Experiences and challenges in achieving sustainable quality improvement in two UK hospitals

While the PDSA (plan-do-study-act) audit process may appear straightforward, real-life efforts to implement change can be both frustrating and time consuming. This article describes some of the experiences faced while undertaking two separate quality improvement projects in the anaesthetic and critical care departments of two London-based institutions.

Project A aimed to modernize central venous catheter packs to support evidence-based practice and improve the compliance with established best practice guidelines for the completion of central venous catheter bundle paperwork. Project B proposed several changes in accordance with National Audit Project 4 recommendations, including formulation of an airway plan for each critical care patient and introduction of a simplified airway trolley.

This article describes the challenges encountered and efforts required to engage team members by following the seven rules for disseminating innovations in health care (Berwick, 2003). These challenges included staff acknowledgement that alternative approaches to alleviate well-known problems existed and the processes involved in changing the mindset of staff in order for proposed changes to be implemented in the long term.

This article demonstrates that quality improvement is a dynamic process which requires a dedicated team with a combination of experience and enthusiasm. The process of implementing change via quality improvement projects has several universal themes. Familiarity with these themes may facilitate the process of creating sustained change in both attitudes and clinical practice.

Quality improvement projects are best thought of as processes by which better patient outcomes and experiences are achieved through modifying provider behaviour and organization, through use of a systematic change method and strategy (Royal College of Physicians, 2012). There has been a surge of both consultant and trainee interest in quality improvement projects since the General Medical Council (2012) announced the expectation that all doctors should participate in systems of quality assurance and quality improvement that will form part of their assessment in the upcoming appraisal and revalidation process.

Health care is rich in evidence-based innovations, yet even when such innovations are implemented successfully in one location, they often disseminate slowly – if at all (Berwick, 2003). Diffusion of innovations and institution of quality improvement can prove to be a major challenge in health care. The adopters of new innovations can be divided into five groups (innovators, early adopters, early majority, late majority and laggards) based on the number of standard deviations from the mean adoption time (*Figure 1*, Berwick, 2003).

While the PDSA (plan-do-study-act) audit process may appear straightforward (Pratap et al, 2013), real-life efforts to implement change can be both frustrating and time consuming. This article describes some of the experiences faced while undertaking two separate quality improvement projects in the anaesthetic and critical care departments of two London-based institutions. It describes the challenges encountered and efforts required to engage team members. These challenges include staff acknowledgement that alternative approaches to alleviate well-known problems exist and the processes involved in changing the mindset of staff in order for proposed changes to be implemented in the long term.

Using these two examples the authors identify how changing culture and infrastructure can be a slow process, requiring refinement of human factors associated with staff members in order to bring about both psychological and cultural change. The process of implementing change via quality improvement projects has several universal themes. Familiarity with these themes may facilitate the process of creating sustained change in both attitudes and clinical practice. In addition to the 'stumbling blocks' encountered during these projects, the authors document their

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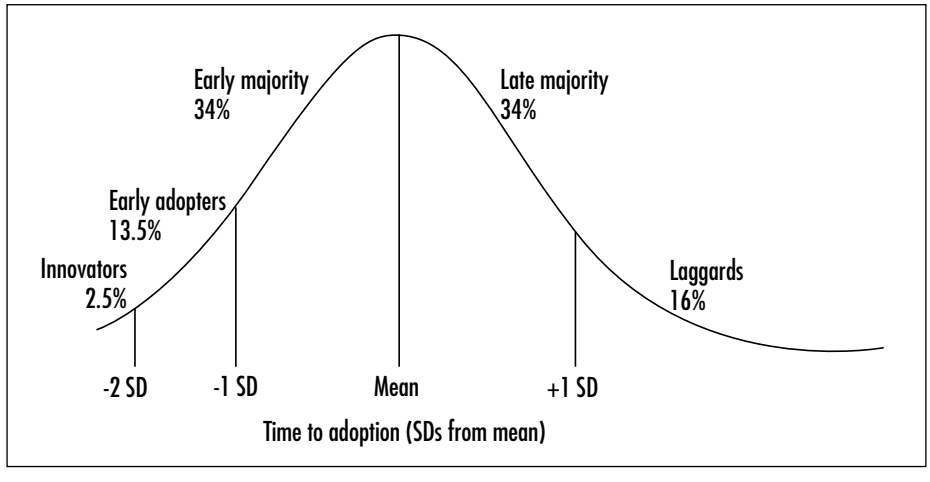
Figure 1. Adopters of new innovations. From Berwick (2003). SD = standard deviation.



encounters with the quality improvement project process and describe some factors that helped promote the spread of change.

Project A

The National Institute for Clinical Excellence (2002) recommended the routine use of ultrasound to guide placement of central venous catheters. A locally performed audit in institution A identified suturing of central venous catheters as a potential nidus for infection, a common cause of neck scarring and discomfort for patients. Furthermore, the institution identified that central venous catheter placement and ward-based aftercare were being inadequately documented by both doctors and nursing staff. The hospital central venous catheter pack itself contained outmoded equipment and did not support evidence-based practice (Pronovost et al, 2006). Team A developed the quality improvement ideas of:

1. Modernizing the central venous catheter packs to incorporate adhesive devices instead of sutures to secure lines, sterile ultrasound probe covers to encourage doctors to insert lines with ultrasound guidance (National Institute for Clinical Excellence, 2002), and an adhesive label to be completed by the doctor inserting the central venous catheter to be recorded in the patient records.
2. Improving compliance with established best practice guidelines (Pronovost et al, 2006) for the completion of central venous catheter bundle paperwork and daily central venous catheter review by nursing staff.

Project B

The National Audit Project 4 (NAP4, Cook et al, 2011), a collaboration between the Difficult Airway Society and the Royal College of Anaesthetists, determined the incidence of complications of airway management in anaesthesia within the UK. This comprehensive national audit and commonly cited publication identified emergency airway management in the intensive care unit as a common risk factor for several complications including worse patient outcomes, particularly when airway management was performed by junior staff, an increased incidence of difficult endotracheal intubation, a higher incidence of failed extubation, greater cardiac instability on induction of anaesthesia in the out of hours setting, inadequate airway planning for high-risk patients and insufficient use of end-tidal carbon dioxide monitoring. This was the driving force behind the conception of project B, a joint intensive care and anaesthesia project. The changes that were proposed in institution B, in accordance with NAP 4 recommendations, included:

1. An airway plan to be formulated at the end of each consultant-led ward round tailored for each individual patient on the intensive care unit
2. A simplified airway trolley, equipped with airway devices and adjuncts arranged in a prescriptive and methodical manner and the obligatory use of end-tidal carbon dioxide monitoring for all patients with an artificial airway.

Common experiences and themes in projects A and B

Although the quality improvement projects aimed to improve two very different aspects of patient care, several common themes were encountered during the development of both projects. Both teams consisted of a trainee, a consultant anaesthetist, a consultant intensivist and a senior charge nurse. Teams A and B acknowledged that their ambitions from the outset were both pragmatic and achievable in the set time frames for the projects. The total duration of projects A and B, defined as time taken from conception of idea to full implementation and repeat audits confirming sustained improvement, were 18 and 21 months respectively. The timeline of these common themes is summarized in *Figure 2* and a summary of pertinent multidisciplinary meetings is provided in *Table 1*. Both project teams had allowed 2 years to complete their respective projects. Reasons for delays which were encountered during the projects are outlined in *Table 2*.

The authors describe their experiences by following the seven rules for disseminating innovations in health care (Berwick, 2003):

1. Find sound innovation
2. Find and support innovators
3. Invest in early adopters
4. Make early adopter activity observable
5. Trust and enable re-invention
6. Create slack for change
7. Lead by example.

Find sound innovation (identify the problem)

Both projects originated as trainee solutions to problems that they had noted within the departments of the two institu-

Figure 2. Timeline for quality improvement projects A and B. ★ indicate stages in which the greatest number of delays and problems were encountered. These stages were the parts of the quality improvement project in which the majority of time was spent in order for changes to disseminate throughout the departments. Numbers in blue arrow represent timeline of both projects with 3, 6, 9, 12, 18 and 21 months marked (black = project A, white = project B).

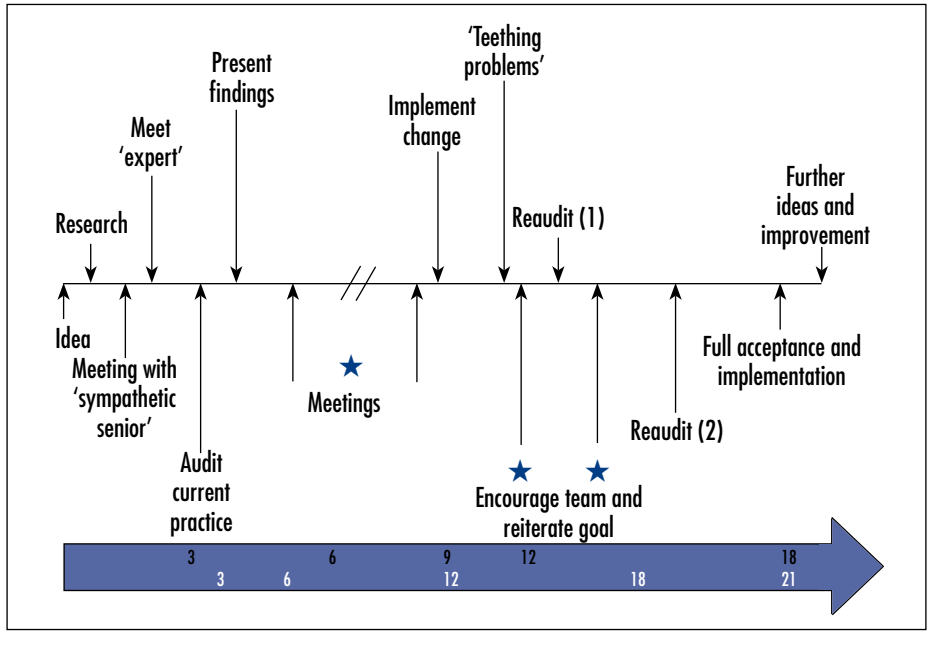


Table 1. Numbers of pertinent meetings in projects A and B

Meeting held with:	Project A	Project B
Supervisor	8	12
Expert in field	2	3
Department head (intensive care unit and anaesthesia)	2	3
Senior nursing staff	3	6
Department to make presentations	3	3
Total	18	26

tions. Positive trainee experiences from another hospital, which used an alternative and potentially superior central venous catheter bundle of care, inspired project A and the NAP-4 inspired project B.

After identifying the area requiring quality improvement, the two teams adopted a PDSA approach for structuring the projects (Langley et al, 1992). Key driver diagrams were formulated to highlight global and specific aims and these dynamic documents were continually revised as the groups learned through PDSA cycles. In order to ensure that the projects were of adequate methodological quality, the audit project assessment tool devised by the NHS clinical governance support team was used (*Figure 3*). Explicit criteria were related to important measurable aspects of care, for example percentage of patient records with complete central venous catheter documentation and number of monthly airway-related critical incidents were audited.

Table 2. Reasons for delays in projects A and B

Meetings cancelled or rescheduled	Staff 'forgot' to attend
	Emergencies to attend at the same time as scheduled meeting therefore unable to attend
	Room booking not made
	Illness
	Wait to present data at audit meeting
Individuals	Lack of interest
	No acceptance that change required or problem exists
	Personality clashes among staff
Cost	Time
	Equipment
Education	Prolonged training time

Furthermore all data collection and presentation of results were in accordance with the Data Protection Act 1998.

Find and support innovators

In order for the projects to be successful, both institutions required the creation of a culture where staff did not fear reporting or confronting inadequate performance, and where the staff members' experience was the primary motivation for improvement. Both teams found this to be a hugely important step in managing their projects.

Both departments have a policy in place to ensure that all proposed changes to be implemented as a result of quality improvement projects are discussed within a forum of permanent staff members including an allocated senior supervisor. Identifying and gaining the support of a senior colleague with experience in quality improvement provided structure, aided formulation of a clear plan with realistic goals or deadlines and aided networking with useful contacts within the institutions. Inclusion of a permanent member of staff also helped to embed changes beyond the period that the trainee and other non-permanent staff

Figure 3. Audit checklist used in projects A and B. From Copeland (2005).

Audit Project Assessment Tool

Criteria	Score	Comment
Topic appropriateness		**Maximum score allowed 5**
High volume, high risk, high cost	Score 2	
As a result of litigation or patient compliant, adverse incident	Score 2	
National Clinical Audit or NHS Standard	Score 2	
Standards (evidence based)		**Maximum score allowed 5**
Based on nationally agreed best practice eg NICE/NSF	Score 3	
If none available then standards based on SIGN or College guidelines	Score 3	
Alternatively literature search undertaken, supporting information with regard to the level of evidence identified and the method of consensus	Score 3	
Patient perspective considered	Score 2	
Methodology		**Maximum score allowed 5**
Multidisciplinary design with service users	Score 2	
Outcome and process built into design	Score 2	
Lead responsible clinician identified	Score 1	
Data sources for prospective data collection identified	Score 1	
Adequate audit tool and sample size	Score 1	
Case mix adjustment for outcome assessment	Score 1	
Intended dissemination of results		**Maximum score allowed 5**
Distributed to all stakeholders and service users	Score 2	
Presented to directorate including managerial team	Score 2	
Local team presentation	Score 1	
Presentation to regional or national meeting or publication	Score 1	
Potential for change consideration		**Maximum score allowed 5**
Lead clinician responsible for action planning identified	Score 1	
Managerial input into action planning identified	Score 1	
Potential barriers to change identified	Score 2	
Potential financial implications and risks identified and prioritized	Score 2	
Re-audit planned with tool adjustments if necessary	Score 1	
Service monitoring criteria considered	Score 1	
Some criteria may not be achievable pre-audit		
Total (max 25)		Maximum score allowed 25

A score greater than 16 would be regarded as a good clinical audit project.

members worked within the department. The senior colleague also provided the trainee with emotional and psychological support and provided sound advice on management strategies for liaising with certain members of the multidisciplinary team. Familiarity of senior colleagues with the quality improvement project process, and the order in which to tackle problems and maximize efficiency also proved to be invaluable.

The success of both projects depended on enthusiasm which developed by educating staff about the importance of good documentation and basic central venous catheter care (project A) and the importance of familiarity with basic and advanced airway algorithms in emergency situations (project B). In these teaching sessions team members identified and supported innovators who could help take the projects to the next level.

Invest in early adopters

Shortly after starting the projects and auditing current practice, one 'frontline' nursing team member from each department stood out by demonstrating a clear interest in and passion about the project aim. Consequently these early adopters were invited to represent the nursing staff within the quality improvement project team as equal partners and were invited to all subsequent project meetings. Addition of team members from the nursing specialty allowed identification and anticipation of logistic and practical nursing problems that may have otherwise been overlooked.

In essence, expanding the team to embrace the early adopters resulted in increased efficiency of the projects. Fresh and effective thinking was stimulated by bringing together representatives from all parts of a system who otherwise may have never met (Plsek and Wilson, 2001). For example nursing staff from theatres and the intensive care unit attended presentations and discussion extended to ward staff and porters and delivery teams who were involved in ensuring adequate stocks of the central venous catheter lines.

Both groups invested heavily in the education programme of their quality improvement projects. Team B systematically educated 200 staff members on NAP-4 data, new protocols, devices and departmental changes in practice in order to facilitate change. Senior nurse team members presented at nurse training days resulting in a 4-month programme of airway practice education. Eventually both projects reached a 'tipping point' after which it became difficult to stop the changes from spreading further. Team A noted nursing staff were actively reporting ongoing bad practice as they found it and team B were heartened that a member of each nursing shift had been allocated the task of checking the airway trolley on a daily basis.

The popularity of the new protocols began to acquire momentum once the innovators and early adopters embraced change. The 'late majority' of staff eventually became more comfortable with the changes once they had realized that the majority had already adopted the changes. Ultimately investing in staff members who were interested in changing their practice rather than those who were against it was of paramount importance in early adoption.

Make early adopter activity observable

This stage highlighted the importance of leading by example. The early adopters became crucial in the publicity of the project aim and key drivers of the project and continually helped to remind and engage staff regarding the benefits of participating in the project. These members of staff and newly appointed project leaders also relayed valuable information regarding why delays were occurring on the 'shop floor' with new policies being used, why 'teething problems' were occurring and possible solutions to the issues that arose.

For example when the quality improvement project idea was presented to the multidisciplinary team of institution A, one nurse approached the quality improvement project team following the talk to say that central venous catheter-related infection was an area of interest that she felt passionate about and that this project could form part of her dissertation for an infection control higher degree. Clearly recruiting such a useful and influential member of the nursing staff to the team was an important step towards change.

Additionally, staff members adopting recommended changes were encouraged and congratulated at departmental and staff meetings. Two new adopters in institution B were invited to write a short review of their experiences, highlighting the changes undertaken, which featured in a clinical governance newsletter sent to all hospital staff.

Trust and enable re-invention

While attempting to achieve the project aims, problems were inevitably encountered and alterations to plans consequently occurred. During each stage of the quality improvement projects, team members actively sought feedback from staff and sought opinion about problems encountered with the new changes made.

Both project teams felt that empathy with and exploration of staff ideas, concerns and expectations in an open manner not only improved team spirit but also allowed all members of the multidisciplinary team to feel like they owned the positive process of change within the department. For example there was some concern in institution A that agency staff employees were not being made sufficiently aware of the protocols. In order to address this issue, extra efforts were subsequently made to introduce these protocols to new staff when they were welcomed to the department on their first day of work.

Create slack for change

Adoption of new policies takes energy so there must be slack in the system to allow for this. There is a real need for investment of time to initially launch any idea. For example, project A initially aimed to improve the central venous catheter pack used by the hospital by replacing sutures with adhesive dressings and including ultrasound sheaths. However, on closer inspection the old packs had many more problems with them, such as lack of mask, hat, saline flush, eye protection and chlorhexidine to decontaminate the skin. Thus this raised discussion in the department about the importance of minimizing the number of items that should be 'dropped' onto the sterile field. It was eventually felt that it would be better to include these extra items within the sterile pack. However, a manager of the department rightly raised the question of cost, which led to multiple extra meetings with industry partners and departmental leads for local negotiation based on cost. It was finally acknowledged that pack changes would free nursing staff to help position and comfort the patient during the procedure rather than spending valuable time

retrieving and opening items for the operator that were not included in the pack. Similarly the airway trolley introduced in project B required several alterations in terms of drawer content based on feedback from trainees who had used the equipment in emergency situations.

Each audit and re-audit was performed and formally presented at combined departmental meetings, which had the advantage of not only publicizing the ongoing project, but also educating staff members about the importance of achieving the goals. The process of re-auditing twice following the interventions in both projects highlights the requirement for slack in the system to create sustained change. In addition to departmental presentations, one audit was published (Flavin et al, 2012) and presented at a regional meeting by team B as a means of demonstrating successful local practice. The team approach to project publication in a peer-reviewed journal was seen to further galvanize the team and resulted in considerable pride being taken in their project.

Recommendations from national guidelines must be adopted to suit each individual institution in order for the department to benefit from optimal results. The repeat audits recognized deficiencies and new system problems which allowed for discussion among the team and implementation of solutions and changes.

Lead by example

Leaders who champion the spread of innovation must be prepared for resistance, even ridicule; most importantly, they must be prepared to begin change within themselves.

After presenting data to the department the authors felt that there was a small window of opportunity to implement changes while the topic was fresh in the thoughts of multidisciplinary team members. After an initial period of encouragement for staff to perform tasks, the changes soon became routine practice and fewer reminders were required. This sustainability of change in culture was demonstrated by the repeat audits performed after 12 months following the inception of intervention.

The incorporation of daily checks has been crucial in both projects and meticulous documentation allows the teams to maintain and monitor the quality of intervention. The nature of hospital medicine and research means that there will always be potential for improvement, and team members are therefore still encouraged to feed back their positive and negative experiences and make suggestions for change. Finally, the addition of the quality improvement projects to the department audit dashboard will ensure robust trust mandated re-audit in the future to help produce sustained improvement.

Conclusions

By describing experiences of quality improvement projects from two different institutions, this article demonstrates that quality improvement is a time-consuming, dynamic process which requires a dedicated team with a combination of experience and enthusiasm. The benefits of adopting a 'PDSA approach' to structuring the projects were experienced from an early stage. The most challenging point of both projects was immediately before implementing the change for the first time, largely because many meetings with members from various departments were required which led to time delays. Similarly the period between implementing change and re-auditing was crucial to the final success of the project because of the negative impact that teething problems had on the projects. Problems in this period needed to be addressed promptly and the teams were required to remind staff of the ultimate aims of the projects.

Two years after conception of both projects, despite trainee doctors having moved to new hospitals, what has been left is a sustained change in practice. On their first day of work, new doctors are now taught about the central venous catheter bundle of care and hospital central venous catheter insertion protocols (institution A) and protocols for airway management 'out-of-hours' (institution B). New trainees have seamlessly adopted these protocols and routinely use the airway trolley for all endotracheal intubations and routinely document central venous catheter bundle care as part of the daily patient review.

These quality improvement projects have allowed protocols that previously failed to exist, or at best seemed unwieldy, to become readily adopted and acknowledged. The new culture seen in both institutions has been sustained primarily because remaining staff within the departments now own the process and the infrastructure has adapted to make it work. **BJHM**

Conflict of interest: none.

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LEARNING POINTS

- Quality improvement is a time-consuming, dynamic process which requires a dedicated team with a combination of experience and enthusiasm.
- While the PDSA (plan-do-study-act) audit process may appear straightforward, real-life efforts to implement change can be both frustrating and time consuming.
- Changing culture and infrastructure can be a slow process, requiring refinement of human factors associated with staff members in order to bring about both psychological and cultural change.