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Improvement in Context:
An ethnographic study of quality improvement programmes for
Acute Kidney Injury

March 2018

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(The views expressed are those of the authors and not necessarily those of the NHS, the NIHR, or the Department of Health and Social Care)

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Executive Summary

Introduction

AKI is a clinical syndrome (not a condition) that is 'common, harmful and costly'.[1-4] It refers to a rapid reduction in kidney function and is a marker of illness severity.[2] There are many causes though in the majority of cases, AKI occurs as part of an episode of acute illness, such as flu or gastroenteritis.[2 5] Targeting Acute Kidney Injury (AKI) has become a global priority for improving patient safety and offers the potential to achieve the triple aim of improvements to 'care, health and cost.'

A new international classification system for AKI was introduced in 2012 with the primary goal of driving the delivery of evidence based high quality care. In England, its introduction built on findings from the National Confidential Inquiry into Patient Outcome and Death (NCEPOD) report on AKI.[6] This report highlighted hospital failings in patient safety in terms of poor assessment of acute illness with delays in the recognition of AKI, with evidence that around one in five of episodes of AKI were avoidable.

The NCEPOD Report directly led to the introduction of a range of national initiatives including: NICE guidelines and quality standards to support the prevention, detection and management of AKI; an NHS England Patient Safety Directive mandating the implementation of an AKI alerting system within all NHS Acute Foundation Trusts; and a NHS England Commissioning for QUality and INnovation (CQUIN) incentive framework to improve post-AKI discharge care.[5 7-9]

Research objectives and approach

The aim of this research was to develop an in-depth understanding of the work required within two hospital trusts to improve the identification and management of AKI. Both trusts are large urban teaching hospitals serving mixed demographics. They both provide specialist renal services regionally.

The research focused on exploring the work required in each organisation to introduce an AKI alerting system and embed it with associated care processes.

Key objectives were to:

1. Describe and understand the quality improvement (QI) approaches adopted within each hospital to improve the identification and management of AKI;
2. Understand how adoption decisions are related to organisational context; and
3. Understand how the planned AKI work unfolded in each hospital over time according to the different QI approaches adopted and the different organisational contexts.

The research entailed a comparative ethnographic approach, undertaking extensive participant observation and interviews in each site (Hospital X and Hospital Y) over a 22-month period from November 2015 to September 2017. The approach taken should not be taken as a strict comparison of the different processes undertaken in two different organisations. This research did not evaluate the effectiveness of the quality improvement

approaches adopted within each trust and the methodology used is not appropriate for any conclusions to be drawn about which approach was more 'effective' in affecting clinical outcomes. Rather, through comparative methods it aimed to enhance understanding of the work undertaken and negotiated in translating AKI policy initiatives into everyday practice.

Findings

Both Trusts reported notable successes against key process and outcome targets in the management of AKI. To achieve this, they both sought to capitalise upon the mandatory introduction of an AKI alerting system as a means to formalise existing work within each organisation. Though employed differently, both hospitals drew upon Institute of Health Improvement (IHI) methods for QI.

Hospital X adopted a 'collaborative' approach that sought to make AKI 'everybody's business' and incorporate learning into day-to-day working routines by bringing together representatives of 11 wards, for five learning sessions spread over a 17-month period concluding with the creation of a 'change package' and a final event to spread improvements hospital-wide. The approach was based upon their established systematic and strategic approach to QI that was informed by IHI collaborative methodology but adapted for use in the organisation. In addition, compared with Hospital Y, Hospital X had an established integrated electronic patient record.

Hospital Y adopted a 'change agent' approach, with the AKI improvement programme delivered through the work of nurse specialists. This approach was informed by a decision taken by Hospital Y to use their internally developed AKI alert which in testing had proven to be more sensitive than the national alert. The QI work was based upon key personnel in Hospital Y having participated in a 12-month programme of IHI informed improvement education in order to design a programme of work around AKI. Small scale pilots were conducted in order to demonstrate potential savings and secure the permanent employment of two specialist nurses.

Though the hospitals adopted contrasting approaches to AKI improvement, comparative analysis illuminated common tensions and trade-offs relating to the identification and management of AKI. The differences lay in how each hospital negotiated these challenges in order to implement an AKI alerting system to improve process and health outcomes. Overall, there was a general tension between policy requirements to implement new interventions to improve AKI-related care and the resources allocated to achieve this.

The NHS England AKI e-alert comprises a 'detection' phase, based upon an algorithm installed in laboratory management information systems, and an 'alert' phase, which communicates the findings to relevant clinical teams. The potential for over- and under-diagnosis directed the work of each site in adapting the introduction of the AKI e-alert to the organisational and human resources at their disposal.

Hospital X adopted the national algorithm for the detection phase and dedicated substantial work to integrate the alert phase into the electronic patient record. This required sustained input from IT systems experts, clinical leads and QI team over a period of around 12 months.

The role of the participants in the collaborative was to develop a reliable system for responding appropriately to the alert and embedding it within the care process bundle.

Hospital Y had already put IT systems expertise and time into the development of their locally developed alert, which they trialled alongside the national alert and found it to be more sensitive, eradicating under-identification. The specialist nurses were involved in both the detecting and alert phase: firstly, to conduct daily monitoring of detected cases and correcting any over-identification; secondly, communicating this alert to ward teams, through electronic systems, backed up by person- and paper-based systems, and prompting the initiation of a care process checklist.

Both approaches brought their own distinct benefits and challenges. A key benefit to the collaborative approach was the opportunity it afforded to develop changes that were situated in an in-depth examination of everyday practices, by a sample of relevant practitioners. The collaborative was successful in achieving its primary objective of developing a change package that comprised a set of practical steps for introducing changes at local team level. A key challenge was the sustained commitment of a relatively large number of people to the programme, in the face of ongoing resource pressures. Both the initial programme and the plan for spreading the change package had to be modified in light of resource pressures and their effects upon the continued engagement of participants in the programme.

A key benefit of the change agent approach was the dedicated human resources of time and expertise it mobilised in successfully addressing the introduction of a 'failure proof' detection system, hospital-wide. A key challenge was the concentration of expertise among so few people and the ongoing resource dependency this created. Through the handover of information, the nurse specialists had to negotiate boundaries to do with specialist/generalist, and nurse/doctor orientations, and in doing so, overcome a lack of familiarity between the specialist nurses and the various hospital teams.

Only Hospital X adopted the voluntary national CQUIN for AKI. The CQUIN had the effect of bringing discharge onto the agenda of the organisation. However, though the CQUIN targets were met, tensions were evident between the top-down, procedural approach of the CQUIN and the bottom-up and exploratory approach of the collaborative. Its introduction disrupted and reduced the degree of 'exploration' that was possible through use of QI methods (i.e. process mapping). There were also reports of a 'drop off' in QI engagement once the CQUIN tasks were met.

Across both hospitals there was limited evidence to suggest that patients were aware of or understood the significance of AKI as part of their episode of illness. There were limited attempts to integrate patient perspectives into AKI improvement; patient narratives framed the start of collaborative learning sessions in Hospital X. They functioned as a way of enrolling clinical staff into the programme and situating 'basic' care processes and practices within 'real' experiences.

Conclusions

Our findings have illuminated a number of tensions and trade-offs inherent to the attempt to improve quality in public organisations. Before moving to a discussion of these tensions, we first briefly summarise key findings, guided by our original research objectives:

1. Describe and understand the quality improvement approaches adopted within each hospital

The two approaches adopted by the two organisations in this research were: a 'collaborative' approach (Hospital X) and a 'change agent' approach (Hospital Y). Both approaches mobilised approaches developed by the Institute for Healthcare Improvement, incorporating SMART objective setting, process mapping, and Plan-Do-Study-Act (PDSA) cycles. At the outset of our data collection, Hospital X was at the 'initiation' phase of their improvement and Hospital Y was at the 'spread' phase.

These two approaches exemplified a distinction between 'exploratory' and 'exploitative' innovation.[10] Exploitative innovation entails 'exploiting' existing products or ways of working to enable incremental improvement, while exploratory approaches entail learning anew in order to open up potentially radical innovation. Exploitative approaches have the advantage of building upon what is known or has been successfully demonstrated. Exploratory approaches have the advantage of opening up a specific activity for detailed examination, in so doing aiming to illuminate key 'blockages', which once resolved can have transformative effects beyond the immediate domain of interest. At the same time the exploratory approach requires the organisation to accept a greater risk associated with uncertainty of outcome.[10-12]

2. Understand how adoption decisions are related to organisational context

The successes of both the 'collaborative' and 'change agent' approaches to quality improvement depended largely on their 'institutional fit'. Organisations that seek to replicate the success of these organisations should give careful consideration to the local characteristics of their organisation and its similarity to the two hospitals described in this report.

This contextual fit was also expressed through the manner in which the organisational context and the improvement materials themselves together shaped the approach taken. The materials upon which the improvement programmes in each site were based; that is, the national AKI alert and care process bundles developed locally from national guidelines. Two examples illustrate this point:

1. The AKI alert has the potential to result in both over- and under- identification of AKI. Both hospitals invested resource to address this. Hospital Y used their pre-existing work on an alert system to eradicate all under-diagnosis, while Hospital X accepted the inaccuracies of the national algorithm but exploited their digital capabilities in embedding the alert into decision prompts for ward teams. The Hospital Y 'failsafe' approach was enabled by the dedicated resource of the AKI nurses. In the absence of these resources the Hospital X system relied instead on an IT decision support system that was embedded within ward-based teams.

2. The Hospital X bundle was developed by and for ward-based teams. It was designed iteratively in combination with tests of change. It was printed on a small card and used an acronym in order to attempt to embed both the process to follow and the ward-

based practices and routines through which this process would operate. The Hospital Y checklist was also the product of iterative development over time, however, its content and use were shaped by the need for it to become a 'boundary object', that is a material means of managing the transfer of care from the specialist nurses to ward-based teams. As a result, the checklist contains more specific information about what needs to be done and by which staff, and has checkboxes to enable documentation and audit.

3. Understand how the planned AKI work unfolded in each hospital over time

Both sites encountered barriers to improvement associated with resource constraints and with the lack of understanding and knowledge of AKI among staff. These barriers required adaptation on the part of both organisations, with each programme evolving distinctly in response to context specific challenges. In spite of challenges, both organisations reported considerable success against their core aims within the evaluation timeframe.

In Hospital X, the collaborative programme required the engagement of staff from eleven wards over a prolonged period of time. Resource constraints left wards with less effective capacity to release staff to engage in improvement work, which resulted in a reduction of the time commitment that was requested by the programme leaders, and a re-shaping of the ongoing plans for spreading improvements. Uncertainty about AKI could exacerbate this challenge, sometimes resulting in lower levels of engagement from those clinical areas where there were competing opinions about whether or not AKI should be an improvement priority.

In Hospital Y, the programme of improvement had initially been shaped by resource constraints, with the Board requirement to have potential savings demonstrated prior to investment being committed to fund the resource upon which the programme was built; the AKI nurse specialists. Uncertainty about AKI led to the team encountering initial resistance to their attempts to increase awareness and support staff in managing AKI. This drove the approach to provide one-on-one support through education and the iterative development of the care process checklist in collaboration with ward-teams.

Tensions & Trade-offs

There is an overarching tension illuminated by our research between policy requirements to improve identification and management of AKI and the resources allocated to achieve this. This relates to a persistent assumption among policy makers and opinion leaders that improvement to care can be achieved in a 'resource neutral' manner, by 'improving value'; identifying waste and improving efficiency.[13-15] Our research suggests that even when this might be possible, it takes substantial work, and therefore resource, to identify waste, develop and embed alternatives, and realise efficiencies. This assertion is supported by a recent review of QI collaboratives, which found positive results in terms of the effectiveness of collaboratives in achieving against their core aims, with significant reduction against at least one primary target in 83% of cases, whilst also noting that: 'A collaborative is a complex and time-consuming intervention for clinicians, teams and sites and represents major financial, organisational and political investment'.[16]

The challenge of maximising benefits while minimising additional burden was apparent across three related tensions underpinning AKI improvement work carried out in the two hospitals:

1. *Resourcing the work required to maximise the clinical utility of AKI whilst minimising additional burden:*

   National guidelines and approaches for AKI have a core objective of reducing avoidable harm.[5][9] However, embedding AKI, as an effective driver of patient safety, into routine care without creating additional workload for clinical staff or burden for patients requires sustained work. Any approach to introducing an AKI alerting system must consider the mobilisation of dedicated resources towards identifying and correcting the potential for under- and over- diagnosis.

   Consideration should be given to how this work can be made more visible at the organisational level to guide resource planning and prioritisation of improvement objectives. At the system level, policy and guidance also requires a realistic understanding of this work, such that there is an attempt to make new approaches adaptable to the contexts in which they are to be embedded.

2. *Resourcing exploratory approaches to QI in order to improve care and reduce costs:*

   Research suggests that programmes that attempt to simultaneously improve 'care, health and cost' require systematic and flexible processes for planning, initiation and completion of improvement work.[13][14] It is also acknowledged that the simultaneous achievement of all three aims should not be expected of individual programmes, but rather accrue over time.[14] Exploratory and collaborative work require the deployment of considerable resources prior to the potential demonstration of benefits. Cost savings in particular might have to be deferred well beyond the lifetime of individual programmes.

   This implies that there is a greater degree of uncertainty associated with cost savings, which must be borne as a risk in QI planning. In resource scarce contexts there is a danger that considerations of cost could exert a greater influence upon QI planning and resourcing decisions, which is likely to disincentivise more exploratory approaches.[17]

   We suggest that greater attention is needed to the question of how prioritisation occurs within different organisations and how design decisions are made within particular programmes with respect to each element of the IHI Triple Aim.

3. *Integrating collaborative 'bottom up' approaches to learning and improvement with performance driven 'top down' incentivised targets:*

   Target driven performance incentives such as CQUINs can be effective in mobilising resources and clinical interest around particular areas of care. However, CQUINs can direct attention towards attainment of a target rather than attention to the underlying processes to which the target relates, resulting in a 'tick box' approach.[18] Our findings

demonstrate the benefits of approaches which involve an open examination of practices and processes from the 'bottom up' (through process mapping, for example).

This requires an attempt to give QI work space and time in order to develop adaptable solutions to problems as they are uncovered and to not allow an isolated set of targets to narrow the potential focus of QI work.

4. *Integrating alternative perspectives into QI.*

Approaches to QI benefit from the meaningful involvement of a broad range of stakeholders in identifying population needs, developing objectives, and developing learning and outcomes.[14] In practice this is very difficult to accomplish because it requires additional resources, not only financial, but also time to engage and include multiple perspectives. Hospitals such as the two under examination in this report are also complex and formally structured organisations. They are situated within a fragmented policy environment which can mitigate against collaboration across group and organisational boundaries.[19]

We draw examples of two groups for whom there a strong case for greater involvement in AKI QI work in secondary care; patients and primary care.

The limited involvement of patients in QI activities generally is a recognised problem. Our findings reveal specific challenges related to attempting to engage patients with AKI into improvement work: the lack of recognition of AKI even among those who have had an episode of care complicated by it; the wide distribution of AKI across many different patient groups; and the resulting difficulty generating a collective identity and shared interest around AKI upon which to develop more inclusive approaches to improvement.

The limited extent to which primary care was considered and incorporated into the improvement work of either site means that further work needs to be done in order to improve communication and transition across the interface between acute and continuing care. AKI can appear and reappear within the illness narratives of patients over many years, each time potentially requiring attention to questions of temporary medicine cessation and possible hospitalisation. Our findings illuminate some of the complexities of discharge processes for patients with AKI, however, this was neither one of the core aims of the programmes examined here, nor their evaluation. This is an area requiring further research.

1. Introduction

In the wake of the global financial crisis of 2008, public healthcare budgets worldwide have faced sustained cuts. In the English National Health Service, the projected funding gap requires savings of £22 billion by 2020.[20] At the same time global opinion leaders in quality improvement, such as the Institute of Healthcare Improvement (IHI) couple patient safety with the need for continuous improvement and suggest that all organisations should be able to achieve improvements in 'care, health and cost' (the so-called 'triple aim').[13 21] However, attention is needed to the question of whether this is achievable, particularly for organisations facing sustained reductions in funding alongside increasing levels of complexity and demand.

There is some evidence of policy being mobilised in order to grapple with this problem. In the UK, the Quality, Innovation, Productivity and Prevention (QIPP) programme was launched in 2011 to encourage innovation through service redesign and more recently, NHS England has launched its campaign for 'new models of care' and 'sustainability and transformation plans'.[22 23] Substantial investment has been directed at health informatics and technology as a means to improving care and cost, through the development of more automated and standardised care processes.[24] However, previous research suggests that the implementation of new technology is not simple, and requires work within organisations in order to make sense of and embed changes.[25-27]

This report examines the implementation of new approaches to improve the identification and management of Acute Kidney Injury (AKI) in two NHS hospitals, part of two different NHS Trusts. This new approach comprised a new classification system, a diagnostic e-alert, and a minimum standard care process bundle.[2 9 28] Drawing upon existing frameworks for the introduction of new approaches into health care practice, we explore the possibilities for action afforded by the new approaches to identification and management of AKI and the work required for practices to be adapted to them.[29 30]

Targeting AKI is now a global priority for improving patient safety and health outcomes.[2 31] AKI is a clinical syndrome (not a condition) that is 'common, harmful and costly'.[1-4] It refers to a rapid reduction in kidney function and is a marker of illness severity.[2] There are many causes though in the majority of cases, AKI occurs as part of an episode of acute illness, such as flu or gastroenteritis.[2 5] That is, it is often the combined result of infection, low circulatory blood volume (hypovolaemia), low blood pressure (hypotension) and medication effects resulting in a reduction in kidney perfusion and filtration.[2 5 32] AKI is identified on a scale of severity from Stage One (least severe) to Stage Three (most severe).[2] AKI is estimated to complicate between 5 to 6% of all hospital admissions and around 1 in 5 unplanned hospitalisations.[3 4 33-35] AKI is more common in elderly patients with multimorbidity, living with multiple complex health and social care needs.[2 5 35-38] It is of particular relevance to patients with pre-existing chronic kidney disease and/or those with cognitive decline reliant on carer support for maintaining fluid intake during an acute illness.[2 5 7] Viewed as a 'force multiplier,' hospital AKI-related care is estimated to cost 1% of the NHS budget and AKI is associated with poor health outcomes in terms of high rates of rehospitalisation, further episodes of AKI, development or progression of CKD, and mortality both in the short and long term.[1 2 5 33 35]

A new international classification system for AKI was introduced in 2012 with the primary aim of driving the delivery of evidence based high quality care.[2] In the UK, its introduction built on findings from the National Confidential Inquiry into Patient Outcome and Death (NCEPOD) report on AKI from 2009.[6] It highlighted hospital failings in patient safety in terms of poor assessment of acute illness with delays in the recognition of AKI and evidence that around one in five of episodes of AKI were avoidable.[6] The NCEPOD report resonated with findings from the Francis Inquiry and the Berwick Review, both of which shed light upon, and provided recommendations to address gaps in care quality occurring in Mid Staffordshire NHS Foundation Trust.[6 21 39 40]

In this context, tackling AKI has emerged as a national priority to improve care quality.[5] NICE guidance was published in August 2013 leading to quality standards to support the prevention, detection and management of AKI.[5 7] Within NHS England's Patient Safety Domain, the Think Kidneys Programme was established, entailing multidisciplinary work streams to improve AKI-related care across settings both within hospital and in the community.[41] Through Think Kidneys, NHS England published two national patient safety directives: A mandatory Level 3 NHS England Patient Safety Directive came into effect in March 2015 that requires all NHS Acute Trusts and Foundation Trusts to implement a computerised AKI alert to support earlier recognition and response to AKI; followed in 2016 by a Level 2 Patient Safety Directive requiring all NHS providers to 'develop an action plan' to 'improve local systems and processes for the care of patients with AKI'.[9 32 42 43]

Identified as having the 'biggest potential impact in reducing premature mortality,' sepsis and AKI were specified as the two clinical priorities central to improving patient safety and realising the vision for high quality care set out in the NHS England *Five Year Forward View*.[23 44] Fifteen Patient Safety Collaboratives were established across England in response to the Francis Inquiry and Berwick Review with nine of the Collaboratives forming a cluster to address patient safety through the lens of AKI (AHSN, 2016, KSS AHSN, 2016).[*] In secondary care, national levers for driving improvement have included the introduction of the Commissioning for Quality and Innovation (CQUIN) incentive framework. In 2015-2016, CQUINs for both sepsis and AKI were introduced to 'incentivise quality and efficiency' and included 'goals' for improving discharge summaries for patients who had a hospital admission complicated by AKI.[8 45 46]

It was in this global and national context that the two hospitals that feature in this report sought to improve the quality of AKI-related care. Using in-depth ethnographic methods, this evaluation aimed to understand approaches to quality improvement (QI) to support the delivery of high quality care. The focus of our report is upon the implementation of two programmes of improvement, based upon the introduction of the AKI e-alert and care processes. We examine the work required to embed changes within everyday care processes, drawing on the distinction between 'work as imagined' and 'work as done' to illuminate the tensions and trade-offs that exist between the formal and ascribed purpose of

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[*] http://www.kssahsn.net/what-we-do/better-quality-and-safer-care/acute-kidney-injury/Pages/National-AKI-Cluster.aspx

new approaches, and the reality of introducing and embedding changes within complex organisational environments. [26] [47]

2. Research objective and approach

The aim of this research was to develop an in-depth understanding of the work required within two hospitals to improve the identification and management of AKI. We focus upon the different QI approaches adopted within each trust, to understand how adoption decisions are related to organisational context, and how the planned work unfolded in each trust over time.

Key objectives were to examine the introduction of new approaches for the identification and management of AKI (classification system, e-alert, care bundle) in order to:

1. Describe and understand the quality improvement (QI) approaches adopted within each hospital to improve the identification and management of AKI;
2. Understand how adoption decisions are related to organisational context; and
3. Understand how the planned AKI work unfolded in each hospital over time according to the different QI approaches adopted and the different organisational contexts.

The hospitals under study both mobilised aspects of the QI methodologies set out by the Institute of Health Improvement (See Section 2.1 for detailed description). However, both took different approaches and used them in different ways. Hospital X adopted a Break Through Series collaborative approach (hereafter: 'collaborative'), while in Hospital Y a change agent' approach was taken through the employment of AKI specialist nurses, combined with an IHI informed programme of system redesign.

The data collection adopted an 'ethnographic' approach, which is a longitudinal qualitative method originating in the discipline of anthropology and now widely used in applied research across many different disciplines.[48] We collected data between November 2015 and September 2017 undertaking extensive observation of relevant events and activities and conducting interviews with healthcare professionals, QI experts and managers involved in the implementation process, as well as patients who had received care in either one of the two sites. The longitudinal approach enabled the development of an in-depth perspective of QI developments, behaviours and actions within each organisational setting over time. The research focused on the underlying contextual factors influencing the development and implementation of the two improvement strategies within the different hospital settings at stake. The period of data collection and the activities undertaken by both hospitals are summarised in Figure 1. This shows that the research period coincided with the roll out of the AKI Bundle in Hospital Y and with the collaborative activity in Hospital X.

While there is a greater recognition of the importance of understanding how and why interventions work, the role of the underlying context and its relationship with improvement programmes is still a relatively new area of investigation.[49] The use of ethnographic research proves particularly helpful in developing an understanding of context that goes beyond the somewhat static understanding of organisations and their structures, to instead explore the unfolding manner in which the 'how' questions of improvement are tackled with regards to specific attempts to introduce new approaches.[29] The use of a comparative approach allowed us to bring to light the different work required in two different sites in order to translate externally developed approaches into organisational practices. Accordingly, we structure our analysis drawing upon the distinction between 'Work as Imagined' and 'Work as Done'.[26 50] Work as imagined refers to the ideals and assumptions that are embedded

within new policies and approaches to providing care, and work as done refers to the adaptive work that is required in organisations in order to introduce changes and embed them into routine practice. In complex organisational environments, such as health care, this adaptive work might take considerable time and energy, and require the negotiation of locally specific challenges. Understanding organisations as continually engaged in multiple adaptive processes at any one time signifies the importance of developing suitable and sustainable adaptations to particular problems.

The approach to examine the different processes underway in two different organisations was intended to draw out the differences between the two organisations, the approaches they adopted, and the work undertaken to translate ideals into actions. This approach should not be taken as a strict comparison, rather we sought to describe the series of translations and trade-offs negotiated in making plans work in practice. The research did not evaluate the effectiveness of the quality improvement approaches adopted within each trust. Rather, through comparative methods it aimed to enhance understanding of the work undertaken and negotiated in translating AKI policy initiatives into everyday practice. The methodology used is not appropriate for any conclusions to be drawn about which approach was more 'effective' in affecting clinical outcomes.

Data collection comprised observation of QI activities and qualitative interviews with key personnel in each site. Ethical approval was required in order to interview patients as part of the study, and this was obtained in November 2015. Data collection commenced immediately in both sites thereafter, concluding in September 2017 (see Figure 1). Observations were unstructured and were focussed upon capturing a descriptive record of events and situating these within both the organisational and external context. Interviews were semi-structured and were used to capture first-person accounts of the development and implementation of the programmes in each site. Patient interviews were unstructured and were used to develop an understanding of the place of AKI within an individual's own ongoing narrative of health and illness. A summary of data collection is provided in Table 1

Table 1 Data collection

	Hospital X	Hospital Y
Observations (days)*	28	9
Interviews (total)	24	25
Managers	6	7
Nurses	4	9
Pharmacists	0	1
Patients/Family carers	6	3

2.1 Institute of Healthcare Improvement (IHI) Methods
The IHI was established in the early 1990s and was initiated by a QI group led by Dr Don Berwick. Over time it has developed an approach described as a 'science of improvement', 'that emphasises innovation, rapid-cycle testing in the field, and spread in order to generate

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The differences in observation days reflects the different approach taken to QI and the different phase of the programme at which each trust was during data collection. As Hospital X had a collaborative programme ongoing at the time of data collection, there were more activities to observe, whereas in Hospital Y the programme was based mainly upon the work of two individuals working one-on-one to spread improvements hospital-wide.

learning about what changes, in which contexts, produce improvements'.[◊] IHI's methodology is based on organisation science, which suggests that by adhering to certain principles, organisations can increase quality and simultaneously reduce costs. In recent times this principle was incorporated into what the IHI refer to as the 'Triple Aim'; to improve 'care, health and cost'.[13]

IHI has advocated several specific methodologies, all of which incorporate several core principles:

- A clear aim supported by a measurement framework
- A clear description of content and causal pathway from changes to outcomes
- A clear execution strategy
- Rapid testing and learning through Plan-Do-Study-Act (PDSA) cycles
- Understanding of systems through process mapping
- Use of time-ordered data across different locations
- Application of behavioural and social science[◊]

In this study, Hospital X adopted a 'breakthrough collaborative' approach: a 'short-term (6- to 15-month) learning system that brings together a large number of teams from hospitals or clinics to seek improvement in a focused topic area.'[51] Hospital Y's approach involved a team including a renal consultants, pharmacists and AKI nurse specialists in a 12-month programme of externally delivered IHI informed education (see Figure 1).

[◊] *http://www.ihi.org/about/Pages/ScienceofImprovement.aspx*
[◊] *http://www.ihi.org/about/Pages/ScienceofImprovement.aspx*

Figure 1. Timeline for development, implementation and evaluation of QI AKI interventions
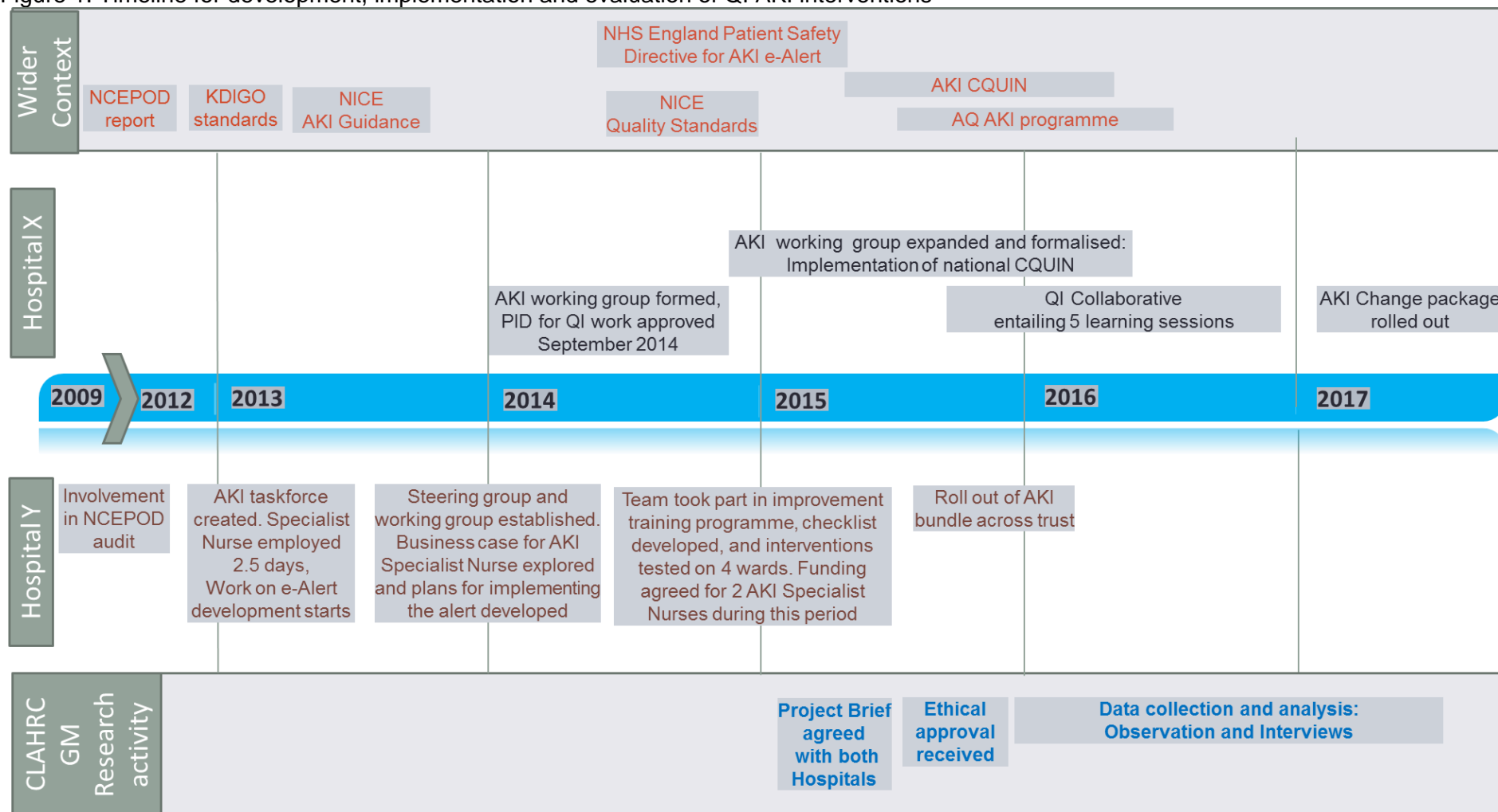
3. Context & Intervention

3.1 National and Regional Context

Between 2013 and 2016, three national AKI initiatives were introduced in England. They comprised: NICE guidelines and quality standards to support the prevention, detection and management of AKI; an NHS England Patient Safety Directive mandating the implementation of an AKI alerting system; and a NHS England CQUIN to improve post-AKI discharge care.[5 7 9 45]

3.1.1 NICE Guidance and Quality Standards

Findings from the NCEPOD Report (2009) directly led to the Department of Health requesting NICE to develop a guideline on AKI.[5 40] The NICE guidelines were published in August 2013 and were primarily intended to support the delivery of care by non-specialist clinicians working in a range of settings. The guidance highlighted a need for early intervention and emphasised 'the importance of risk assessment and prevention, early recognition and treatment'. Key priorities for implementation outlined in the NICE clinical guidelines , informed the publication of NICE Quality Standards in 2014 and the subsequent launch of Clinical Process Measures by Advancing Quality in 2015.[5 7] In December 2015, the NHS England Think Kidneys programme recommended implementation of a care bundle for patients diagnosed as having AKI.[28] Without intending to replace care bundles developed locally, Think Kidneys provided guidance on the minimal requirements for hospitals to meet national recommendations on the management of AKI.[43]

Table 2 NICE Standards, AQ Process Measures, and Think Kidneys Care Bundle

NICE Quality Standard for AKI (QS76) 2014	Advancing Quality AKI Clinical Process Measures 2015[1]	Think Kidneys Core Elements of initial AKI Care Bundle 2015
Statement 1: People who are at risk of acute kidney injury are made aware of the potential causes. **Statement 2**: People who present with an illness with no clear acute component and 1 or more indications or risk factors for acute kidney injury are assessed for this condition **Statement 3**: People in hospital who are at risk of acute kidney injury have their serum creatinine level and urine output monitored. **Statement 4**: People have a urine dipstick test performed as soon as acute kidney injury is suspected or detected.	**AKI-01** Urine Dipstick Test within 24 hours of 1st AKI Alert **AKI-02** Stop Angiotensin Converting Enzyme (ACE) inhibitor and Angiotensin Receptor Blockers (ARBs) within 24 hours of 1st AKI Alert **AKI-03** Serum creatinine test repeated within 24 hours of 1st AKI alert **AKI-04** Ultrasound scan within 24 hours of first alert **AKI-05** Specialist renal/Critical Care Discussion within 12 hours of	**Initial Assessment** ABCDE as assessment (follow NICE CG50) Observations – check NEWS score Look for signs of sepsis Abdominal palpation looking for full bladder **Initial Treatment** Prompt treatment of sepsis (start Sepsis Six care bundle) Fluid challenges if hypovolaemic/hypotensive Medication review Stop potentially harmful drugs Check for dose adjustments in AKI Relieve obstruction (see

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[1] *http://www.aquanw.nhs.uk/resources/advancing-quality/AKI-poster.pdf*

NICE Quality Standard for AKI (QS76) 2014	Advancing Quality AKI Clinical Process Measures 2015[1]	Think Kidneys Core Elements of initial AKI Care Bundle 2015
Statement 5: People with acute kidney injury have the management of their condition discussed with a nephrologist as soon as possible, and within 24 hours of detection, if they are at risk of intrinsic renal disease or have stage 3 acute kidney injury or a renal transplant. **Statement 6:** People with acute kidney injury who meet the criteria for renal replacement therapy are referred immediately to a nephrologist or critical care specialist.	1st AKI 3 alert **AKI-06** Give patients written self-management information prior to discharge **AKI-07** Pharmacy medication review - data collection measure only	guidance)

3.1.2 NHS England AKI Alert

In March 2015, NHS England published a Level 3 Patient Safety Directive (NHS/PSA/D/2014/010) requiring a national AKI detection alert to be installed in the laboratory information management systems (LIMS) of all NHS Acute Trusts and NHS Foundation Trusts.[9] The detection alert is based on the KDIGO (2012) classification system for AKI.[2] The NHS England Think Kidneys Programme published best practice guidance emphasising that the generation of an AKI e-alert is a two-step process:

1. Detection of an acute change in serum creatinine producing an AKI Warning Stage Test Result through implementation the national AKI Algorithm and then;
2. An alerting phase entailing communication of AKI Warning Stage Test Results to clinicians.[32]

The NHS England Think Kidneys Best Practice Guidance acknowledged local resources and capabilities may vary and that 'due to the volume of work' it may not be necessary for laboratory staff to prioritise which AKI Warning Stage Test results are telephoned to clinicians (i.e. 'may only be possible for stage 2 and 3 or stage 3 only'). It was recommended the stage of AKI and timeliness in communication needed to be 'determined by local governance/risk assessment and within the Trust's overall AKI response; any resourcing issues may need to be discussed with commissioners.'[32]

3.1.3 National CQUIN for AKI

Through the Commissioning for Quality and Innovation (CQUIN) framework, financial incentives were introduced in April 2015 to improve discharge care for patients who had a hospital admission complicated by AKI.[45] There are two types of CQUIN, those disseminated nationally and adopted on a voluntary basis by individual providers, and those adopted by Clinical Commissioning Groups and mandatory for member providers within the CCG area. The CQUIN for AKI was national, and provider adoption was therefore voluntary. The CQUIN goal was 'to improve the follow-up and recovery' and in doing so, reduce both the

risks of rehospitalisation and long-term cardiovascular risk through medicines optimisation. Recognising the 'financial challenges facing the NHS in 2015/16', the CQUIN for AKI aimed to 'incentivise quality and efficiency' through 'transformation across care pathways that cut across different providers.'[45]

For patients managed in an acute hospital, payments were made for documentation of four key items on their discharge summary:

1. Stage of AKI (a key aspect of AKI diagnosis);
2. Evidence of medicines review having been undertaken (a key aspect of AKI treatment);
3. Type of blood tests required on discharge; for monitoring (a key aspect of post discharge care);
4. Frequency of blood tests required on discharge for monitoring (a key aspect of post discharge care).

The CQUIN for AKI lasted from April 2015 to March 2016. Payments for achievements were weighted over the four quarters of 2015/16, with a 50% of the whole-year AKI CQUIN value being made available to participating Trusts for ≥ 90% of the required items being included in the discharge summarise in the final quarter (Q4).[45]

3.2 Local Context & QI Approaches
Both hospitals are large urban teaching hospitals serving mixed demographics. They both provide specialist renal services regionally across a patient population of approx. 1.5-1.8 million people each. The hospitals adopted contrasting approaches to AKI improvement: Hospital X adopting a 'collaborative' approach, and Hospital Y adopting a 'change agent' approach through employment of specialist nurses. However, there were similarities as well; both hospitals drew upon Institute of Health Improvement (IHI) methods, though they employed these differently (See Section 2.1). Both programmes also contained very similar material elements; the AKI alert and the stepped processes of AKI care based upon NICE and Think Kidneys guidance.[5 32] Both hospitals sought to capitalise upon the mandatory introduction of the AKI alert as a means to formalise and focus work that had been on-going within each organisation for a number of years. This is an important consideration when evaluating the extent to which these programmes can be reproduced in other contexts. We begin with a summary of the programmes (Table 3) before describing each site in more depth and situating the approach adopted within local organisational contexts (see also Figure 1).

3.2.1 Hospital X: Collaborative approach
Between 2012 and 2013 a group of clinicians interested in AKI formed a multi-disciplinary working group to consider approaches to improving the care of patients with AKI, involving a wide sample of clinical and managerial stakeholders across the trust. Hospital X had a systematic and strategic approach to QI that was well established prior to the initiation of the AKI programme. Each year the strategy involved identifying specific clinical priorities. Following the inclusion of AKI in the hospital's improvement priorities, the group became more formalised. A case for establishing a QI collaborative for AKI was approved in 2014 and, following this, two members of the hospital's QI team – as well as key managerial and technical personnel – were incorporated into the working group. Between November 2014

and May 2016, the group met fortnightly and monthly thereafter up until mid-2016 when meetings became less frequently, happening roughly bi-monthly.

Hospital X's distinctive 'improvement culture' – a set of norms, values, and 'ways of doing things' – was recognised widely both within and outside the organisation. This was of critical importance to the collaborative approach, which required engagement and ongoing time commitments from a relatively wide range of stakeholders. The hospital had conducted many successful collaboratives in the past and often had several operational at any one time, and this was integral to the manner in which the organisation as a whole operated. The collaborative was based on IHI collaborative methods but it had been adapted for use in the organisation and members of the working group believed its use made the organisation distinct from other hospital trusts. The collaborative approach was based upon incorporating learning into day-to-day working routines and there was an expectation that this would lead to sustainable changes to working practices once the programme finished.

The QI programme managers invited staff from 11 participating wards to take part in a collaborative in five 'learning sessions', which were held between August 2015 and December 2016. The collaborative days brought together key members of the working group, ward nurses, ward managers, as well as pharmacists and on occasion junior doctors, to hear presentations about AKI improvement and share the strategies they were employing within their clinical areas. The collaborative was aimed at developing a 'change package'. When complete, the change package would be a singular document detailing the steps to be taken to bring about improved management of AKI in each ward and clinical area across the hospital.

The collaborative learning sessions were initially delivered over a full day (10am-4pm). There were six learning sessions in total, concluding with the launch of the change package and the handover of this from phase one to phase two (spread phase) of the collaborative.

The sessions typically began with a patient story presented by one of steering group's clinical leads. The rest of the session was then usually led by one of the QI leads, who were non-clinical, and were highly trained and experienced in QI methods–. Each learning session consisted of three types of activities:

- 'Programme' elements, concerning the discussion and monitoring of aims, objectives and targets;
- 'Education' elements, consisting of presentations of information (on for example AKI, IHI methodology, pharmacy, IT systems) by the QI leads, the clinical leads, or other members of the working group;
- 'Participation' elements, where participants were encouraged to discuss problems, ward systems, and tests of change with the room at large as well as in small group work.

In the first session the QI team presented an overview of the IHI methodology, and then a detailed overview of how this was being translated into a plan for the programme, including aims and a flow diagram to envisage how these might be achieved across different work-streams. The majority of the afternoon was group work involving open discussions based upon the central objective of ensuring appropriate actions (i.e. implementation of the care bundle) following an AKI e-alert.

The care bundle drew directly upon the NICE and AQ stepped care processes (See Section 3.2). It included a summary guide for some of the steps as well as signposts to more detailed guidance from NICE and Think Kidneys in order to proceed through initial and ongoing assessment and possible escalation. AKI is not limited to one area of a hospital or one clinical specialism. It happens to patients being treated for a broad range of other primary diagnoses. The wards and clinical areas selected in Phase 1 were based on those with the most AKI cases covering a spectrum of hospital services and specialities and were assumed to have distinct local routines, procedures, and needs. This meant that whilst the clinical response to AKI was to be the same throughout the hospital, its implementation had to be adapted to the specificities of different ward systems and routines, types of patients, and clinical practices. A critical part of the collaboratives' methodology was the notion of 'tests of change'. These were small, practical techniques that the wards involved in the collaborative would develop iteratively through Plan-Do-Study-Act (PDSA) cycles, which occurred in between the learning sessions. Whether successful or not, tests of change were shared at the collaborative events through which they would be reviewed and modified, or abandoned. It was through the tests of change that the care bundle was to be embedded in day-to-day ward practices.

A key test of change was the incorporation of AKI into the 'safety huddle' onto one ward – a twice daily meeting at shift changeover wherein safety concerns were discussed. During the first round of the PDSA cycle (i.e. PDSA1), nurses used the huddle to highlight patients with AKI and indicate their stage. Throughout, PDSA1 safety huddle testing underwent a number of tests of change. At PDSA2 they added the care process bundle for AKI, highlighting aspects that remained to be completed. This test was eventually incorporated into the change package, as one stage out of six (See Figure 2 below). The safety huddle therefore became one of the central components in tying together the alert response to the appropriate care process.

Figure 2: Hospital X Change Package
1. AKI score highlighted by coordinator
2. AKI patients discussed via safety huddle
3. Nurse communicates with medical team
4. Care process bundle
5. Pharmacy Review
6. AKI education

Figure 3: Hospital X Care Process Bundle
1. Urine dipstick test within 24 hours of 1st AKI alert
2. Stop ACE inhibitors and ARBs within 24 hours of 1st AKI alert
3. Serum creatinine test repeated within 24 hours of 1st AKI alert
4. Ultrasound scan of urinary tract within 24 hours of 1st AKI alert
5. Specialist renal or critical care discussion within 12 hours of 1st AKI alert
6. Written self-management information prior to discharge
7. Pharmacist medication review within 24 hours of 1st AKI alert

3.2.2 Hospital Y: Change Agent Approach
In 2011, Hospital Y launched an internal audit of AKI services against the NCEPOD report findings, showing significant deficiencies in AKI detection and care, which led to the formation of the Acute Kidney Team in 2013 (see Figure 1). The team was multidisciplinary,

consisting of three nephrologists, an intensivist, an acute physician, a part-time renal nurse specialist, a renal pharmacist and an IT business intelligence developer, who worked collaboratively on designing an improvement framework and IT system to manage AKI. The team reported directly to the newly created AKI Steering Group which provided quarterly reports to the Trust Board through the medical director. The Steering group and Working group established a business case for an AKI nurse specialist with plans to implement the locally developed AKI e-alert system.

Between 2014 and 2015, Hospital Y undertook a 12-month programme of IHI informed improvement education, which key personnel in Hospital Y used in order to design a programme of work around AKI. The intervention developed was tested using a factorial design on 4 wards. Funding was agreed for two AKI nurse specialists during this period. As such, at the time the national alert was made mandatory across the NHS, Hospital Y was already undertaking a project to devise an alert. Instead of relying on the standard national alert, Hospital Y decided to use their internally developed alert, which in testing proved to be more sensitive than the national alert, mandated by NHS England. In 2015, following this programme, the initial interventions were introduced through hospital-wide interventions of education and awareness events and a pilot study conducted across four wards. The idea was to test various combinations of improvement activities, through PDSA cycles in order to produce a set of interventions that could be spread hospital-wide. The appointment of two AKI nurse specialists in March 2015 supported the move towards the spread of the intervention hospital-wide.

Figure 4: Hospital Y Care Process Checklist
1. Ascertain baseline creatinine
2. Identify cause for AKI
3. Perform fluid assessment
4. Investigate for cause and consequences
5. Consider catheterisation
6. Renal and bladder ultrasound scan
7. Consider referral to renal
8. Fluid balance charts
9. Perform urine dipstick
10. Perform drug review

Figure 5: Hospital Y Change Package
1. AKI Alert analysed and picked by AKI Nurse
2. Review of AKI patients by the nurse
3. Nurse communicates with medical team/nursing/pharmacy team
4. Care process checklist implemented
5. Pharmacy Review
6. AKI education
7. AKI patients followed till they recover

Table 3: Local QI programmes

	Hospital X: Collaborative	**Hospital Y: Change Agent**
Aim	To improve the identification and management of AKI in secondary care through an adapted IHI Breakthrough Series Collaborative	To improve detection of AKI in secondary care through the development, refinement and implementation an e-alert system, but

	Hospital X: Collaborative	Hospital Y: Change Agent
		also employment of AKI nurse specialists (change agents) to facilitate improvement in awareness and management with the help of a checklist.
Objectives:	• Integrate safety alert into electronic patient record • Develop and implement online learning package for AKI for clinical staff • Establish collaborative in order to develop and implement 'care bundle' for AKI	• Development of hospital-based locally developed e-alert system • Simultaneous implementation of national alert (as comparator for locally developed AKI e-alert) • Implement learning from 12-month improvement programme • Hospital-wide spread of improvement from successful pilot studies on four wards
Methods	• Process mapping to visualise current system and identify threats to achievement of reliable care process • Collaborative learning days involving representatives of wards with highest incidence of AKI (5 sessions over 17 months) • Collaborative tests of change in PDSA cycles, in between learning days • Development of 'change package' to design and embed care process bundle • Change package to subsequently support hospital-wide spread	• A team including clinical leads and AKI nurse specialists completed 12-month IHI informed QI training to design new system • Process mapping to visualise current system and identify potential barriers to introduction of new systems • New system piloted, with PDSA cycles, checklist developed, and interventions tested using factorial design on 4 wards. • Spread supported by development of ward-based care process checklist, supported by AKI nurse specialist • Spread further supported by education and training sessions delivered by nurse specialists

Resources (human & physical)	• QI and NIHR CLAHRC GM teams both with expertise in IHI methodology and prior experience managing BTS collaborative approach; • QI collaborative team comprising QI lead, project manager and clinical lead • AKI working group involving leaders from all relevant areas of the trust (regular meetings) collaborative participants to represent 11 wards for six learning sessions • One learning session requiring one full day release from ward duties, and five learning sessions requiring one half day release from ward duties; • Electronic patient record and IT system expert to integrate with AKI alert • Digital learning platform and e-learning systems specialist • QI collaborative approach embedded in organisation-wide reporting systems	• Formation of an Acute Kidney Team, initial work on alert development, 0.5 FTE nurse specialist employed on AKI project • Steering group and working group established and business case for AKI specialist explored and plans for implementing the alert developed • Acute Kidney Team took part in IHI informed QI training programme checklist developed, and interventions tested using factorial design on 4 wards. • Two full time AKI nurse specialists required throughout design and spread phases • Ongoing support from AK team (clinical specialists, managers, lead nurses, IT) • IHI-informed QI training delivered by external consultant • In-house e-alert developed over ~12 months by IT/clinical team • Oversight of programme by steering committee reporting to board
Modifications made to programme:	• Participation in learning sessions challenged by resource constraints, leading to these being cut from whole to half-day each • Numbers of participants within each group reduced over time due to same constraints, led to disengagement of some areas and greater input required from QI team and working group in development prior to spread of change package	• Locally developed e-alert designed to 'over identify' AKI, with daily monitoring by specialist nurses to 'correct'. • Specialist intervention encountered initial resistance from wards. Education and training delivered 1-1 in wards due to low attendance at learning sessions • Checklist developed over time for completion by ward staff with all cases of AKI • Daily ward rounds of specialist nurses required to embed changes

4. Findings

In this section we begin by providing a summary of the outcomes reported by each programme, before moving to a description of the unfolding experience of implementation in each site. To reiterate, the research was not focused on evaluating the effectiveness of the quality improvement approaches undertaken within each hospital. Rather, through use of ethnographic methods, the evaluation aimed to enhance understanding of the work undertaken in translating AKI policy initiatives into routine practice.

We provide a more detailed examination of the two key material dimensions of the QI programmes: the AKI e-alert and the care bundle, with a comparison of the approaches taken in each trust. We then consider the role of the CQUIN, discharge processes and the relationship with primary care, before concluding with a discussion of the role of patients in shaping these improvement efforts. In each case we draw out the key challenges and opportunities created by the introduction of these policy materials and mechanisms and explore the trade-offs that occurred with implementation and rationalisation at the organisational level. We highlight the role of organisational context as instrumental in both the success and challenges that the two programmes faced.

4.1 Outcomes

Table 4, below provides full details of process and outcome measures reported by each trust, the targets set for each and the results attained. Where no data has yet been made available this has been indicated with 'no data'.*

Table 4: Local process and outcome data

| Hospital X | | | | | |
Measure	Type	Definition	Target	Baseline (August 2015)	Outcome (August 2017)
Care Process Bundle	Process	See Figure 2, Section 3.2.1	95% compliance	No data provided	Data not yet available
Medicine Cessation	Process	Stop ACE inhibitors and ARBs within 24 hours of 1st AKI alert	95% compliance	No data provided	52.4% hospital-wide
Serum-creatinine	Process	Serum-creatinine test repeated within 24 hours of first AKI alert	95% compliance	No data provided	71.3% hospital- wide
Medication review	Process	Pharmacist medication review within 24 hours of 1st AKI alert	95% compliance	No data provided	45.2% hospital-wide

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* The evaluation team was not responsible for the collection of the quantitative data cited here. This data is drawn from the internal evaluations conducted by each hospital, which have been published and are in the public domain, but which have not been cited here to protect anonymity. In the case of Hospital X, process data limited to collaborative wards only was not yet available, so hospital-wide figures have been used.

Hospital X					
AKI Incidence	Outcome	Proportion of AKI cases in all admissions	10% reduction	212	277 (no statistically significant change)
Incidence of Hospital Acquired AKI	Outcome	New cases of AKI developed in hospital	25% reduction	115 per month	96 per month (16% reduction, 22% reduction on collaborative wards)
Progression of AKI	Outcome	Proportion of patients who progress from AKI Stage One to either Stage Two or Three	50% reduction	49% progression to Stage Two (27%) and Stage Three (21%)	No change (48% reduction on collaborative wards)

Hospital Y					
Measure	**Type**	**Definition**	**Target**	**Baseline (March 2015)**	**Outcome (August 2017)**
AKI Detection	Process	Proportion of AKI cases appropriately diagnosed within 24 hours	95% attainment	47%	100%
Fluid Assessment	Process	Proportion of AKI patients with documented fluid assessment and charts	95% attainment	40%	93%
Drug Review	Process	Proportion of AKI patients with a documented appropriate drug review	95% attainment	48%	95%
Adherence to AKI priority care	Process	Proportion of AKI patients in whom nine elements of the checklist were adhered to (see Figure 3)	80% attainment	67%	84%•
AKI incidence	Outcome	Proportion of AKI cases in all admissions	10% reduction	9%	6.5% (28% reduction)
Incidence of Hospital Acquired AKI	Outcome	New cases of AKI developed in hospital	10% reduction	40%	28% (30% reduction)
AKI Length of Stay	Outcome	Average number of days AKI patients spend in hospital	10% reduction	22.1 days	17 days (23% reduction)
AKI Days	Outcome	Average number of	20%	15.5 days	9.3 days

• *When all aspects of the checklist were bundled then the overall compliance was 20%, due to poor performance with urine dipstick. Table shows results with urine dipstick excluded.*

Hospital Y					
		days a patient remains in AKI after diagnosis	reduction		(40% reduction)
AKI Deaths	Outcome	Count of deaths with a diagnosis of AKI	10% reduction	38	35 (8% reduction)
Dialysis/ Haemofiltration for AKI	Outcome	Count of AKI patients requiring dialysis/ haemofiltration	10% reduction	13.5	15 (no statistically significant reduction)

The Hospital X improvements were driven by the introduction of the AKI alert, the launch of the collaborative programme, the development of the process to achieve compliance with the bundle, and an online educational programme. The Hospital Y improvements were driven by the introduction of the AKI alert, the employment of two full time AKI nurse specialists, the development of the checklist, and, the hospital wide education and awareness programme delivered by the nurse specialists. In both sites, these components were developed iteratively and over a considerable period of time. Our detailed findings below describe the process through which this development took place, focussing upon the obstacles encountered and strategies developed to overcome these.

4.2 Implementation overview

4.2.1 Hospital X: Collaborative Approach

Due to the multifaceted nature of the programme and the need to embed learning into existing working routines across the organisation, the objective to make AKI 'everybody's business' was a complex undertaking. The first of the six collaborative learning sessions were split between a morning and afternoon session and took-up the whole working day. It began with a patient narrative delivered by one of the QI leads – a story about an individual with a combination of chronic and acute conditions that brought them into an extended, episodic and at times critical contact with acute care. The story was explicitly intended to evoke an emotional reaction and to instil a sense in the audience of the importance of improving the management of AKI and the effect it would have on patient care. There were no financial incentives attached to participating in the programme for the ward staff. The steering group was aware that the success of the collaborative relied on the attitudes of staff and that nurses truly cared about their patients and the quality of care in the hospital. The staff were therefore encouraged to participate in the programme via the notion that AKI was indeed a serious problem for patients and patient stories were presented at the beginning of each collaborative day as a way of drawing a relationship between practical changes the audience was being asked to make and the emotional realities of care. These patient narratives continued to feature at the start of learning sessions throughout the majority of the 17-month programme. They are common to most collaboratives that are run within the organisation, and they also feature in board meetings.

The following collaborative days were based on a similar format. The main task for the collaborative was to work out ways to implement the various elements of the care bundle in different clinical areas. This meant that whilst the programme was developed in advance, the strategies for realising the programmes aims (the tests of change) were developed in collaboration between the ward staff and the steering group managers. The tests of change

made the collaborative innovative and allowed its methodology to be adaptable to local idiosyncrasies. This form of adaptability was intended to give the staff a sense of ownership over the intervention and to ensure any improvements were embedded in ward routines. Latter collaborative events also included sessions where successful tests of change would be shared, or where encouraging data that showed some drop in the progression or prevalence of AKI would be celebrated, and any successes attributed to the audience.

As the programme progressed however, the trust began to experience a period of increased organisational pressure, caused by financial pressures which led to reduced workforce capacity and challenged the ability to release staff to attend learning sessions. Whilst this was only mentioned in passing during the formal collaborative events, in private, members of the working group expressed concern that competing priorities (such as patient flow) and problems associated with trust-wide workforce capacity might have a negative impact on the collaborative work. At the end of the second learning session there was concern among the QI team that morale was low and so it was agreed that key members of the working group would start doing 'walk-arounds' in between learning sessions to try and encourage and maintain engagement.

Individuals within the programme highlighted the challenges created by external resource constraints, which the QI leads felt went beyond those experienced in similar past programmes. Members of the working group expressed concerns about the challenges facing the intervention and raised issues such as poor attendance at collaborative meetings, modest engagement from some staff, and staff being moved from the wards involved in the collaborative. There were additional challenges with competing priorities, such as Hospital X joining a regional group, which involved moving QI managers over to other trusts temporarily to support the development of their improvement agendas. In response to these pressures, and the effect they were having on the amount of time the clinicians were able to dedicate to the collaborative, the QI team decided to shorten the collaborative events to half a day. This meant that in the latter collaborative events, the content of the meetings had to be carefully selected and much of what was included in the previous events – team building exercises, extended periods for sharing ideas and group discussion – was dropped from the agenda. This was in part a response to resource pressures and the reduced time available to learning sessions, which one of the QI leads noted reduced the time available for 'reflection'.

Individual attitudes of the staff involved in the collaborative were perceived by the QI team as a key component in the success of the intervention. As the programme did not include any financial incentives, its success relied on the notion that better AKI management was a matter of professional pride and about getting the basics of care (hydration, bloods, fluid balance) right. This drove the following assumptions: 1. the programme would be more or less 'cost neutral', and 2. the standardisation of practice would not cause additional work burden. Whilst this might have been the case with previous collaborative programmes, in a context of acute resource pressures, this rationale was challenged. Some nurses pointed out that there was increasingly little time from anything other than the basics of care within their day-to-day working routines. Nurses spoke about how standardising certain clinical practices did consume more time than would otherwise be the case and how taking time out from ward work to attend a collaborative could be a distraction from the delivery of basic care. Indeed, one nurse went as far as to claim that she had no time for the collaborative because she had to "prioritise patient care". The challenge this posed to the rationale of the collaborative and how collaborative work was prioritised in relation to other clinical duties

was evidenced by falling attendance and decreased engagement as the programme progressed. These problems did not reflect a lack of individual will or effort, nor did it represent a failure on behalf of the QI team or working group. Instead, they were related to pressures that existed beyond the parameters of the programme.

In light of the difficulties securing the attendance and engagement of staff throughout phase one, it was decided following the launch of phase 2 that this would not be organised around further learning sessions, but rather the change package would be presented to individual wards and teams in order to initiate the spread phase, which was planned to commence once the initial 17-month programme was complete.

4.2.2 Hospital Y: Change Agent Approach

The direct involvement of a senior consultant in the NCEPOD study was an important driver for Hospital Y to take action in relation to AKI. The iterative manner in which the intervention evolved through small pilots - as described above – effectively limited the number of stakeholders involved in delivering the intervention, and those deciding whether or not to further resource it. Positive pilot results, and evidence of reductions in mortality and bed days, was positively received at board level, and led to the intervention being supported through an increase in resources, including dedicated human resources. The multi-disciplinary nature of the acute kidney team allowed the combination of various backgrounds and expertise to develop a hospital-specific AKI alert, and plan and roll-out the programme with largely internal resources. At the outset of the project, a team of five including the leading consultant and AKI specialist nurse attended external improvement methodology training, which ran alongside the AKI project and included mentoring and supported for the project. Senior management required some demonstration of impact prior to committing ongoing resources to the project, and this drove them towards a more formally structured approach centred upon creating and defining the roles of the AKI Specialist Nurses.

The interest was initially driven by two renal consultants who were actively engaged in research activities on the topic and established the need to address the issue within the hospital. The main consultant established the need for leadership for executing the project beyond merely research and presented the idea to a newly appointed consultant to lead on the project, who engaged a multi-disciplinary team. The AKI team played an important role in facilitating and organising and implementing the programme. The Board initially required evidence that the resources requested were worth the investment, hence the need for the pilot and business case. The business case emphasised the degree to which existing resources were being exploited and drawing on the part-time and temporary work of one of the AKI nurse specialists., The AKI lead consultant went through a Trust leadership and management programme for newly appointed consultants, using the AKI project to develop and implement leadership skills through action-learning sets with peers and a facilitator. This went alongside the QI training undertaken by the whole team. The positive results of the pilot became a major turning point in receiving adequate funding for two AKI specialist nurses. The AKI specialist nurses, the key change agents, became not only symbolic to AKI improvement practices but also a motivator and benchmark for ward staff to evaluate their performance and AKI care practices. Over time the AKI specialist nurses became known across the hospital as "the Face of AKI" and as the main point of access for the AKI improvement work. However, this was not achieved without overcoming initial resistance from ward staff. Being described as "the face of AKI" was taken by the nurses, in part, to

imply a separation enacted by ward staff, between their 'daily work' and the 'additional work' that the specialist nurses were imposing upon them. This resonates with the experiences of the collaborative, described above, and the sometimes conflicted relationship between 'improvement' and 'basic care'.

4.3 AKI Alert

As noted above (Section 3.1), the AKI alert systems relied on the testing of bloods samples. If a potential case of AKI was detected in a pathology lab, an alert would be triggered, notifying a responsible clinician that a patient was at risk of developing an AKI. These two steps – the detection and the alert - provide a structure for examining the different approaches taken between the two sites, with Hospital Y intervening earlier in the process, in the 'detection' phase, and both sites adopting different approaches to the 'alert' phase.

4.3.1 AKI Alert: Hospital X

Hospital X adopted the national algorithm for detecting potential cases of AKI from measures of serum creatinine, collected through routine bloods. In implementing the alert phase, there was considerable work undertaken within the working group in order to set up an effective electronic system which could be integrated into the electronic patient record (EPR). The steering group believed that the e-alert needed to trigger a tangible set of actions and interventions to halt the progression of AKI and provide clear advice to non-renal specialists about the referral pathway. The e-alert was integrated into the electronic patient record, appearing as a warning banner if the patient was believed to be having an AKI. In addition to the banner, a phone call from biochemistry to the ward where the blood sample had been taken was introduced for every new AKI Stage 3 (complying with Think Kidneys guidance).[32]

Developing and then embedding the alert was initiated primarily via the working group and through meetings between working group members and hospital systems and IT experts. This required complex and coordinated care processes to be understood in its different stages. The process of integrating the alert into the EPR involved a systems expert developing and testing different approaches. Hospital X is known as a digital leader for its EPR, nevertheless, integrating the alert was a protracted and at times contested process. For example, an AKI checklist – a consecutive list of tasks to be completed for every suspected case of AKI – was developed and built into the EPR. The checklist would appear on the record of every patient suspected of having an AKI. The EPR made it possible for the checklist to be mandatory (in the sense that nurses would not be able to close a patient's records until it was complete). However, the group decided not to make it mandatory for fear of adding to the bureaucratic burden faced by nurses in the day-to-day work. This created the problem of how to compel nurses to use the checklist. The EPR systems manager worked between the working group and nurses on the wards to develop a way of making the checklist as accessible as possible.

Tensions such as this – between usability, effectiveness, and the work burden produced by adding new elements of the EPR – characterised not only the role of the EPR but also other aspects of the collaborative programme. In discussion about the EPR, the concept of 'alert fatigue' was often raised.[52 53] Alert fatigue described risk of nurses and other clinicians becoming so used to alerts appearing on patient records for so many different reasons that they no longer afforded them sufficient attention.

Embedding the alert required an in-depth examination of ward practices. Once care processes had been mapped-out, and potential problems highlighted, it was possible to envisage how the alert might take place in real time and to develop practical techniques aimed at ensuring the process was reliable; this drove the focus of the collaborative. Through a series of tests of change, a process was laid out involving the identification of an AKI coordinator in each ward, inclusion of AKI reviews in handovers, and documented process for communication between nurses and medical teams. This process was reached incrementally over several months and tested in different wards and was eventually integrated with the care bundle, as described further below.

Just as the alert triggers an automated alert, so this process was designed to trigger a set of actions, communications, and documentation. However, the fallibility of the alert itself, in under- and over- identifying patients, allows a greater degree of human error in the process. This is something that the Hospital Y approach sought to address, as we describe next.

4.3.2 AKI Alert: Hospital Y

Prior to the introduction of the mandated alert, Hospital Y had a system for identifying potential cases of AKI in development for some time. When the mandatory alert was introduced, Hospital Y adopted this and ran it alongside their existing system. This allowed them to use the national system as a benchmark for the accuracy of their own. When they found both over- and under-identification in the national system, they chose to make their own system more sensitive, leaving them with more over-identification than the national system, but eradicating under-identification. This work took place over a 1-2 year period and involved regular consultation between members of the AKI steering group, and IT systems experts, much of which occurred prior to this evaluation taking place. Using their own system, Hospital Y estimated a prevalence of approximately 5% over-identification. Against this, they observed approximately 10% under-identification of true AKIs using the national system, while still also producing false positives.

In contrast to Hospital X, Hospital Y did not have a fully functioning EPR, so it was unable to embed the alert phase in the same way. This resulted in them adopting a different approach to the second part of the system; the communication of the alert to clinical staff. This is because from the point at which the alert had detected possible AKIs, the system employed in Hospital Y was much more heavily reliant on people- and paper-based systems. The system that emerged over several weeks and months of trialling was that the two specialist nurses would monitor the output of the alert every day, and firstly check for any over-identification. This gave them a dedicated resource with which to undertake the necessary 'repair' work on the alert. The nurse would then attach stickers to the notes of each AKI patient, with stickers colour coded to alert nurses, doctors and pharmacists to relevant sections (much like the EPR alert looked different to different members of staff at Hospital X). The nurse specialists then undertook daily ward rounds in order to communicate directly with nursing and medical teams. In effect, the nurses were doing the work that was assigned to the EPR and AKI coordinators in Hospital X. Although frontline staff in Hospital Y still received alerts directly on electronic reporting systems, the specialist nurses regularly attended to each ward in person in order to provide guidance and prompt appropriate actions. When the nurses 'handed over' to each ward, there was then a limited extent to which they could then continue to monitor and intervene (being only two of them to cover the entire hospital). The nurses encountered several difficulties at this point in terms of: 1. low

awareness of and engagement with AKI, which could become resistance to their intervention; and 2. a need to establish and monitor a reliable process for ensuring that once they removed themselves from the wards, the teams would carry out the correct process. This shaped the design and implementation of their care process checklist, which is described below.

4.4 Care Processes and Bundles
There are several recommended care bundles for AKI, drawing on a combination of NICE; KDIGO and Think Kidneys guidance (see Section 3.1).

Although NICE and Think Kidneys provide detailed guidance, breaking the steps required down into particular actions, as general guidance, the steps themselves are not always associated with particular groups or professionals, and they do not constitute a 'work plan' that is specific and action oriented. There are examples of more detailed action guides, for example, the AQ bundle (Section 3.1.2) sets out a structured work plan through a series of decision support prompts. While it is more specific and action-oriented, there is still translational work required in order to embed these stages within local systems and routines.

4.4.1 Care Bundle: Hospital X
The function of the collaborative was to work out ways to make sure the alert system was working effectively in all involved clinical areas and to develop methods through which the different elements of the care bundle could become embedded into clinical areas and routines. The active period of the collaborative resulted in a change package which tied the alert and bundle together. Together, the change package and the role of the collaborative represented the organisational translation of the bundle into local routines and systems. A key example of this was the identification and development of the role of the 'safety huddle' in identifying and communicating actions, which became a discrete step in the change package (See Figure 2 Section 3.2.1). In other cases, the tests resulted in ideas being rejected. For example, the bundle required the fluid intake and output (or "fluid balance") of each patient thought to be at risk of AKI to be monitored. This is an important and on the surface, a relatively simple task. One ward involved in the collaborative tested the idea of having patients record their own fluid balance but found that in practice, this was not feasible as the patients were often too ill and found the task too onerous.

In addition to the active role the collaborative played in creating and testing the series of actions that became the change package, it also played a symbolic part in attempting to communicate these changes to those who did not participate in the programme. This entailed situating the change package within short case studies, describing the genesis and rationale for the change in the words of participants, so as to perform some of the translational work which change requires. These descriptions also reproduce key assumptions associated with the programme, such as resource neutrality, through slogans such as 'work smarter, not harder'.

This process of allocating tasks related to the bundle caused certain tensions to emerge. Some of the nurses involved in the collaborative felt too much of the care bundle was being allocated to the nursing staff. The tensions in the programme reflected the distinction between 'work as imagined' and 'work as done'.[26 50] As already noted, the care bundle was not supposed to create new work for clinical staff. Instead, it was imagined that the care

bundle merely standardised the work nurses were "*supposed to be doing anyway*". In the rationale of the programme, it would not add a new process, but merely simplify an existing process. What the programme did not contend with however, was the existence of multiple, simultaneous quality improvement programmes, and other increasingly competing demands on ward staff. At the same time as the AKI collaborative was underway, a programme of activity aimed at improving the management of sepsis was also introduced. Moreover, during this period, the hospital was facing pressures due to falling budgets and increasing demand. If standardising one strand of work was not too onerous, standardising multiple strands had a kind of cumulative effect. Different programmes competed for time and attention from clinical staff. These pressures meant the QI managers began to face challenges such as attendance at collaborative days.

4.4.2 Care Process Checklist: Hospital Y

The Hospital Y approach was to implement a checklist to be used by clinical teams on each ward. Hospital Y had deliberately gone against a 'bundled' approach to measuring and monitoring of QI progress and compliance. This meant that each step in the care process was measured independently rather than aggregated into one 'all or nothing' package. In practice, the checklist was very similar in content and delivery to the care bundle implemented in Hospital X. The differences between the organisational process for implementing and embedding the bundle differ, in part due to the differences described in relation to the alert phase of the e-alert, and in part due to the different general approach adopted to each programme.

One of the consequences of the initial decision not to adopt a 'bundle' approach, was that the checklist did not exist prior to the initiation of the QI programme. Its content and use developed through the programme as one of the responses to the challenges encountered by the specialist nurses in engaging ward staff and raising their awareness and knowledge of AKI. This relates to the discussion above, about the different points at which AKI care was 'handed over' and the different personnel involved in this hand over. The hand over that occurred in Hospital Y was from one discrete team (specialist) to another (ward-based). Both teams had different skills, and they might have been quite unfamiliar with each other prior to the programme being initiated. This meant that the nurse specialists and their education and instructions for the appropriate treatment of AKI were sometimes perceived as an imposition. This contrasts with the approach of Hospital X to involve clinical teams and locate the steps for improvement within their everyday work.

The handover of information therefore had to negotiate boundaries to do with specialist/generalist orientations, nurse/doctor, different teams and a lack of familiarity between the specialist nurses and the teams they were handing over to. The checklist therefore became a 'boundary object'; [54] a material means of supporting the more 'bounded' hand-over from nurse specialists to wards.

Another major component of the QI work, the education component, was also shaped by these boundaries. The education began as a session to which clinical teams were invited, but when it proved too difficult to engage teams away from wards, this became a mobile presentation, which the specialist nurses took around to wards and often delivered one-to-one. The checklist emerged out of this same iterative process of engagement/resistance and modification.

Through the development of the checklist and delivery of education, the AKI nurses built relationships and enlisted greater engagement and participation from local teams. Over time this appeared to overcome any initial feelings of imposition.

The different use of technology in each site is also evident in the checklist, which is a paper and pen document, with different sections to be filled out by doctors and nurses. We return to this in discussion.

4.5 CQUIN for AKI

The NHS England CQUIN for 2015-16 required hospitals to ensure that information related to the stage of AKI, medication review and type and frequency of blood tests was communicated to patients and documented at the point of discharge.[45] Of the two trusts, Hospital X was the only site to adopt the CQUIN. This is because Hospital Y had already agreed a separate list of AKI performance metrics with the commissioners prior to the launch of this CQUIN. As such, there is no direct comparison to be made between the two in the way in which this was implemented.

The CQUIN was adopted in Hospital X in April 2015, for 12 months. This meant it overlapped substantially with the collaborative programme, the first learning session for which was held in September 2015. The CQUIN targets were monitored as part of the AKI working group meetings, and there was an attempt made to separate out the agenda of these meetings, to distinguish between the CQUIN and the QI collaborative. This separation signalled awareness on the part of the organisation that the two programmes represented two different and to some extent competing ways of trying to introduce change. In contrast to what we have described as the ideals of the QI programme as 'bottom up' and 'distributed', the CQUIN works in a very 'top down' and individually accountable manner. Once the CQUIN target has been set then this becomes the essential requirement of the work – there is no external benefit attached to going beyond the target, nor for any 'process' learning that might occur in relation to achieving the target. In the QI programme, although targets are set at the start and the programme works towards the achievement of these targets, there is a significant emphasis placed upon the process according to which implementation happens, and the importance of being able to provide a rationale for the changes to be made. The only rationale for change that the CQUIN offers is the simple one of either reaching the target and getting paid, or not. The differences between the two programmes were referred to by individuals in Hospital X as 'carrot & stick', referring to the collaborative and CQUIN approaches respectively. By offering participants the opportunity to be involved with change and to shape the methods and means by which change is introduced, the QI programme aims for what we might call 'rational commitment' from those involved. By establishing a binary target according to which the organisation either receives a particular benefit or not, and by not including any focus upon the process by which this target is achieved, the CQUIN, in contrast, only inspires a sense of 'ritual conformity'.[55] This matters, firstly, for thinking about the translation of 'work as imagined' into 'work as done', and secondly for thinking about creating sustainable change – both of which we return to in discussion.

Before the collaborative was formally launched, several meetings were held within acute admissions. These meetings were intended to test some of the programme methodology before rolling out the programme across the 11 collaborative wards. In one of these

meetings, members of the working group attempted to map how the ward staff were responding to the AKI alert. Members of the collaborative first had to work through and 'process map' patient flow, in order to be able to describe the chain of events and actions that should be triggered upon the system communicating an alert. This required complex and coordinated care processes to be broken down into individual stages, each with defined actions, accountable persons, and reliable processes for reducing variance and incidents. As described in relation to the tying of the alert to the bundle, this mapping process required a detailed moment-by-moment breakdown of process into practical steps which could be reliably implemented. For example, in emergency admissions, there was a focus on the point at which the pathologist would telephone the ward to notify clinical staff that a patient likely was having an AKI 3. This was a particular problem in emergency admissions as the busy and unpredictable nature of the ward meant it was difficult to predict who would likely receive the call. The QI lead conducting the mapping therefore tried to implement a system for recording the phone call so as to ensure reliability of the broader system.

Experiences such as the process mapping taking place during these emergency ward meetings showed how practices of performance management and collaborative working could become more closely intertwined than their formal separation implies. It was notable the effect that the CQUIN criteria had upon the rationale according to which the process mapping proceeded; which began as an open-ended attempt to map a range of possible pathways for AKI patients, into and through the emergency assessment unit. When it appeared that this process was becoming too lengthy and complex, the CQUIN criteria were introduced in order to establish a required set of outcomes that needed to be assured through the definition of a single, standard process. In this respect, the CQUIN reduced the degree of 'exploration' of new approaches that it was possible for the process mapping to achieve, and instead emphasised the 'exploitation' of existing approaches/resources for a specific aim. This is not to say that it was necessarily a positive or negative thing – the balance to be struck between exploration/exploitation is an essential part of decision-making in any programme of innovation.[10] Although the CQUIN narrowed the exploration of possible processes, we also note that the existence of the CQUIN forced discharge onto the agenda of the organisation, which might not have occurred through the QI programme alone.

Within both hospitals the involvement of pharmacy within the QI programmes was seen as essential. This relates to the guidance to have a pharmacy review within 24 hours for anyone with a suspected AKI. In Hospital X, the CQUIN target, which included confirmation that the pharmacy review had been completed, drew attention to the role of the discharge summary in continuing care. Through the process mapping, this in turn had an impact on the manner in which the care process was organised from the point at which the AKI alert was raised.

However, beyond the achievement of the CQUIN target, there was still a sense among some members of the working group that there remained 'two types' of discharge; one in which a continuing care process in primary and community care had been given due attention, and one in which this had not happened. This suggests that although the CQUIN prompts attention to a particular process, meeting the targets might be a question of demonstrating correct procedure. If the box to confirm that a pharmacy review has occurred was ticked, then this demonstrates adherence to the correct procedure. Such an approach allows improvement to be quantified, demonstrated and audited, however, it cannot provide quality assurance about the information that is handed from pharmacy to the nursing staff that

undertake discharge, or then from the nurse to the patient and GP as part of the discharge process. This issue is further explored in the following section.

As the collaborative programme lacked financial incentives, the CQUIN became an important artefact in the working group's efforts to promote the importance of AKI and, by extension, the collaborative. However, this had both positive and negative consequences. Towards the end of the programme, after the CQUIN was achieved there was a distinct drop in attendance of collaborative meetings. This was likely due to a variety of factors, many of which were not within the control of the managers. However, some managers speculated that achieving the CQUIN, despite its limited scope, had nevertheless given rise to the sense that AKI was now done, there was nothing left to be achieved, and therefore no reason to continue to attend the collaborative meetings.

4.6 Patient Perspectives
Within Hospital X's collaborative, as already described (Section 4.1.1), patient narratives functioned as a way of enrolling clinical staff into the programme and situating 'basic' care processes and practices within 'real' experiences. The patient narratives that appeared at the start of the collaborative days were consciously intended to augment the more process and outcome focused presentations with something emotive and to make a relationship between the practical tasks the audience was being asked to do and their effects in the lives of people. As the programme progressed however and time during the collaborative days became more pressured, the patient narratives were dropped from presentations.

There is a gap in academic literature with regard to patient experience of AKI. The study intended to help fill this gap by exploring the experiences, journeys, and experiences of patients diagnosed with AKI. The focus of the interviews was broad, covering the full range of AKI patients (AKI Stage One, Two and Three) and aimed at capturing the plurality and diversity of AKI patient experiences.

We only approached patients for interview if they had been formally told be a clinician about their AKI. However, only two of eight patients with whom we spoke could define AKI and understood its role in their treatment and illness. The other patients either claimed to have never heard of AKI before or believed the first time they had come across the term AKI was in the study invitation. One patient, a twenty year old man who had received a diagnosis of AKI 2 during a recent hospital stay – reacted with confusion when asked about his understanding of AKI. His complex and protracted experience could be traced back to Christmas 2013 when he developed pneumonia. The infection caused septicaemia and respiratory failure and ultimately led to a stay in ICU. Perhaps because of the complexity of his treatment and illness, this patient did not remember the diagnosis of AKI. The interviewer had to remind the patient that the research project of which he was now a part was principally concerned with AKI. After a certain amount of cajoling, the patient did remember AKI and told the researcher that the first time he had encountered the term "acute kidney injury" was on the postal invitation our team had sent him as part of the effort to find potential interviewees.

A likely explanation for the patients not recalling their diagnoses is that AKI often happens in the context of episodes of severe and acute illness and in certain circumstances, particular when the AKI is minor – i.e. stage 1 – it does not cause subjectively appreciable symptoms. For the patient mentioned above, AKI was a hazily remembered detail embedded in a story

of life interrupted by a period of severe illness, rather than a self-contained illness experience in its own regard. This and other narratives illustrated how AKI features as an element in often protracted and complex narratives of treatment and care. In doing so, instances of communication about AKI, medicine management, and so on can be lost in an excess of information as patients deal with episodes of acute illness.

The lack of an easily recognisable empirical basis for AKI has particular implications for Hospital X. As a methodology, QI relies on a shared sense of what is important in order to engage participation. This is true of Hospital Y in terms of senior buy-in and especially true of Hospital X because of the lack of traditional incentives. However, unlike previous collaboratives (sepsis) – or areas where QI has been successful (such as cancer) there is no coherent patient body or unifying identity upon which a shared understanding could be built. The distributed nature of AKI means the effects of AKI are not always obvious to clinicians operating in discrete areas. Neither can the effects of AKI be easily located in an emotional context; patient's lack of awareness of the contribution of AKI to their illness episode means they are unlikely to associate AKI with suffering or attach discrete experiences to it. In other words, it is difficult to make an emotionally compelling case for AKI QI because there is not a normative story attached to it.

This means there needs to be more work to illustrate the effects AKI has – via its capacity to complicate the care of other conditions or to lead to kidney failure – in the contexts of people's lives and experiences of illness, care, and treatment. However, as patients do not necessarily experience AKI as the cause of their suffering/ illness, clinicians must show how the effects of AKI take form in real life case study examples. Illustrating the effects of AKI on patients therefore has to be accomplished between clinicians and patients, rather than by either party in isolation. Nurse specialist led approaches to quality improvement have an advantage here due to nurses' the direct, face-to-face interactions with patients. Collaborative based approaches may need to develop alternative means to engage more fully with patient populations.

5. Discussion

In the following section we introduce a summary of the key findings presented in terms of key tensions and trade-offs which we have highlighted. We then discuss findings in light of existing literature and draw out implications for research, policy and practice.

5.1 Summary of Key Findings

We introduced this report by noting the key overarching tension created by an context of resource pressures, combined with the IHI Triple Aim: improvement to 'care, health and cost'.[13] Our findings demonstrate the effects of these resource pressures upon the adoption and implementation of QI programmes in each site, exacerbating the translation of 'work as imagined' into 'work as done'.[26 50] This overarching tension feeds into several more:

Tension 1: Maximising utility and effectiveness of new approaches whilst minimising additional burden
Although central to any attempt to introduce new approaches, the achievement in practice of a balance between the benefit and burden associated with the introduction of a new approach takes considerable work. This work is often unrecognised in the sense that new approaches are not always easily adapted to different organisational contexts, and also in the sense that the work of adaptation is often not supported by dedicated resourcing at the system level.

Several features specific to AKI further shape the experience of this tension. AKI is still a relatively new way of classifying the deterioration of kidney function associated with acute episodes of illness (for example, AKI Stage Three replaces the more established description of 'acute renal failure'). From this derives a general lack of knowledge among health care staff of best practice in relation to identification and management. The adoption of new processes in England has been stimulated by the publication of NICE guidance (2014), mandatory introduction of e-alerts (2015), and incentivised targets (2015). Although these policies and guidelines have pushed AKI onto the improvement agendas of organisations, their implementation on the ground is still in its infancy and there is a distinct lack of knowledge relating to the necessary adaptive processes required at the organisational level to accommodate these changes. Therefore, there is no generalisable guidance concerning how to optimise this process according to the aim of maximising utility and effectiveness whilst minimise additional burden.

We have observed two different approaches to navigate this challenge: Hospital X was at a slightly earlier point in the development of their AKI QI Programme and was more 'exploratory' in character.[10] Their work was focused upon local teams developing and embedding a reliable system of alert and bundle that could be incorporated into local practice; the assumption being that over time this would represent a 'resource neutral' intervention. This work was key in making visible issues associated with changes to do with quality/safety and bureaucratic burden. Practical learning in the form of tests of change allowed moment-to-moment actions and communications to be considered and re-shaped to accommodate changes.

The approach taken by Hospital Y was more developed at the time of evaluation as Figure 1 shows, and was more 'exploitative' in approach.[10] Piloting the implementation of a locally developed AKI e-alert system, through the role of a specialist nurse, demonstrated positive results and potential cost savings produced by shorter lengths of stay. Through monitoring and correction of over-identification, the role of the specialist nurse enabled use of a more

sensitive alert (see Tension 2, below). Secondly, the nurse specialists spent considerable time to attend to the handover of care to local teams, and to develop the checklist and use it in collaboration with them.

A specific example of the tension between benefit and burden discussed above is found in the introduction of the AKI alert. A key difference in approach between our two sites is the use of technology to support both the detection and alerting phases of the system. Hospital Y put greater work into the detection phase in order to eradicate under-identification. Specialist nurses then had to develop a combination of IT and paper-based systems in order to regulate hand over to ward teams. Hospital X adopted the national algorithm and with it the possibility of both under- and over- identification. However, their fully integrated electronic care record allowed them to embed the alert phase into day-to-day routines of wards at system and practice level.

There is a trade-off to be faced by organisations which is inherent to the introduction of the AKI alert. The national alert results in both under- and over-identification, creating the potential for both under- and over-diagnosis. This means that rather than substituting human resources such as time and clinical judgement, it requires these to be made into a reliable system for the detection of AKI. Hospital X worked to manage this trade off by embedding the alert into a collective care process based upon regular handovers between local teams, and automated prompting to guide decision making. Hospital Y worked to manage this trade off by first eradicating all under-diagnosis and then deploying AKI nurse specialists in order to eradicate over-diagnosis and to support the embedding of appropriate actions at local team level.

Both these solutions come with a resource dependency. In Hospital Y, this is associated with the cost of providing sufficient AKI nurse specialist time to check for over-diagnosis and to embed in local teams. Over time, one might expect the embedding work to reduce, as local teams become more proficient in the management of AKI (and this had already begun to be observed during data collection). In Hospital X, because the programme was a collaborative, the resource is distributed among a greater number of people. Nevertheless, there are particular roles – such as the AKI coordinator, which is allocated each day to enable a distributed responsibility – upon whom the system is reliant. Additionally, the system worked by being embedded in the 'safety huddles', which contained a checklist of all the different safety priorities which needed to be discussed at handover. This is in itself a finite resource, as there is finite time available in which to conduct a huddle and a finite number of items that can be included on a checklist.

Tension 2: QI as a mechanism to address the IHI Triple Aim of improving care, health and cost
QI programmes which undertake the work described above are a possible means of realising the ambition of the IHI 'Triple Aim' of care, health and cost.[13] However, further attention is needed to the effects of resource pressures upon these aims, where one might expect resource pressures to drive a cost driven approach. In Hospital Y, senior management required some demonstration of impact prior to committing ongoing resources to the project and this drove them towards a more formally structured approach centred upon creating and defining the roles of the AKI Specialist Nurses.

In Hospital X, we observed the effects of resource pressures upon the ability to engage staff and sustain that engagement over a period of time. This had a knock-on effect in reducing the input of participating staff in the spread of the changes to non-participating wards.

Both sites reported successes against core outcome measures, which reflected a combination of improvements to each element of the Triple Aim:

Table 5: Performance of QI programmes against the IHI Triple Aim

	Hospital X	Hospital Y
Care	- Improved identification of AKI through embedding detection/alert system - Embedding care process bundle with electronic prompts to support local teams - Delivery of hospital-wide online AKI training programme	- Improved identification of AKI through embedding detection/alert system - Modified detection system eradicating all under-diagnosis - Embedding care process checklist to support local teams - Education and awareness training delivered by AKI nurse specialists
Health	- Reduction in numbers of hospital acquired AKIs - Reduction in progression from AKI Stage One to Stage Two and Three	- Reduction in overall incidence of AKI - Reduction in hospital acquired AKI - Reduction in length of stay for AKI - Reduction in AKI days - Reduction in mortality related to AKI
Cost	- No estimated cost savings yet associated with programme. - Successful attainment of CQUIN with value in excess of £500k	Estimated costs savings associated with reduced length of stay in excess of £1m per year

Both hospitals reported results that indicate success of both the QI programmes under examination here. However, our findings also highlight the potential for tensions and trade-offs to achieve these aims. An overarching trade-off is in the degree of investment an organisation can make in the interests of achieving improvements. If the improvement is 'only' to health and care, then can the expense of producing the change be justified? The example of Hospital X suggests that this may be possible though one must consider the QI resources and expertise already embedded in this organisation to begin with. Hospital Y demonstrates a more 'exploitative' approach – requiring evidence of effect and potential cost savings prior to committing substantial resources to improvement.

These two approaches exemplified a distinction between 'exploratory' and 'exploitative' innovation.[10] Exploitative innovation entails 'exploiting' existing products or ways of working to enable incremental improvement, while exploratory approaches entail learning anew in order to open up potentially radical innovation. Exploitative approaches have the advantage of building upon what is known or has been successfully demonstrated. Exploratory approaches have the advantage of opening up a specific activity for detailed examination, in so doing aim to illuminate key 'blockages', which once resolved can have transformative effects beyond the immediate domain of interest. At the same time the exploratory approach requires the organisation to accept a greater risk associated with uncertainty of outcome.[10-12]

This raises a question of the extent to which systems exist in organisations for making such decisions. This would require a formal process for identifying, prioritising and planning areas for improvement, which was informed by regional and national strategic planning, but also sensitive to the expertise and capabilities within the organisation and the needs of relevant local patient populations.

The potential for conflicts between more specific aims can also be seen. For example, the aim to reduce length of stay introduces a resource pressure upon discharge, which must occur earlier, and must be accompanied by information sufficient to guide both patient and professional decision making once out of hospital.

We suggest, firstly, that greater attention is needed to the question of how prioritisation occurs within different organisations and secondly, how design decisions are made within particular programmes with respect to each element of the Triple Aim; if there is conflict between the aims, the question of which aim should be prioritised will likely depend on internal and external resource considerations. Further, this highlights the broader system in which organisations are situated; AKI is experienced across the interface between secondary and primary care, creating the need for knowledge of its identification and management to also be transferred. This is complicated by the very different ways in which secondary and primary care operate with regards processes of quality improvement, as well as basic differences in organisational structures and policy priorities. This underscores the importance of local structures which seek to integrate the priorities and resources of primary and secondary care in QI work. There is evidence that existing mechanisms for improving safety and quality do not realise their full potential with a need to aggregate data and encourage learning across orgnaisations.[56-58] As a digital leader, Hospital X's integrated EPR has the potential to support QI across the interfaces of care. The establishment of AKI nurse specialist may offer the potential to support more coordinated and effective discharge for a high risk patient population, known to have a high rate of readmission.[59 60 61]

Tension 3: Learning and Improvement v Performance management

In Hospital X, the QI expertise and infrastructure already embedded in the organisation enabled them to pursue a more exploratory and collaborative approach. Nevertheless, the introduction of the CQUIN, which overlapped with the collaborative programme, brought to light some tensions between conflicting approaches – the collaborative, which was focussed on changes that were driven by and situated within the everyday work of ward teams, and the CQUIN which required a set target to be reached but could not assure a 'quality' process had been followed in achieving this.

There was evidence that the time-limited and target-driven approach of the CQUIN drove intense activity in order to attain the target but did little to sustain this activity beyond its lifespan. Furthermore, in spite of the attempts of the QI team and working group to present these two approaches (CQUIN and collaborative) as separate endeavours, it appears this was not necessarily understood uniformly by staff, resulting in disengagement from the wider QI programme once the CQUIN had been achieved.

In this respect, when pursued in isolation, CQUINs and other incentivised approaches appear to represent the kind of sporadic and disconnected attention to modifying particular work practices which might be undone or re-modified with the next incentive and are unlikely to accumulate over time into organisational learning and systems development.

In Hospital Y, demonstration of savings prior to dedicating funds to support ongoing quality improvement was required. This hurdle was overcome through the deployment of existing resources to demonstrate the potential of the work. From this point on, a more exploratory approach was made possible, in tailoring the role of the AKI nurse specialists and the handover from specialist to local teams. Nevertheless, had the initial pilot not been as successful (which might have happened for various reasons to do with the difficulty of demonstrating measurable impacts in a short space of time), then it is possible the mandatory introduction of the alert would have proceeded without the expanded AKI nurse specialist role, and a less safe, less reliable system would have been the result.

Tension 4: Resourcing patient involvement and perspective as part of QI activity.
We briefly note here the effects upon patient involvement of the overarching resource tension, and the attempt to maximise utility while minimising burden. An important part of this is minimising treatment burden, and the targets in both sites related to the prevention of progression from Stage One to Stage Two or Three (Hospital X), and the attempt to reduce 'AKI days' (Hospital Y) clearly show that both sites were cognisant of this issue. Nevertheless, our findings suggest that there was a limited extent to which patient needs and voices could be enacted through either programme. This implies a need for support to be provided to organisations to involve patients as part of QI endeavours; nevertheless our findings also note some of the complexities specific to AKI which will make this challenging.

5.2 Relating tensions to existing research

5.2.1 Work as Imagined and Work as Done
The tensions and trade-offs related to the attempt to maximise the benefits of new approaches while minimising their additional burden can be related to the concepts of Work as Imagined (WAI) and Work as Done (WAD), which have been developed in the healthcare safety and resilience literature. This research defines safety as the ability 'to make dynamic trade-offs and to adjust performance in order to meet changing demands and to deal with disturbances and surprises'.[50] Safety failures are therefore to be understood not in terms of individual mistakes, accidents or errors but rather as 'dysfunctional interactions' that become embedded in complex systems over time.[62]

WAD makes visible this dynamic relationship and the resulting translational work that is required in order to match the ideals of new approaches, with organisational processes and practices through which those ideals can be realised.[63] Previous studies have highlighted the problems encountered when this everyday work is not acknowledged at a 'system' level – i.e. at the level of making policy and developing guidelines and approaches.[47] The outcome of a lack of attention at a system level is that policies and guidelines are not realistic, and organisations are under-resourced in their attempts to turn ideals into practice.[47 50] The introduction of something new into a complex system initiates a process of adaptations and trade-offs referred to as 'workarounds'.[50 64]

Our findings resonate strongly with these conceptual concerns, highlighting in particular the ongoing and conflicted relationship between external context (policy and resources), organisational context (e.g. organisational attitude to improvement) and the ongoing decisions regarding adoption, implementation and modification of QI approaches. Drawing on our findings relating to e-alerts: a mandate required organisations to introduce this new system by a particular time, irrespective of resource capacities. Trade-offs followed in

organisational decision making: Hospital X chose to accept the deficiencies of the 'detection' phase of the alert and put translational work into the 'alert' side. Hospital Y chose to correct some of the deficiencies of the detection side, but this created the need for the workarounds of the specialist nurses to monitor, correct and handover the alert.

Our findings from two hospitals demonstrate the work required in order translate AKI policy into practice. Aspects of this work have the potential to be unacknowledged and under resourced at the system level. Nevertheless, our findings suggest that the care processes approach taken by in depth guidelines such as those produced by Think Kidneys, perhaps allow for a smoother transition from work as imagined and work as done, when compared to the CQUIN, for example, the ideal of which is to 'transform pathways' and yet it contains no mechanism, guidance or support to enable this transformation to be made in practice.[32 43 45] Previous research relating to the effectiveness of incentivised approaches to quality improvement noted issues related to sustainability, particularly when such approaches are adopted in isolation.[65 66] Our findings develop this further, showing that even when such approaches are not adopted in isolation, but in tandem with an ongoing QI programme within a receptive culture and high degree of support at various levels, that there are still issues of 'drop off' following the achievement of incentives, and limits to the effectiveness of incentivised approaches in locating meaningful improvements at the level of everyday work.

The research evidence related to adaptation and workarounds in complex systems prompts further reflection upon the extent to which changes introduced in these two programmes might be expected to be sustained (a question we give more detailed attention to below).[50 63 64] In particular, in both sites, concerns were raised about the shifting of resources and priorities towards new areas of improvement prior to the completion of their programmes of work. If new programmes of work result in the adoption of new practices which conflict with the practices adopted as part of this programme of work then further trade-offs will be necessary, and the sustainability of any change is put in question. As we have discussed with the literature on 'alert fatigue', so recursive adaptation and workaround also brings with it the possibility of *improvement fatigue*. This problem has not been described elsewhere, and although it is a logical consequence of the dysfunctional effects of accumulated adaptation and workaround, further attention is required to the implications of this that our findings have raised, for the engagement and commitment of individuals engaged in improvement, and for the possibility of conflict and trade-offs between past, present and future versions of everyday work (i.e. WAD).

5.2.2 New technology, alert fatigue and care bundles
We have discussed the tension concerning the balance of benefit and burden specifically in relation to the introduction of the AKI alert. Previous research alerts us to a general problem concerning the introduction of technology driven approaches, in proceeding according to the assumption that technology will necessarily result in more efficient, less human-dependent systems and processes. In practice this assumption has been challenged by research which notes the existence of enduring barriers to the effective introduction and embedding of new technology.[27 67] In general, barriers to effective implementation are thought to be mitigated by iterative design models which pay attention to the broad range of material, human and environmental factors that are relevant to the introduction of the technology in question.[68-70] Examples of specific barriers relevant to our findings are presented in Table 6 below:

Table 6: Barriers to the introduction of new technology

Barrier	Description	Example from Findings
Technology	Characteristics of the technology itself that impede implementation[70] [71]	Alert tendency to both over- and under-identification of possible cases of AKI
Logistic	Features of the core tasks associated with the use of the technology that impede effective implementation[70] [72]	Alert reliance on existing blood results to provide a baseline for identification of possible AKI
Human-Technology Interaction	Recursive impacts on implementation related to disruption to workflow caused by the introduction of technology and the acceptance and use of that technology in practice[68] [69] [73] [74]	Challenge of developing a reliable system for embedding the 'alert' phase within routine care processes
Organisation	Wide range of issues related to the ability of organisations to adapt to and embed new technology into enduring structures and processes[68] [72] [75]	Extent to which alert could be embedded within integrated electronic systems and decision prompts
System	Features of the wider environment, such as policy, governance and finance, which can impact ability of organisations to introduce and embed new approaches[71] [72] [75] [76]	Availability of dedicated funds to support introduction of technology

In relating these general findings to the specific case of AKI, we note studies have highlighted the lack of effectiveness of introducing AKI alerts in isolation with the potential for alert fatigue.[52] [53] In a recent UK study, Kangasundaram et al (2017) highlighted that a mandated response to an AKI alerting system can irritate users with the potential to disrupt existing workflow.[52] Their evaluation indicated that clinicians found ways to bypass alerts, which in doing so had a knock-on effect and 'simply hid it until the next time a patient's chart was accessed.' In addition, alert credibility could be 'strained' when the detection was deemed to be too sensitive.[52]

As stated, a key finding that emerged through our ethnographic approach was the considerable efforts carried out by staff in both hospitals to maximise the effectiveness of the AKI alert whilst minimising the potential for unnecessary workload burden and over-diagnosis. In a context where workload pressures are near saturation point, clinicians and QI teams worked to navigate this inherent challenge underpinning care. Hospital X's approach offered the potential to shape implementation through end user engagement, whereas Hospital Y sought to reduce potential for over-diagnosis and credibility issues through the role of the AKI Nurse Specialist and their allocated responsibility to review all AKI alerts.

Kangasundaram et al recommended the need for an 'end-user responsive process' that extends beyond initial scoping and implementation. The drop off in participation at Collaborative meetings due to workload pressures in Hospital X may jeopardise this. The effectiveness of Hospital Y's approach may be dependent on on-going resourcing of AKI Nurses Specialists. Our analysis of the discharge process and patient perspective, offers an insight into further possibilities to optimise the delivery within the two trusts and across the interfaces of care.

5.2.3 The Triple Aim and incentives to change

The Triple Aim is described as 'strategic organising principles for health care organisations and geographic communities that seek, simultaneously, to improve the individual experience of care and the health of populations and to reduce the per capita costs of care for populations'.[14] Drawing on a retrospective review of programmes that had signed up to the triple aims programme, research proposes three guiding principles for achievements against all three aims, each broken down into component elements (see Table 7, below).[14]

Table 7: Guiding principles for achieving the IHI Triple Aim

Guiding Principle	Component Elements
Capturing the right foundation for population management	Identifying a relevant population
	Identifying/Creating leadership and governance structures
	Articulating a purpose around which stakeholders will coalesce
Managing services at scale for a population	Identifying a population segment on which to focus
	Conducting a needs and assets assessment
	Developing a portfolio of projects
	Designing or redesigning services
	Developing a plan for delivering services at scale
	Expanding the capabilities of 'integrator' organisations
Developing a learning system for population management	Using population-level measures
	Developing an explicit theory or rationale for system changes
	Learning by iterative testing
	Using informative cases to 'act with the individual; learn for the population'
	Selecting leaders to manage and oversee the learning system

Several of the components listed in Table 7, above, can be readily applied to aspects of the two programmes we have studied, for example we can identify challenges and opportunities relevant to the identifying a relevant population with regards AKI, which is distributed, multi-morbid and transient, but at the same time is a 'force multiplier', for which 'getting the basics right' might prompt significant change. Equally, we have noted in some detail the differences between the two sites in the manner in which they set out governance and leadership, articulated their purpose, developed projects, and learned by iterative testing. Given that many of the components listed in Table 7 are re-statements of the core aims and components of IHI improvement methodologies (see Section 2.1) it is perhaps unsurprising that we can map the experience of both sites onto them.

However, there remain challenges, noted in Tensions Two and Three (see above), that remain unresolved by a focus upon these environmental, organisational and cultural concerns, and neglecting issues associated with the specific materials through which improvements to AKI are being mobilised, the possibilities for action they afford, the work it takes to adapt everyday practice to new approaches, and the resources available to undertake this work – bringing together these concerns we highlight the following three challenges to achieving the Triple Aim:

1. the necessary but complex task of introducing systematic but adaptable systems to prioritise and initiate particular programmes of improvement
2. the relationship between improvement adoption decisions and the likely achievement of the Triple Aim
3. the potential for tensions and trade-offs between the three elements of the Triple Aim, and in particular the influence of 'Cost' in a resource scarce-environment

While the first of these challenges can be thought about in relation to the components set out in Table 7, above, the second and third challenges require attention to the specific affordances of the material means of making improvements (see Section 5.2.2) and the recursive relationship of this to the local context in question and the QI approach adopted. In general, it appears that attempting to consider each element of the Triple Aim simultaneously results in possibly 'uncomfortable' trade-offs.[77] More specifically, we have noted the affordances of new approaches to identifying AKI, such as the e-alert, which affords a measure of standardisation in the identification of AKI, but directs attention to specific issues, such as over- and under-diagnosis, the management of which involves trade-offs and results in 'drift' from the ideal of standardisation.[29] This suggests that research into the Triple Aim requires greater attention to the unfolding and political relationship between material and organisational aspects of context relevant to QI programmes.[29 78] We now consider this relationship in more detail, with a focus upon the key question for QI of sustainability of changes.

5.2.4 Organisational change, learning, and sustainability
Thinking more broadly across the tensions related to resource constraint, adaptive work, and the ideal to embed change within a longer-term narrative of organisational learning, we draw upon research related to sustainability.

As already noted, there is a substantial amount of organisational research focussing on how change happens. Often this is organised around the idea of their being 'receptive' or 'unreceptive' contexts to change.[79] Research based upon longitudinal study of QI collaboratives has built upon this concept to develop a framework for understanding the relationship between context, improvement and sustainability.[80] Identifying six key contextual 'challenges' (structural, political, cultural, learning, emotional, technical), this framework proposes a corresponding set of sustainability issues (fragmentation, inertia, evaporation, amnesia, energy sink/fade out, exhaustion).[80] This framework places heavy emphasis upon structural planning and formalisation processes.[80] Relating this to our findings, and over and above the obvious differences between the approach taken at each site, there is good evidence of a formal and structured approach to planning and leadership of change having been undertaken in both sites, with clearly articulated and results-oriented planning from the start, data and monitoring systems established to track process and outcomes, and both formal and informal procedures for benchmarking and communication.

Of the two approaches, Hospital Y was the more 'top down' and structured, through the formal allocation of roles and division of labour between specialists and generalists. This was effective in clearly linking the physical, human and organisational resource required for the change to be made. A sustainability challenge arises out of the concentration of knowledge among so few people, and the dependence this creates upon the individuals involved. This placed great emphasis on the hand-over of care from the specialists to the ward teams.

We draw out three further key aspects of the implementation of changes in each site and relate them to this sustainability framework:

1. Educational challenge and the risk of amnesia

There is a sustainability challenge related to the tension noted above, between improvement driven by a commitment to accumulative learning and one, more driven by performance management. The collaborative approach placed a heavy 'educational' (and 'political' and 'emotional') burden upon participants, who were required to absorb materials delivered in quite didactic fashion, and then turn these reflectively upon their own everyday work and consider barriers and solutions. There is likely to be a substantial degree of variance in the extent to which individuals take to such work, however, once ideals have been practiced through the programme, then one would expect there to be a reduced chance of 'amnesia' at least for those who have actively participated in the programme. However, once the programme moves away to non-participating teams, then the educational challenge could well be much more similar to the experience of the nurse specialists in Hospital Y, attempting to 'educate' ward teams and encountering sustained resistance. This means there is a resource dependency associated with the collaborative participants, which is similar in character to the dependency upon the nurse specialists, though it is distributed among a greater number of people.

2. Technical challenge and the risk of exhaustion

As we have noted at various points, the two organisations took divergent paths regarding their adoption of the e alert and their use of technology in integrating the alert and care processes into practice. The reliance in Hospital Y on the nurses to undertake daily monitoring and correcting of the alert creates a resource dependency for the continued integrity of this system. The approach taken in Hospital X required translational work devoted to integrating the alert into the EPR, and developing the alert and bundle process based upon a close examination of ward practices. Therefore, technology played an important role in the delivery and potential long-term effectiveness of the bundle approach in Hospital X.

Nevertheless, as noted in Section 4.3, the over- and under-identification that is inherent to the alert creates an ongoing sustainability challenge, in the continuing reliance that the use of the alert has on human resources: time, awareness and clinical judgement. Such resources are subject to variability as well as to future modifications and adaptations to Work as Done.[30]

3. Political challenge and the risk of inertia

The distributed nature of AKI drove the collaborative effort in Hospital X towards making AKI 'everybody's business'. This encountered political challenges, firstly in engaging staff to participate in the programme and then to maintain that commitment over time in the face of resource pressures. Allied to this, a further political challenge was faced in the role of programme participants as 'links to their ward teams. If only one or two members of a particular ward were participating in the programme, and/or there was resistance from participant's clinical teams, then this made it more difficult for the proposed changes to be embedded in all areas to the same degree. The future challenge with this approach will be the extent to which the change package itself and demonstrable success of the collaborative

can face the potential political challenges of spreading changes to non-participating wards, who might not consider AKI 'their business'.

Nevertheless, the improvement culture in Hospital X perhaps helped create a context receptive to this approach, and this might also be expected to also soften some of the political challenges. This can be contrasted with the requirement to demonstrate evidence of effect prior to ongoing investment, which drove a more formal and structured approach. Assuming the resource upon which this approach depends is sustained, the improvement should be as well.

5.2.5 Patient Engagement in QI
Although there is strong rhetorical support for the involvement of patients in quality and safety initiatives, evidence about the role of patient involvement in quality improvement is limited.[81-83] Furthermore, the available evidence suggests that there is considerable ambiguity concerning the appropriate role of patients in QI and the appropriate and effective methods for their involvement. Successful approaches are based upon clarity of rationale, identifying 'fit' between the model adopted and the desired outcomes, and identifying clear and meaningful roles and responsibilities for patients.[81]

Although we note the absence of such an approach within the programmes under examination, it is clear from previous research that this is far from unusual. The research literature on quality and safety more generally also lacks a discussion of the specificities of particular conditions. One might find such a discussion in relation to cancer, for example, however, this is a condition which have received sustained funding and attention from policy and research, and which over many years has built a collective understanding of its importance, and a collective identity for those associated with it. AKI lacks this history, and this collective understanding, and our findings suggest that building this will require attention to the distributed and transient character of AKI, which challenges the formation of a coherent identity and the mobilisation of individuals and resources around it. These issues reinforce the importance of co-development and co-production between providers and patients in the development of more inclusive QI approaches.

5.3 Implications for improvement research, policy and practice
The ultimate organisational goal when implementing new policies and approaches is to maximise the effectiveness and utility, while minimising the burden, created by the introduction of the new practice or process. Achieving this in practice takes considerable work. We suggest that greater attention is required to understanding and supporting this work in order to ensure that policy and guidance is realistic in its scope and ambition and in order to better support organisations to realise these ambitions in practice.

- The success of both approaches to quality improvement depended largely on their 'institutional fit'. Organisations that seek to replicate the success of these organisations should give careful consideration to the local characteristics of their organisation and its similarity to the two hospitals described in this report;
- Each programme required a great deal of work from managers and clinical staff. However, due to the different ways in which QI can be embedded within organisational structures, and role allocations, it is very difficult to put a discrete financial value on this kind of work. This can lead to a tendency to render the ongoing work of making and maintaining improvements invisible. This problem can be exacerbated by external organisational pressures and compounded by the existence

of competing improvement priorities. Consideration should be given to how this work can be made more visible at the organisational level to guide resource planning, and at the system level, so that the implementation of new policies and guidelines is guided by a realistic understanding of the translational work required to embed them in organisations;

- Unanticipated external resource pressures can result in a reordering of priorities as QI programmes progress. Whilst more 'exploitative' QI programmes (Hospital Y) re-prioritisation is explicit, in collaborative working, re-prioritisation can be more subtle. This can lead to unacknowledged shifts from exploration to more target driven approaches. As evident with the introduction of the CQUIN in Hospital X, careful consideration needs to be given to reprioritisation so as to avoid undermining the logics on which collaborative working is based. The need for reprioritisation might emerge as part of ongoing QI work and might require flexibility and ability to work around formal processes.

- Target driven performance incentives such as CQUINs focus on specific practices and areas of care, and as such can be effective in mobilising resources and clinical interest around particular issues. However, CQUINs do not necessarily open up an area of care for examination and improvement, which means there is no way of knowing if the attention that is given to meeting the CQUIN target results in an improved process of care. This means there is a risk that interest in a particular area grows and then fades again once the target is achieved. This highlights the problematic relationship between performance management and quality improvement consistent with findings related to pay-for-performance systems in other sectors (e.g. the Quality Outcomes Framework in primary care).[65][66]

- While both programmes were driven through by key people, the collaborative placed a greater emphasis on distributed responsibility, devolving a certain amount of influence to front line staff, and in return, requiring ongoing engagement from them. The change agent approach is in some respects the opposite of this. Here there is a great dependence on the individuals actually enacting the improvement – i.e. the specialist nurses. If there was one key issue in Hospital X it was the ongoing engagement of participants in the programme. If there was one key issue in Hospital Y it was the hand over from specialists to the ward-based teams. Resource planning for QI needs to take careful account of the ongoing political and cultural challenge that these key issues raise.

- Given the possible actions afforded by the AKI e-alert, any approach to introducing the alert must consider the mobilisation of dedicated resources towards identifying and correcting any under- and over- diagnosis.

- The limited extent to which primary care could be considered and incorporated into the improvement work of either site means that further work needs to be done in order to understand and improve the discharge process and ongoing interface between acute and continuing care provision;

- The limited extent to which patients were meaningfully involved in improvement activities in either site means further work needs to be done in order to understand the diverse needs of this patient group, particularly in light of organisational pressures towards earlier discharge of patients with AKI.

6. Acknowledgements

7. Appendix 1: Project support provided to Hospital X

NIHR CLAHRC GM provided a project manager, facilitation and administrative support to the Hospital X QI team. This team was comprised of individuals employed within the NHS, and was separate to the research team, which was based at the University. The two teams met on a monthly basis to discuss project progress, however, the NHS team did not collect or analyse any of the data drawn upon in this report.

The NHS team facilitated the following AKI related activities;

Facilitation, planning and delivery of meetings and events:
- AKI working group, AKI collaborative link nurse study day and lunch meetings
- Collaborative learning sessions
- Facilitating weekly sub group meetings in assessment unit

Assistance with local QI activities:
- Support delivery of collaborative tests of change
- Arranging regular ward rounds and follow up actions
- Collating audit data, tests of change and feeding back to clinical teams
- Reporting of e-learning module completion at Working Groups and Link Nurses events
- Assisting wards with producing materials (e.g. magnets, aide memoirs)
- Facilitating procurement of equipment for tests of change (e.g. urine syringe packs)

Communications and engagement:
- Attendance at regional AKI collaborative meetings to learn from/share learning
- Visits to other NHS trusts in the region who were also undertaking AKI improvement work
- Assistance in production of print/media (e.g. conference posters, promotional video)
- Production of blogs and communication pieces for websites and social media
- Assistance with World Kidney Day activities

Hospital Y did not receive any dedicated project management support from the NIHR CLAHRC GM team. However, both sites received the same level of research resource.

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