Quality and Productivity: Proven Case Study

Wireless working in hospitals:
Improving efficiency and safety of out-of-hours care

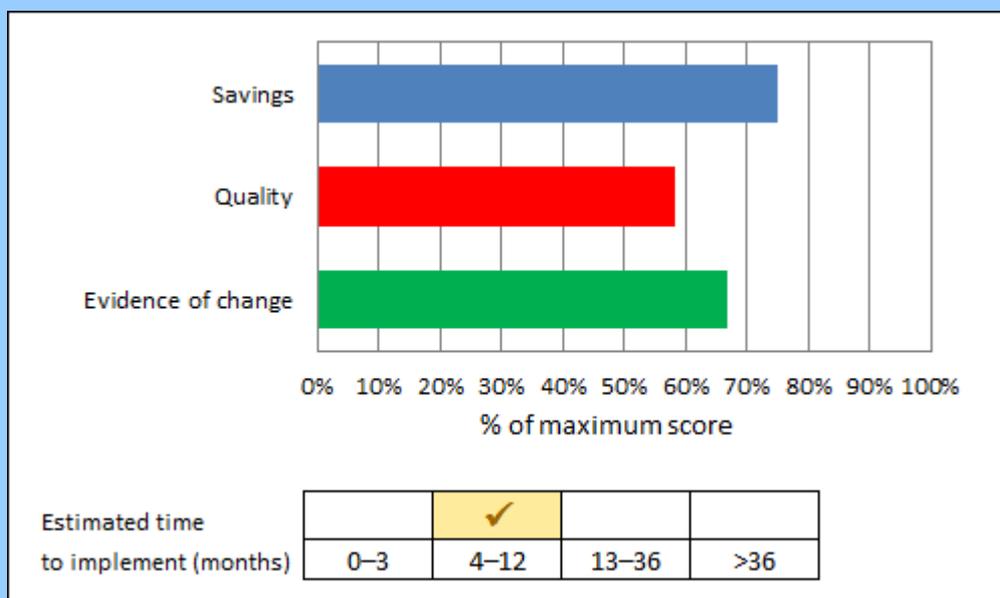**Provided by: Nottingham University Hospitals NHS Trust**

Publication type: Quality and productivity example

Sharing good practice: What are 'Proven Quality and Productivity' case studies?

The NICE Quality and Productivity collection provides users with practical case studies that address the quality and productivity challenge in health and social care. All examples submitted are evaluated by NICE. This evaluation is based on the degree to which the initiative meets the NICE Quality and Productivity criteria: savings, quality, evidence and implementability. The assessment of the degree to which this particular case study meets the criteria is represented in the summary graphic below.

Proven Quality and Productivity examples are case studies that show evidence of implementation and can demonstrate efficiency savings and improvements in quality.

Evidence summary

Date published: March 2013
Last reviewed: April 2016
Last updated: April 2016

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Changes since the previous version

Published Quality and Productivity case studies are reviewed annually. One year after the case study has been published in the Local Practice Collection, the submitter of the case study is contacted to ask if there is further information relevant to the case study, and the case study updated as required. The case study has been amended to meet NICE style and any additional changes to this case study are outlined in the table below.

Case study section	Update
Introduction	No changes.
Savings	No changes.
Quality	No changes.
Evidence	Since the last update University Hospitals of the North Midlands have rolled out the initiative at the Royal Stoke University Hospital and plan to implement at County Hospital in Stafford soon. Many of the Trusts using wireless technology have also implemented electronic observation and handover solutions alongside the task management solution to create an integrated system which improves communication of clinical data.
Implementation	No changes.

Details of initiative

Purpose	To improve the efficiency and safety of out-of-hours care in hospitals by replacing the standard pager and telephone-based system with a wireless solution that also records in detail the actual work undertaken.
Description (including scope)	Coordination and communication between hospital wards and team members has been a major issue locally and nationally. Standard pager and landline telephone systems are prone to delays. When pagers are answered, tasks must be interrupted to answer the page, and the originator of the request must wait by the phone for an answer. A page imparts little idea of the nature of the call. There is information decay, through repeated retelling in the absence of a standard set of details that must be communicated, and information loss without robust means of recovery. Handover between shifts has also repeatedly been highlighted as an area of concern, especially since the current system does not record in detail the work undertaken. This lack of

record also limits the potential for improvement of out-of-hours care in hospitals through informed reorganisation of services or identifying sources of inappropriate work.

This initiative introduced a wireless IT system to manage workflow out of hours in hospitals, replacing the pager system. The objectives were to improve the quality and speed of communication between doctors and nurses, reduce information loss and improve satisfaction for both clinicians and patients. The initiative captured data on every task requested (including type, priority, location and duration) to help understand the actual workload and reorganise resources.

The implemented solution
A user requests a task (for example, patient clerking, cannulation, clinical review for chest pain) through an interface on the ward PC, and gives standardised information. Tasks can be requested for immediate or timed action. Once submitted, the request is automatically allocated a priority based on predefined rules and is sent to a coordinator's (usually a senior nurse who is already part of the team) handheld tablet device. Coordinator's see at a glance all the information entered, including the task's priority, location and type. When the coordinator selects a task, a list of staff and their current workloads is shown. The coordinator chooses the most suitable team member and the information is sent to their mobile phone. The recipient accepts the task from the work list on their smartphone and will indicate that it is complete after the task has been undertaken. Urgent tasks are copied to the registrar on call who is in greater contact with the rest of the on-call team, who can communicate via their mobile phones. Cumulative data on task types, durations and so on are collected centrally. Tailored reports on overall or specific activities are automatically generated for service leads and management.

The submission author is now based at the Liverpool School of Tropical Medicine (rather than Nottingham University Hospitals NHS Trust) but continues to be actively involved in this and related initiatives.

Topic	Back office efficiency, right care, safe care and urgent and emergency care.
Other information	**Out-of-hours care in hospitals and Hospital at Night** Three-quarters of the year falls outside 9 am to 5 pm, Monday to Friday. During this out-of-hours period, services are stretched and patients are at highest risk. The demand for out-of-hours care in hospitals is rising yearly as admissions (and their complexity) increase. In accordance with national guidance, care in Hospitals at Night is provided by a small team of doctors, nurse coordinators and healthcare assistants: the Hospital at Night team. This team covers work in all specialties, often across a large area: for

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example, Nottingham City Hospital covers almost 50 hectares and has 8 admission points, more than the number of doctors in the Hospital at Night team.

Savings delivered

Amount of savings delivered	The initiative demonstrates a saving of £757,000 for a population of 2.5 million. This equates to £30,280 per 100,000 population. This takes into account the cost for training staff on the use of the wireless system.
Type of saving	Mixture of real cash savings and improved productivity. Cash savings achieved through a reduction in length of stay and fewer adverse incidences. Productivity savings through efficiencies on currently deployed staff and improved distribution of resources.
	The improvements have led to a reduction in reported incidents concerning handover and team response out of hours. On average, the frequency of experiencing an adverse event related to out-of-hours care fell from 22 out of 100 days to 7 out of 100 days, with these remaining incidents arising from individuals not using the wireless solution (for example, emergency departments to ward nursing handover).
Any costs required to achieve the savings	A non-recurring investment of £118,000 is required for the purchase of equipment. The Association of Chartered Accountants in their report Collaboration and communication technology at the heart of good clinical governance estimated that this cost can easily be recouped in less than four months.
Programme budget	Out of hours care.
Supporting evidence	The financial implications of this initiative have been assessed independently by the Association of Chartered Accountants, and published in a report Collaboration and communication technology at the heart of good clinical governance. They estimate a return on investment in less than 4 months.
	The system uses a Cisco Medical Grade Network common to over 80% of acute Trusts, and standard desktop PCs.

Quality outcomes delivered

Impact on quality of care or population health	A reduction in data errors, more detailed clinical information available to the clinicians and healthcare staff, and a reduction in information decay ensures that the quality of care provided to patients is improved.
	The use of the system frees more time for direct patient care.

Impact on patients, people who use services and/or population safety	The information is graded based on urgency, ensuring that patients get the appropriate care at the right time. The implementation of the initiative has led to a reduction in reported incidents concerning handover and team response out of hours.
Impact on patients, people who use services, carers, public and/or population experience	Patients receive care promptly by the most appropriate clinician.
Supporting evidence	No additional information provided.

Evidence of effectiveness

Evidence base for case study	The experiences of large complex organisations with the potential for serious adverse events have been drawn on, such as aircraft carriers, nuclear power stations and air traffic control. These organisations have a tremendous knowledge of where assets lie, what tasks are being undertaken and what the capacity of various aspects of the system is before there is a risk of an adverse event. The pager and landline system used in hospitals was designed for the level and type of workload and resources in the 1960s. Wireless solutions such as the one Nottingham University Hospitals NHS trust have implemented are a step toward matching stressed, volatile and complex systems in hospitals with capable technology (Reason J. 1995, Sexton J et al 2000).
Evidence of deliverables from implementation	The initiative has shown a return on the investment in four areas:
	1. Improved efficiency of currently deployed staff
	a) Before the implementation of the system experienced nursing staff acted as coordinators and spent on average no time engaged in direct patient care. After implementation of the initiative, nursing staff spent 56% (interquartile range 28.14) of their shift looking after patients. This equates to £300,000 of additional senior nursing time released for care annually.
	b) The increased speed with which information is transferred and its greater robustness may be contributing to the observed fall in length of stay recorded in comparable periods before and after the intervention (median 6.50 days vs 5.67 days). No significant change was seen in departments not using wireless working. This fall in length of stay was estimated by the Association of Chartered Accountants to equate to a saving of £292,000 per

year.

2.   Improved distribution of resources

Recording and analysing the actual work done out of hours in hospitals shows clinical support workers are less frequently needed after 2am and surgical juniors undertake less than 6% of the work. Reorganising shift length and surgical presence saves around £98,000 annually.

3.   Fewer adverse incidents

The trust reviewed over 1100 reported incidents to assess the effect of the new system. The reduction in clinical incidents related to out-of-hours communication and handover (over a 12 month period a reduction to 48 per year from 156) saved the Trust at least £96,000 annually that would have been spent on reporting, investigation, additional clinical work and legal fees.

4.   Improved retention of staff

Before the implementation of wireless working, job satisfaction among coordinators was low and there were long-term vacancies. Vacant slots on the rota were covered by senior nurses at overtime rates or by junior doctors at locum rates. The current increased satisfaction with the role has seen the vacancies filled.

Where implemented	The system was implemented in March 2011 at the Nottingham City Hospital site, then subsequently at Queen's Medical Centre. The system covers care on all wards apart from the general admission wards and maternity services.
Degree to which the actual benefits matched assumptions	Same as expected.
If initiative has been replicated how frequently/widely has it been replicated	**Out of hours task management solution** More than 20 other acute care organisations from the UK, Europe and Australia have visited Nottingham City Hospital to see the out of hours task management system in use and to talk to users. It is envisaged that other organisations will adopt similar strategies and this general method of communication will become the standard, replacing pagers. Similar out of hours task management systems have now been implemented in United Lincolnshire Hospitals at all three sites. Blackpool Victoria Hospital, Queen Alexandra Hospital (Portsmouth), Royal Berkshire, and the University Hospitals of Leicester have implemented the system across their three Hospitals with input from those familiar with the system in Nottingham.

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More recently University Hospitals of North Midlands have implemented the out of hours task management system at their Royal Stoke University Hospital and plan to set up at County Hospital in Stafford soon.

Bespoke solutions

Since the out of hours task management implementation, other groups within Nottingham University Hospitals NHS Trust have requested the technology. In early 2012, porter services rolled out a similar task management system. Later in 2012 the Neuro-rehabilitation unit installed a system where patients have a wearable electronic device registered to them, which they can use to call a nurse or request emergency assistance. This sends an alert to a nurse's phone with the patient's name and room number; the nurse can then press 'Dial' to speak to the patient via a phone in their room.

The system is also being used for referral to on-call speciality registrars, with neurology being the first to adopt the system in September 2012. This new application has reduced waits when trying to contact the registrar, reduced the number of interruptions they face at night and has provided a robust electronic record of patients seen, so they can be more easily discussed with senior staff and followed up, and their care audited.

More recently an electronic FAIR (Find, Assess, Investigate and Refer) system to record dementia assessments has been rolled out to help monitor and improve performance of this National CQUIN target.

EWS and handover solutions

The software has been developed and includes other modules such as electronic observation and handover alongside the task management to create an integrated system which greatly improves communication of key clinical data. Many Trusts have implemented these additional modules.

Recently Nottingham University Hospitals NHS Trust successfully implemented the electronic observations module which electronically captures observations, calculates an Early Warning Score (EWS) and generates escalation tasks when required to ensure a quick and appropriate response day or night. Alongside this, the electronic handover system allowing real-time information to be shared between nurses and doctors and removing the risk of tasks being missed during handover has also been implemented. This means that doctors and nurses can now share key clinical information through an integrated observation, handover and task management system via a mobile device which has the potential to improve patient safety further.

Advantage of wider adoption of system

The system allows the sharing of anonymised data from the above mentioned modules between Trusts with similar systems in order to undertake more meaningful and more detailed benchmarking than the broad figures currently used.

At Nottingham University Hospitals NHS Trust the data captured on each individual are being augmented with direct transfer of results and observations and the Trust is engaged in research projects incorporating real-time mapping of staff, patients and equipment location with colleagues from the national Horizon Digital Economy Research Institute.

Supporting evidence	No additional information provided.

Details of implementation

Implementation details	All tasks are logged on to ward-based desktop PCs using the standardised and validated 'SBAR' (Situation-Background-Assessment-Recommendation) format.
	Patient information is partially populated by the system, reducing errors and increasing relevant detail (location, date of birth, etc.).
	As data are entered into standard boxes and via drop-down menus, the information is standardised and there is less room for misinterpretation. This is not only passed on to the coordinator and practitioners, reducing information decay through retelling, but also allows the system to automatically grade the urgency of the task.
	These features have been praised in interviews with junior doctors, such as those featured in the BMJ Open research article related to this initiative (Blakey et al. 2012).
	Once the request has been entered on to the system, the nurse or other healthcare professional is free to return to their duties rather than wait next to the telephone, as they would if paging someone. This frees more time for direct patient care.
	The individual receiving the task obtains the information rapidly and without the need to interrupt their current task to find a telephone. They can therefore dedicate more time to patient care.
	As the type of task is explicit under the new system rather than a simple 'bleep', nurses can confidently leave the telephone and return to acutely unwell patients in the

knowledge that the doctor and coordinator know the request is urgent rather than undertaking repeated paging attempts. Likewise, recipients can make decisions on when to terminate their current task to attend something more urgent.

In the standard Hospital at Night set-up, registrars are left disenfranchised and are often unaware of acutely unwell patients. The wireless system sends a copy of all urgent tasks to the registrar so they are aware of the situation, and can use their phone to contact the junior assigned the task to discuss the case and to assess if and when they need to review in person.

A key strength of this type of solution is its ability to record in detail the actual work requested and undertaken. Not only does this allow the most appropriate distribution of staff in terms of speciality, seniority and shift times, it also facilitates quality improvement. As an example, the initiative allows automatic identification of tasks that should not have occurred out of hours, such as full drug card rewrites, and reports these back to the ward that generated the job. Such tasks can then be done in normal working hours by doctors who know their patient. The Trust has found that 1.4% of drugs are unintentionally omitted when cards are written in normal working hours, but 17.9% are omitted if cards are rewritten out of hours.

Although the generation of reports is highly useful, steps are being taken to use data in real time. Out-of-hours workload data are being incorporated with other metrics on hospital stress to give managers early warning of an increasing potential for adverse events.

The data from the wireless system allows health professionals to see in detail for the first time what work is actually done out of hours.

The key aspects to the success of the implementation of this project were:

- early recognition of the need for close collaboration between NHS IT, clinicians, nursing staff, academics and industry.
- retention of a small steering group comprising the above, who collaborated closely, contributed a great number of additional hours, moved quickly to address challenges and recognised the need to innovate.
- enthusiastic support from senior managers agreeing initial outlay spending and giving more control to clinical staff (permitting a 'bottom-up' approach to implementation).
- freedom for the Hospital at Night clinical and nursing leads to design their own method of implementation

without frequent reporting or the need for approval from senior management.

- a staggered introduction of the system. The system was initially used for support workers, then junior doctors at the Nottingham City Hospital site before being introduced Trust-wide. As noted, other staff members are now using the system.
- early generation of reports. Many sceptical senior clinicians and managers were rapidly convinced of the value of the system when informative and specific data were presented to them. Junior doctors receive an email of detailing (anonymised) completed tasks after their shift to add to their e-portfolio, and this has proved to be a highly successful feature of the system.
- iteratively improving the interface for those entering requests and end-users, and improving the quality of reports that can be generated.

Time taken to implement	Following the purchase of the equipment this initiative can be achieved in the medium term: 3 months–1 year.
Ease of implementation	Affects a whole organisation across a number of teams or departments.
Level of support and commitment	There has been rapid acceptance of the system, with health professionals being quick to appreciate the benefits and potential. Interviews with staff gave particular praise for the reduction in administrative burden.
	There has also been an appreciation of the system robustly recording detailed information for use both during shifts and for reports and training log entries thereafter. However the success of the initiative is dependent on the support of all out-of-hours staff and senior management.
Barriers to implementation	Significant challenges to implementation have included:

- Hospital at Night does not attract the same management structure as other hospital services, despite its important remit. Without a dedicated and separate budget, a matron or manager with protected administrative time or administrative support, changes to service provision had to rely on additional hours being worked by staff in other departments or the recruitment of additional staff through research and innovation funding.
- some departments have been very reluctant to file all tasks on the system, preferring to request a junior doctor stays within their area at all times. This inefficient approach is the antithesis of the idea of the Hospital at Night team. Similarly,

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some departments were reluctant to engage with the system at all, fearing that 'their' on-call juniors would be taken away.

- those employed to work on specific existing IT systems found the additional task of integration with the new system challenging. This delayed or limited some of the benefits of the system.

These challenges are overcome through:

- demonstrating the benefits of wireless working to all stakeholders
- additional funding can be acquired for dedicated data analyst time and through research and innovation funding
- demonstrating the ability to obtain reports on actual activity and thus address weakness and highlight specific strengths
- appointing a designated analyst as a key contact for the software company and for those engaged with in-house systems
- engaging in regular meetings with a core team of senior managers and healthcare professionals to highlight issues and ensure that everyone understands the aims and challenges of any changes.

Risks	It is important that all staff are fully trained in the use of the new system.
Supporting evidence	None provided.

Further evidence

Dependencies	A vital element of this initiative is buy-in from all staff.

Contacts and resources

Contacts and resources	If you require any further information please email: qualityandproductivity@nice.org.uk and we will forward your enquiry and contact details to the provider of this case study. Please quote reference 12/0017R2 in your email.
	Association of Chartered Accountants CCA. Collaboration and communication technology at the heart of good clinical governance. Accessed March 2016.
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