 CVC patient days by the end of the programme – ie they ‘matched’ *Keystone* in effectiveness. However, unlike the *Keystone* programme which only examined infections acquired in the ICUs, *Matching Michigan* also recorded infections acquired before ICU admission, and arranged for the participating ICUs to join the programme in four clusters. This allowed the English programme to identify that in England CVC-BSI rates were falling anyway, both inside and outside ICUs. Because of this secular trend, the improvements seen could not be confidently attributed solely to the programme.

The *Lining Up* team identified differences in the nature of *Matching Michigan* and *Keystone*. These were differences in the national context and the local history of the ICUs taking part, as well as differences in design and implementation (see Box 3 on page 13). The team also discovered that responses to the programme varied across the ICUs participating in *Matching Michigan*. They identified three characteristic responses among the 17 *Matching Michigan* ICUs it studied:

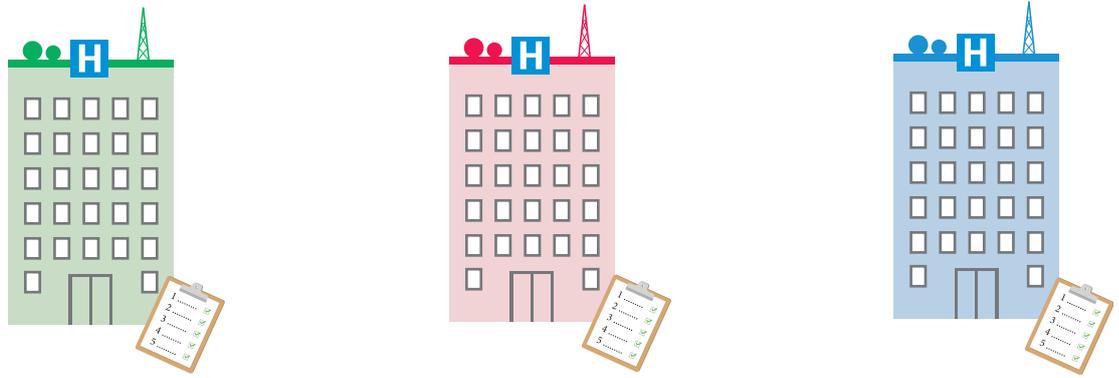
- **Transforming:** In one of the ICUs observed by the team, staff saw the programme as having radically improved care after local leaders drove through changes to practice, culture and behaviour using the programme’s principles, practices and resources.
- **Boosting:** In five ICUs, the programme was credited with reinforcing good practice or supporting further improvement, enabling staff to ask for resources or persuade reluctant colleagues to conform to good practice.
- **Low impact:** In 11 ICUs, staff attributed little of their practice or behaviour to the programme, seeing the influences on what they did as originating elsewhere.

The *Lining Up* team explored what might explain the nature and variation of the *Matching Michigan* programme as implemented across the different ICUs.

Programme participation

Though participation in *Matching Michigan* was not compulsory, most ICUs joined anyway. There was probably a *Keystone* ‘tipping point’ effect, and a feeling that the programme was mandatory in practice even if it was not labelled in this way. Some participants reported a sense of ethical obligation to engage with the programme.

Units did not share the hypothesised *Keystone* experience of being part of a collaborative community working towards common goals. Little evidence suggested any sense of community among *Matching Michigan* participants. They had minimal contact with each other after the training sessions ended, and contact with the programme was mostly with the NPSA. Webinars were poorly attended. On most ICUs, staff were convinced that what they were doing was ‘normal’ practice everywhere.



Organisations varied in the energy, commitment and enthusiasm they invested in the programme. This was evident from the start. Some trusts sent large, eager, multidisciplinary teams to the training events. Others sent single individuals, sometimes unwillingly volunteered, sometimes junior staff, and did not always refund travel expenses. Sessions tended to get bogged down in distracting criticisms of the definitions or anxieties about the effort required to collect the data.

The programme's impact on individual ICUs depended on senior medical and nursing staff 'buying into' it. Little change occurred if consultants were not persuaded that the programme was grounded in high-quality evidence, or saw it as an illegitimate bureaucratic intrusion into professional work. Little impact occurred where local *Matching Michigan* leads (nurses, doctors, and executives) failed to involve staff across all professional groups and at all levels.

By contrast, effective local leads clarified programme values, implementation processes and responsibilities; they respected and involved local experts but avoided lengthy, conflict-ridden debates, ensuring doctors and nurses worked together. Authoritative and unwavering support from senior consultants was especially important in enabling nurses to act as a disciplinary force for junior doctors, who performed most CVC insertions.

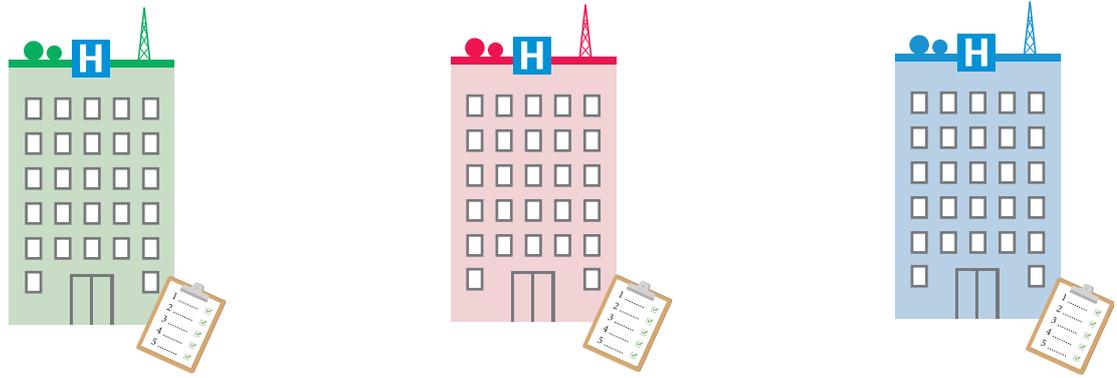
The hope that staff would come to recognise CVC-BSIs as a social problem capable of being solved was undermined by a perception among many that it had already been solved. Whereas *Keystone* benefited from being new and fresh, many ICU staff saw *Matching Michigan* as the latest in a long series of NHS initiatives and pressures relating to infection

control. Many staff perceived it as failing to respect what they had already achieved and, given the other challenges facing hospitals, a misdirection of resources. Its goals, interests and priorities were therefore prone to being regarded as misaligned with those of frontline staff.

Conformity with the interventions

Conformity with good practice in inserting and managing CVCs appeared good, if not always consistent. Most units where the *Lining Up* team undertook their observations had implemented technical interventions for best practice in CVC care, but in most cases this pre-dated the programme. Hygiene practices during insertions were mainly very good, but only eight of the 17 participating ICUs recognised that the *Matching Michigan* checklist was intended to be used concurrently with CVC insertion, and only two were fully consistent in using the checklist in this way.

By contrast, conformity with the programme's non-technical interventions was poor. Few staff understood that cultural, behavioural and systemic change was a major focus of the programme. Most ICUs showed little evidence of 'learning from one defect a month', as the programme stipulated; where such a system existed, it usually pre-dated *Matching Michigan*. Only three ICUs publicly displayed data to staff so they were aware of their own unit's infection rate. Most trusts did assemble a safety team, but they varied in how they functioned and behaved. Executive input was variable: in some it was positive and supportive; in most others, it was either hard to detect or experienced as punitive and performance-oriented.



Data collection

As the learning report *Lining Up: How is harm measured?* shows, most trusts returned at least some data to the programme's online data collection system. However, they varied in how they collected it, and not all the ICUs returned data every month over the programme's entire course. Some ICUs assigned the task to inexperienced junior doctors or poorly supported nurses, and completely decoupled data collection from the programme's interventions. Other than in the 'transformed' and 'boosted' units, data collection was not widely used to change practice and culture; in some it merely reinforced the status quo.

National context and local history

A unit's history of attempting to control CVC-BSIs was deeply implicated in its response to the programme. In the 'transformed' unit, previous attempts had been ineffectual, and staff saw *Matching Michigan* as providing them with the tools and techniques to make change. The 'boosted' units, which had already made some improvement, saw the programme as an opportunity to consolidate gains or improve further. In the 'low-impact' units, a few staff were resentful or hostile, but more commonly expressed apathy or exasperation with the programme, arguing that they had already invested heavily in changing practices to reduce CVC-BSIs in response to previous initiatives. Many saw it as addressing a problem that they believed had already been solved.

National context was also important. Many participants did not see the programme as owned by the local ICU communities. It was often seen as imposed from outside and lacking in professional ownership. Locating the programme in a government agency rather than a professional organisation or research collaboration intensified this effect, alienating some frontline clinicians.

A recent history of target-driven initiatives in the 2000s led many NHS staff to a deep suspicion of centrally-led government programmes. They often experienced these previous programmes as invasive, autocratic and coercive. Some participants remained suspicious that *Matching Michigan* would follow that trend; others feared the potential for data collected through *Matching Michigan* to be used for public shaming in league tables or to exact financial penalties.

4

Lessons learned

The findings from the *Lining Up* project make a significant contribution to safety and improvement science. They have important lessons for those promoting large-scale improvement programmes and for organisations seeking to replicate improvement initiatives pioneered elsewhere.

Understand the totality

It is important to understand clearly all aspects of what makes an improvement programme work if it is to be successfully introduced into a new environment – although some of these factors may be difficult to establish. A programme's success depends not only on its components but also its mechanisms and context: the way in which it is implemented is as vital as the interventions that it prescribes.

Professor Dixon-Woods warns against being misled by apparent simplicity: 'If you're going to launch a new drug, you would do a lot of work to characterise the mechanisms of action and theorise how it was going to work in the body, then put it through a whole series of stages to establish whether and how it works. We would want to know what equipment and training for staff were needed and how to counter any side-effects. In future I'm hoping we will do the same with improvement programmes.'

History and context matter

Organisations' local histories and internal contexts strongly influence how they respond to initiatives. Context can strongly modify the effects of a programme transplanted from elsewhere: it may simply not work in the same way in a new setting.

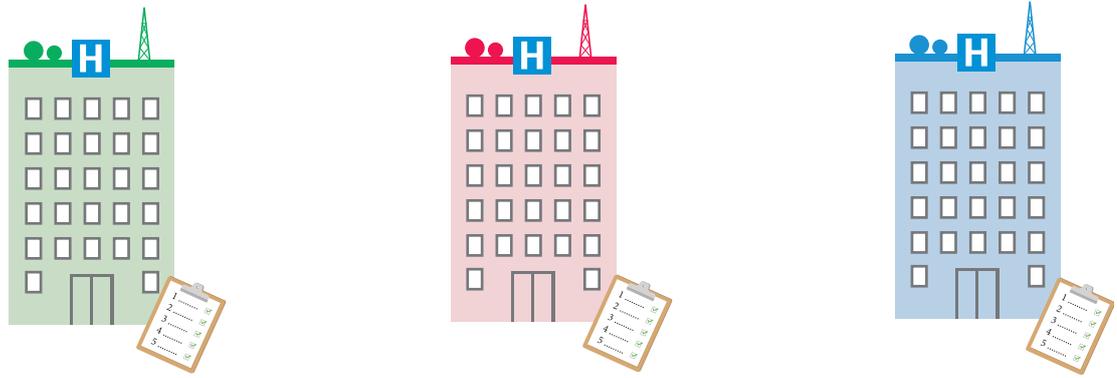
'The implementation of any improvement programme needs to adapt to the needs and priorities on the ground,' says Dr Jo Bibby, the Health Foundation's Director of Strategy.

Different starting points are significant: what has gone before will shape what follows, and organisations which ignore this fact are likely to chase unrealistic goals. 'We need to understand how others have improved, and what their starting point was, and then try to learn what would work in our own situation,' says Dr Bibby.

Large-scale quality improvement involves challenges but can achieve change

Large-scale improvement programmes have an important role to play in healthcare, although they involve challenges that must be handled carefully. Some ICUs used *Matching Michigan* to make a real difference, though others were turned off by features of programme delivery. Centrally-led initiatives may cause fear and resistance, and limit the extent to which organisations use them for authentic improvement. However, central leadership may also confer authority and legitimacy.

'Large-scale improvement can provide the support and resources to enable change to happen,' says Jonathan Bamber, Health Foundation Research Manager. 'But we need to build in a degree of local flexibility – allow programmes to integrate with the local environment and what is already up and running, facilitating the space for people to focus on what works.'



Ownership is important

Perceptions of who ‘owns’ an improvement programme are likely to have a bearing on its outcome. Programmes stand a better chance of success if they are done **with** professionals rather than **to** them.

Keystone may have been able to engage emotional commitment and create a sense of a community-based enterprise by:

- mobilising its leaders’ star qualities
- building on the bonds people felt with their local hospital association
- partnering with Johns Hopkins, a highly prestigious out-of-state medical school.

ICU staff in England did not always feel the same affection, identification and ownership for a programme led by a governmental agency.

Local leadership has a key role

To be effective and get people behind a programme, local leaders need enthusiasm, commitment and credibility. They have to be able to bargain for consensus and create interdisciplinary coalitions. They must give constant feedback and be adept at persuasion. They need to be both persistent and sincere.

Respect data collection

Data collected by the programme should command legitimacy among participants, and must be used to encourage learning rather than punish and/or reward. It should be carried out by those with skills in data management – collecting, processing and feeding back – or it will lose credibility and persuasiveness. For more details on the lessons from *Lining Up* about measurement, see the learning report *Lining Up: How is harm measured?*

Conclusion

Over the course of both the *Keystone* and *Matching Michigan* programmes, ICUs managed to achieve an impressive reduction in rates of central line infections, and should be congratulated for their achievements and for producing benefits for patients.

However, *Lining Up* discovered that ICUs in the *Matching Michigan* programme did not precisely reproduce many of the features that were theorised to have been important to the success of the *Keystone* programme. This suggests that there may be many routes to securing improvement, not just one.

Where efforts are made to replicate programmes in new settings, the chances of success will be increased when all the components, mechanisms and contextual influences of the original programme are identified and taken into account.

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