Shine 2012 final report

Development and assessment of a rapid feedback system to improve surgical outcomes

Mid Essex Hospital Services NHS Trust

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The Health Foundation
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Project title:
Development and assessment of a rapid feedback system to improve surgical outcomes
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Mid Essex Hospital Services NHS Trust
Partner organisation:
Anglia Ruskin University
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Abstract

Background

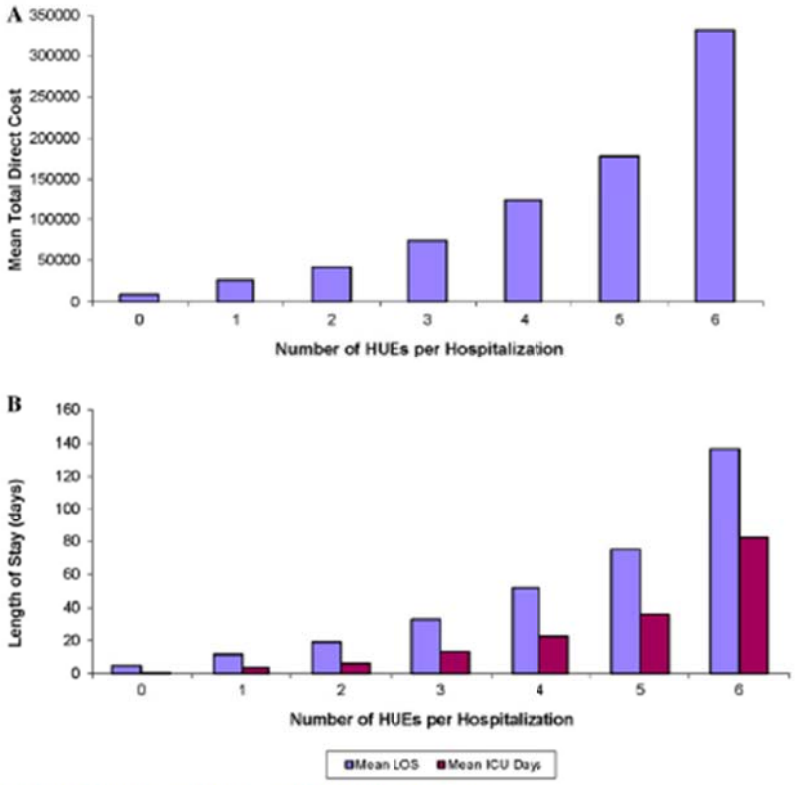
Any surgical procedure carries a risk of an adverse outcome (a complication) occurring. There is increasing emphasis on the importance of understanding about both the impact of complications and on how to systematically reduce their incidence.

"The universal development and reporting of outcomes at the medical condition level is the single highest priority to improve the performance of the health care system"
Michael Porter, Elizabeth Teisberg, 'Redefining Health Care" 2006

There is also growing evidence of the extremely high cost to patients and to the health care system of complications:

Rocco Perla et al, Whole-Patient Measure of Safety: Using Administrative Data to Assess the Probability of Highly Undesirable Events During Hospitalization. J Healthcare Qual: 35(5):20-31

Figure 1. (A) Association Between Number of HUEs Documented During a Hospitalization and Average Total Direct Cost. (B) Association Between Number of HUEs Documented During a Hospitalization and Average Length of Stay



Note. HUE, Highly Undesirable Event; ICU, Intensive Care Unit; LOS, Length of Stay.

Despite this increasing awareness, there is still a tendency to focus on external, regulatory, approaches to monitoring surgical outcomes. Although this can be useful, the basis of our project is to provide feedback of sequential information on patient outcomes to individual clinical teams. The purpose of this is to provide them with information about their current performance, rapidly enough to influence the outcomes for their next patients. Of particular usefulness is feedback of runs of better-than-expected performance, which teams can then aim to reproduce and build on.

For a particular group of people having a specific operation, it might be possible to think of a number of different ways of deciding if the operation worked or not (the outcome). As a general rule, our preference is to concentrate on those outcomes that are most directly relevant to the patients themselves.

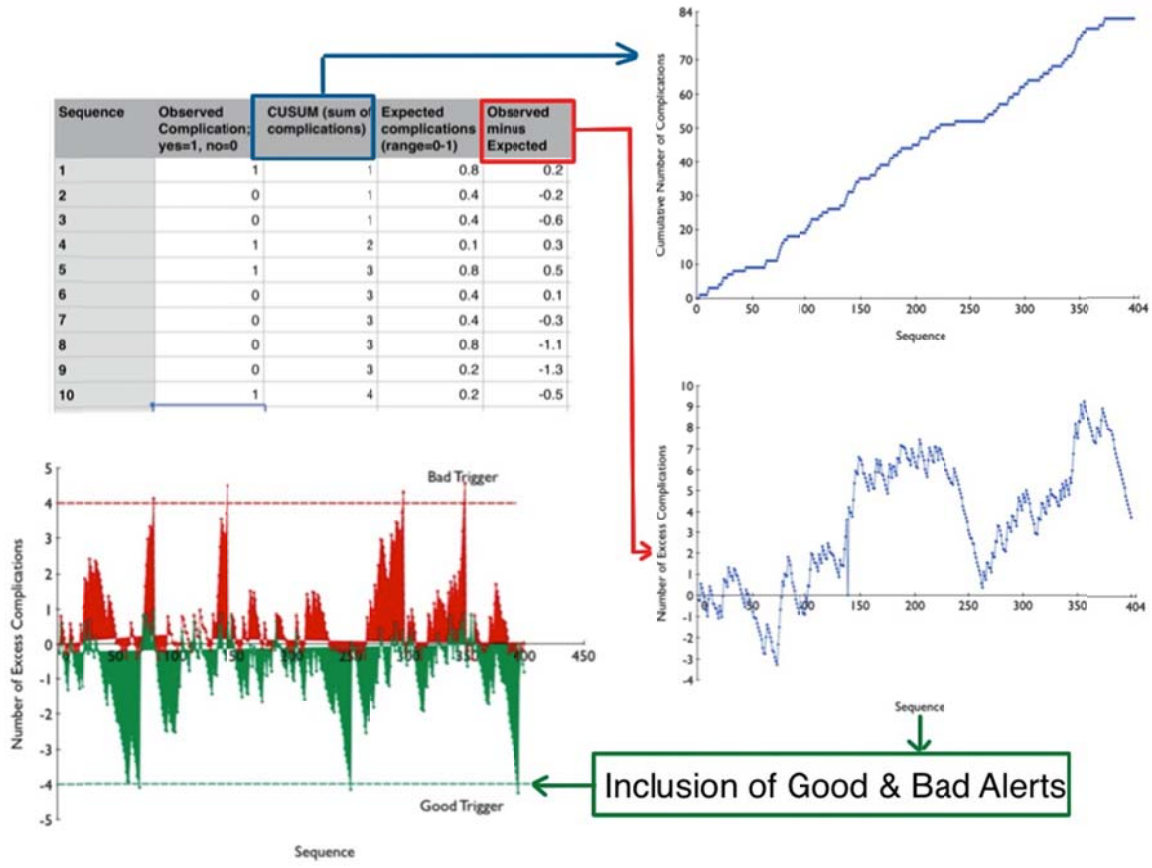
In order to make outcomes information useful to a clinical team, we need to consider the factors that are outside the control of the team (such as how frail a particular patient was before they reached the team for treatment, or how severe their disease was). This is known as risk-adjustment. It allows us to compare the outcome that we Observed for each patient,

with what we Expected to happen, based on what else we knew about that person. This is called O-E and provides very useful patterns of information.

Description of the Innovation

The basis of the innovation is CUSUM (CUmulative SUM) and related charts that provide a visualisation of performance. These are well-described and used in industry. There have been several papers proposing their usefulness in healthcare, and usually describing modelling with retrospective data. Our group published on prospective use of CUSUM in Burns mortality (*G Roberts, G Thorburn et al, Burns, December 2012*).

Up till now, a limitation of using CUSUM in healthcare routinely is the time taken to collate, analyse and clean the data, then build the charts. The key barrier that our project has overcome is to manage this step. (And this step has also taken the majority of the project time). We have done this by creating a tool that automatically collects the information needed, carries out the statistical calculations in the background, and immediately shows the clinician a set of interactive charts.



More detail, and further resources including video tours of the system can be found at our information website http://pabau.com/nhs

Methods

We have developed a system using a web-based tool to efficiently collate the necessary data and create the risk-adjusted charts. We have used the approach that for any time that

we need clinicians to spend on the system, the system has to carry out an additional task to free up the user.

We used an Agile approach to the software development. This is analogous to Plan Do Study Act. We involved the end users at the outset, working with them to identify barriers, and to create a wish-list of functionality. A series of mock-ups were then used to elicit user feedback. The mock-ups became increasingly complex and interactive over multiple iterations.

Regular meetings with clinical representatives from the department allowed us to build engagement and to focus on what they wanted. This was important in maintaining clinical support when the project ran into delays and problems.

Achievements & Challenges

We have developed a functioning tool, which has better functionality than we had thought possible at the planning stage. We have been very appreciative of the ongoing support of the clinical teams.

We have had problems along the way, and the Health Foundation kindly granted an extension in January 2014. At this point, it was clear that our software developers could not complete by the original deadline. We have not had as much time as we had hoped to monitor the effect of the tool in action. We will continue to monitor the effect of the tool over the next 1-2 years.

Part 2. Quality impact: outcomes

Nature of setting and innovation i.e. description of where

St Andrew's Centre for Burns and Plastic Surgery in Mid Essex NHS Trust is hosting this project. We are limiting the project to three patient groups for this phase: Burns, Cleft, and Microsurgery services. Patients of The North Thames Cleft Service (a twin site service with shared clinicians, database and data collection) at Great Ormond Street Hospital are included in the pilot.

Course of intervention, tests of change, adjustments

We are limiting the rollout to only three surgical groups so we can record the impact this system has and the issues likely to exist across a larger rollout. This information has helped ensure that the final system is usable and helpful in a clinical setting, reduces or mitigates clinical workload, and is fit for purpose.

Data and quality

By working closely with the Trust Clinical Coding department, we have been able to identify the information we will require for comparison once the intervention is rolled out. An early-stage benefit has been that this has led to routine improvements in coding data quality, and

ease of access for the Clinical Coding team, by development of coding sheets for surgeons to complete, and incorporation of the coding at a basic layer in the outcomes monitoring.

The existing manual data collection systems for routine (paper-based) audits have been running through the transition phase. Analysis of these shows relatively poor completeness/accuracy (up to 60% depending on form) and that the paper operation and audit records took 12-16 minutes to complete. The electronic forms already outperform in both areas, and avoid later manual data entry with chance of errors. One area of ongoing development is improving ease and speed of use of the electronic forms so this will lead to further improvement over coming years. One innovation of our system is the inclusion of reminders. This means that users who are under time pressure can enter essential data and set the system to allow them to fill in the remainder slightly later when they have the time to do so reliably.

The nature of the system, in that it is centred round ongoing measurement of results, means that it lends itself to future improvement work. For instance, the enthusiasm of the outpatients nursing staff, and the pragmatic ideas they have proposed, are likely to provide greater data completeness and reliability than we had been aiming for.

The delays and revised timescales of the project have reduced the patient sample at this point. This therefore means that more of the outcome measures will become apparent over the projected continuation of the project.

In summary, the first key outcome – creation of a toolkit for roll-out has been achieved. The second, provision of supporting evidence of cost savings has early data but more will be collected over time. The continuous outcomes-data collection system is in place.

Part 3. Cost impact

We identified at the outset of the project that cost impact was going to be the most challenging outcome to accurately comment on. It is also the aspect that has been most affected by the delays and challenges the project has faced. The nature of the project means that there are unlikely to be cash-releasing savings. Instead, our hypothesis is that fewer surgical complications will lead to reduced pressure on existing resources, such as inpatient beds, ward staffing and theatre time (allowing better utilisation for other patients instead).

Reduced complications will hopefully also have an economic gain for individual patients and their families, but this remains outside the remit of this project. (We have met with a health economist with a view to a future larger research project on this)

We have gained increased knowledge of the process over the course of the project, for instance, information on existing patients undergoing Microsurgical reconstruction (moving tissue from one parts of the body to another, often as part of cancer treatment). We have been working closely with the Clinical Coding department to ensure that we use the same OPCS codes as they do. This has allowed us to look at the coding information already stored. One financial aspect this highlights is the issue of returns to theatre after Microsurgical reconstruction. In a sample of 75 patients from 2012 (before our intervention), 28 had to return to theatre, with half of those returning more than once. The median length of stay went from 15 days to 26 days with multiple returns to theatre. This is therefore a significant additional resource use (with an estimated cost of £200-250 per night even before adjusting for any Intensive Care Unit stay, or additional staff costs for high dependency).

The additional costs of return to theatre are estimated at £3,000-3,500, but with higher variability. The impact on other patients is also very high – emergency return to theatre will often involve delaying trauma patients waiting to go to the emergency theatre. Again, the secondary costs to these patients are complex and outside the remit of this project, but we already recognise the burden of theatre delays on that patient group (which is the focus of a separate Quality Improvement project).

The additional cost or resource savings is an aspect of the project that we are keen to monitor in the ongoing phase.

Implementation Costs

Our approach to the design of the tool has allowed us to minimise implementation costs. The tool is fast and efficient for users. For each aspect where we need clinicians to spend time using the tool, we have aimed to replace an existing task. For instance, when entering information in theatres, the tool generates and prints an operation note for the user. There are some further efficiencies in this approach: we have been working closely with the clinical coding team throughout the project. This means that the tool makes clearer to the coding staff about exactly what has been done (and hence which OPCS codes are used) as well recording comorbidities (which the system uses for risk-adjustment, but which increase the tariff payments to the Trust).

Part 4: Learning from your project

Achievement & Learning

Although the project has encountered many challenges and delays, the fact that the project team has been able to complete it has mainly been down to the support and engagement of the wider clinical team in the department. The Health Foundation has been very kind in agreeing an extension for the project.

We began the project with a process of engagement with the team, even before the application to the Health Foundation was submitted. The approach we chose to development centred on including the full team and making best use of their ideas. We therefore made an effort throughout to ensure that the project reflected what the wider team felt was needed (and equally importantly, that it was clear that patient benefit and outcome was at the centre of the project). This approach was essential when the project ran into significant problems in late 2013 and early 2014. The wider team engagement and support was the deciding factor in being able to proceed at all. We also had strong support at Trust Executive level.

It is perhaps worth considering where this project fits in to the use of data within the NHS. The core purpose here is to provide a tool that is centred around the front-line clinical team and their patients. Many Trusts already make use of ‘Quality Dashboards’ or other indicators of Trust-wide outcomes at Executive level. This system is intended for a different purpose and audience. Indeed, if Trust Executives were receiving continuous patient-level feedback on multiple outcomes for every clinical team, they would inevitably become overloaded with information.

By focussing on team-level information, we have been able to harness the relative lack of information available to individual clinicians. In addition, this approach makes it feasible to utilise a wider range of more subtle outcome measures for each patient. An outcome measure must be very black and white if it is to be used for comparison across Trusts or teams: for instance inpatient mortality. However if the focus is an individual team monitoring themselves over time, far more outcome measures become feasible (either where the measure could be open to differing interpretation by different teams, or where the subtlety make it potentially informative but difficult to interpret). Examples might include measuring detailed change in clarity of speech after a cleft palate operation, or the patient’s satisfaction with the appearance of her breast reconstruction after cancer). As you can see, these are still highly relevant to the individual patient. CUSUM charts lend themselves very well to identifying runs of better-than-expected performance, which can be hugely informative for improving patient care, but are often overlooked.

There are two other important advantages of a tool which functions at team level. First is that we have been able to take into account the typical access for busy front-line clinicians. They are unlikely to have time to review outcomes data on a daily basis, and often will not routinely sit at a desktop. This is perhaps even more the case at times of increased pressure, when thing may be more likely to go wrong without getting noticed. To get round this, we aim to ‘push’ important data. When clinicians enter new information onto the system, they are automatically shown the latest outcomes charts, even if they are accessing from a tablet or smartphone, and if a trigger threshold is reached, the system sends out messages to the clinical leads. Second is that the sensitivity of triggers can be adjusted where there is less need for certainty. This means that trends can be picked up earlier, but with the reassurance that the team understands that a trigger is indicating that there “might” be an issue to look for, rather than that there “is” a statistically significant issue.

Challenges

The project did require an extension, and has encountered many challenges. Although the team had made backup plans for predictable adverse events (nearly all of which were used at some point!), we also encountered some more extreme challenges. We did learn about the importance of developing a range of further contingency measures as each original one was used, and of the importance of utilising the strength and combined experience of the core team to deal with issues that we had not been able to anticipate.

We had identified at the time of application that we would need a full-time individual to drive the day-to-day progress and manage the project. There were some delays in the project manager starting. The project manager left after about 6 months. At this point it was too late to recruit another PM from scratch. The clinical lead picked up the majority of the role but this did impact on the time that could be spent on this role.

One general challenge was developing an IT-based project that required an innovative approach but without Google's financial might. We assessed a large number of potential software developers or development companies. There were a number who appeared to have most of the core skills, but it seemed that all would be outsourcing at least some of the more complex/detailed tasks. This did raise a particular risk of managing tight delivery timescales and more importantly of communication so that we could be sure that those third parties had understood the nuances of the project and were coding exactly what we needed. This has been quite an issue, and difficult to control.

Part 5. Plans for sustainability and spread

Sustainability

The web tool that we have developed is planned to run in its present form for approximately two years. This timescale has been chosen as this is the likely timeframe for the Trust moving to an electronic patient record. Our aim would be to implement this tool within whatever electronic system is implemented across the Trust, rather than to keep a standalone tool, and lose efficiency. This timescale will also allow monitoring of the effect of the tool over an adequate timescale, and to develop future improvements. The agreement with the developers includes 2 years of support in the first instance.

Our intention overall is to continue and promote continuous monitoring of outcomes in some form.

At the same time as this project, several of the Clinicians involved, have also been developing links with ICHOM (the International Consortium on Healthcare Outcomes Measurement), a collaboration between Harvard Business School, Boston Consulting Group, and the Karolinska Institute. ICHOM develops minimum datasets for assessing the outcomes of treatment of specific conditions. Cleft Lip and Palate, one of the 3 conditions in this project, has been adopted by ICHOM and a minimum data set will be published in November 2014. This process feeds into an international comparison of outcomes, which can provide crucial information for improving the risk-adjustment process, and so making our continuous monitoring more robust over time.

Spread

Early in the project, our paper on use of CUSUM in Burns was published. Further discussions have also been held nationally within Burns networks, and many units have already adopted a manual version of CUSUM monitoring. Over time we would like to roll out the automated toolkit.

Several national and international presentations have been given about use of CUSUM for Cleft and Microsurgical Reconstruction. These have prompted approaches from other clinical teams who are interested in using CUSUM monitoring.

We have also been working with Consultants in other clinical areas in our Trust, as they are very interested in applying the same approach to non-surgical specialties. In particular we would like to roll out to Acute Paediatrics and to Stroke Medicine.

A limiting factor at the moment is that many Trusts are in the process of moving towards electronic patient records, but with multiple providers. This means there is likely to be a practical challenge to rolling out a tool that can work alongside different commercial products within the NHS. Using the tool as an add-on, and so increasing Clinician's workload would negate much of the benefit.

A favoured option to effect widespread and adoption is to negotiate a licensing agreement with a suitable commercial partner that meets the needs of the Trust, the commercial entity itself, but most importantly impacts positively on clinical outcomes for the patients we serve. Such a commercial partner will have the capability to both repackage the content and scale the product to serve the requirements of a large end user such as the NHS. Additionally, the commercial partner will have the means to articulate the needs and benefits, and market

these effectively across our own NHS and health economies in other territories (including overseas).

Mid-term we had discussion with the London-based innovative data organisation, Anomaly42. Whilst mostly engaged in the finance world, they have systems capability that offer revolutionary utility in rapid analysis and reporting of structured and unstructured data. We remain very keen to explore ways in which we could work with Anomaly42 or a similar entity, and an agreement between the parties could rapidly lead to a proposal that we could take to the Innovation Team within NHS England. This would be for a multi-site roll out within suitable NHS Trusts, ideally through selected AHSN participation.

Appendix 2: Resources from the project

Please attach any leaflets, posters, presentations, media coverage, blogs etc you feel would be beneficial to share with others

We have set up an information website which has resources including a bibliography, detailed methodology and video tours. http://pabau.com/nhs