

## ICNet Infection Control Case Management and Surveillance Software: A Study in Success from Scotland

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*Health service administrators in one of Scotland's most diverse regions are helping to control the spread of hospital infections by using control case management and surveillance software developed by the specialist global informatics company ICNet. The system has helped to produce more effective controls, brought greater efficiencies and delighted staff who have used it. There are now plans to extend its use and effectiveness even further.*

PREVENTION of infection is one of the biggest challenges facing modern hospitals. Within a medical care environment, contagion is always a real risk: not only for patients, but also for staff, administrators, contractors and visitors.

Healthcare associated infections (HAIs) are potentially fatal and hugely costly in terms of healthcare spending. In the UK and the Republic of Ireland, The best estimate suggests that there are over 300,000 healthcare associated infections in hospitals each year and these are thought to cost Britain's National Health Service NHS at least £1 billion, though this is acknowledged to be an underestimate.<sup>i</sup> The government uses a cost of £4,300 per infection in its productivity calculator, though it is undertaking new work to strength the estimation.<sup>ii</sup>

The rise in the number of outbreaks of some HAIs has been dramatic: In the USA, fewer than 2000 infections of Methicillin-resistant *Staphylococcus aureus* (MRSA) were recorded in 1993; by 2005, that figure had increased to 368,600.<sup>iii</sup>

### **The Scottish Background**

Like other countries around the world with highly developed healthcare systems, Scotland treats the control of HAIs as a priority. Under the United Kingdom's devolution settlement, Scotland maintains a free-at-the-point of use National Health Service alongside the rest of the UK, but health policy is set and funded by the Scottish Government, based in Edinburgh and accountable to the Scottish Parliament.

The Scottish Government has consistently made it clear that prevention of healthcare associated infections is a priority. The cost of HAIs in Scotland has been estimated at £183 million a year, with the rate of incidence being 9.5 per cent in acute hospitals and 7.3 per cent in community hospitals.<sup>iv</sup> There is an insistence on effective survey and control procedures: the Healthcare Environment Inspectorate (HEI) annually inspects each Scottish NHS board and also makes announced and unannounced inspections of every acute hospital in Scotland at least once every three years.<sup>v</sup>

The government's surveillance agency, Health Protection Scotland, reported 532 new cases of *S.aureus* bacteraemia, which includes MRSA and MSSA, during the second quarter of 2009 - a 4.5 per cent decrease on Q1. This is the second lowest number of cases reported since the start of the mandatory surveillance programme for these HAIs.

NHS Fife is the health authority covering one of Scotland's most diverse areas. Situated on the east side of the country, it is historically an ancient kingdom and comprises rural

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areas as well as industrial towns, post-industrial communities and tourist landmarks such as St Andrews, long reputed to be the home of golf.

### **Surveillance in Action**

Monitoring of HAIs in the kingdom is the responsibility of NHS Fife's Department of Microbiology and Infection Control, with the area laboratory situated at the Victoria Hospital in Kirkcaldy. Since June 2006, the health authority has used ICNet's infection control case management and surveillance software to administer reporting of HAIs. Staff are delighted at the results which have been achieved and the level of control and surveillance of infection which is now possible.

"Before we put the ICNet system in, we had a lunchtime meeting every day, Monday to Friday," explains Tricia Garnett, the Principal Clinical Microbiologist. "The infection control nurse would come over with a piece of paper and we would tell her which MRSAs we had. She would read these, and then phone her colleagues who would deal with the cases in their areas.

"It was quite a time commitment. The system did work, but it meant there was only reporting once a day and if results hadn't come through to the lab, they would have to be phoned again later on. And at weekends, we didn't have meetings, so the records had to be phoned out, which meant more work."

The implementation of ICNET has made things much easier to manage. Purchase of the system was made possible because the high profile of HAIs among politicians and the public led to a local process evaluation among health managers which triggered increased funding.

### **Pulling the Process Together**

A separate patient administration system (PAS) known as OASIS has also been set up to log details for wards and allow for tracking of patients within the hospitals in the area. ICNet also tracks patients, and there are plans to link the two systems to provide full interoperability and patient visibility down to ward bay level. (These are currently linked but the bidirectional importing is being developed for early implementation.)

"With ICNet, we can pull reports on where patients are and who they have been in contact with," Tricia Garnett continues. "Patients move rapidly from ward to ward and from area to area. Someone might have been in contact with MRSA, but by the time the result comes through they may have moved to another ward.

"We can now put a watching brief on those people, which obviously makes us more aware of cross contamination and infection. We can look at who else they have been in contact with. It would have been possible to do that with the old system, but it would have been terribly time consuming."

Using ICNet also means that longer term patient tracking can be far more precise than in the past. For instance, if a patient who has contracted MRSA is allowed home and is readmitted without a swab being taken, the software will immediately flag up the condition,

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which is considered by microbiologists to be resident in the body for life, and allow appropriate control procedures to be put in place.

“One thing we are finding the software particularly useful for is root cause analysis,” says Garnett. “We can establish, for instance, why something like *Clostridium difficile* (*C.diff*) has moved from one ward to another, and what the lab has told the ward. And we can make sure that isolation procedures are logged. In other words, we can now make sure that all the things that should be done have been done. We can also see if we have slipped up, or if there’s another cause of the problem. ICNet allows for full traceability - in the past, that would have involved going through a huge amount of paperwork.”

The team started out by monitoring MRSA on the system, and now monitor a wide range of alert organisms including *Staphococcus aureus* bacteraemias (SABs), Mycobacteria, *Streptococcus pyogenes*, Salmonellae, *Campylobacter sp*, *C. difficile*, Norovirus, Rotavirus and Extended Spectrum Beta-Lactamases (ESBLs).

At present, ICNet can record patient infections at ward level at hospitals across Fife, which include the acute Victoria Hospital in Kirkcaldy and Queen Margaret Hospital in Dunfermline; the Forth Park Maternity Hospital in Kirkcaldy; and a range of smaller non acute hospitals across the kingdom including St Andrews Community Hospital, the Randolph Wemyss Memorial Hospital in Buckhaven and the Glenrothes Community Hospital. It is planned to extend this to bed-level surveillance once the parallel PAS is rolled out further.

Manipulation of data is also quick and easy. “You can compile reports in any way you want, then you can save the information. If you want to go back in and re-examine, the only thing you need to change is the date range. It doesn’t have to be set up again.”

The proposed strengthening of links between ICNet and the Patient Administration System means that by 2010, anyone within Fife who has a clinical need to look at this patient data will be able to do so. If necessary, some information will also be available to nursing homes and to primary care facilities such as GP surgeries.

In the UK as a whole, the Commons Public Accounts Committee reported in November 2009 that the government had ignored its earlier recommendations and that there was still no robust comparable data on the extent and risks of at least 80 per cent of healthcare associated infections<sup>vi</sup>. With ICNet, all infection results are recorded so this data is available.

### **The User Perspective**

The frontline nursing staff are highly impressed with the functionality of the ICNet software and the advantages it has brought. “It seems to be pretty accurate,” says Lizzie Dunstan, an Infection Control Surveillance Audit Nurse, “and I find it very difficult to imagine not having it now. Now I’m familiar with it, it seems easy to use, and it’s something I look at every day.

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“It allows us to see the picture right across the community - with *C.diff*, for example, we can identify individual incidents and see if someone has had a re-occurrence. We can also use the graphing function to see if some places are having more cases than others, and then assimilate this data into community health partnerships to see if there are hotspots. It also helps each ward to understand the picture better.”

Janice Barnes, one of the Infection Control Nurses, says she has found ICNet excellent. “It’s accessible, you can pull up the information you need there and then. On a daily basis, I can view what has come in the day before. I work in the community and we do on call work, so it’s good to know what has been going on. If it shows up an alert organism in the area I cover, then I try and go out and make sure everything is in place. It also provides the local staff with an opportunity to discuss anything they’re concerned about.”

### Rollout and Training

As far as implementation was concerned, the health authority’s IT staff were responsible for setting the software up on a server within their own department onsite at the Victoria Hospital, and installation was a relatively straightforward affair. ICNet’s own team was on hand to assist if necessary.

The most difficult task was achieving the necessary linkage with the separate Patient Administration System, though issues were quickly overcome. There have been some issues with powering ICNet back up after the PAS has been taken down for updating, but these have been related to human procedures rather than the software and new management practices have now solved the problem.

“The training has also been very good,” says Tricia Garnett. “ICNet did this with us initially, and we’ve been able to set up web links to help new people. We have upgraded to version 6 and when we did that, we had a day’s training for everyone. But I actually find the help menu very good indeed - it’s sensibly intuitive. We’ve now set up a user group to get feedback, to see how everyone is using it and also to see what can be added on.”

### Reporting of Results

Like other members of the Fife team, Garnett is particularly impressed by the quick reports ICNet can generate. “We put on an additional module, LabStore, with version 6, which stores all of the laboratory results, so we can then pull data on antibiotic resistance patterns. You can find over time, for instance, that a percentage of MRSAs or ESBLs become resistant to different antibiotics, and this gives you the bigger picture and as the database builds up, it will allow us to determine trends and track patterns of antibiotic resistance.”

“It also allows us to undertake statistical process control - we can set up an average, take deviations from the mean and set an upper control limit. That helps to show us how we are performing in terms of infection control. Every month now, each ward gets a chart on its *C.diff* infections. It allows each ward to understand and get better.”

One extension which is to be made in the future is to put the area laboratory’s serology results onto ICNet alongside the bacteriology ones which are already being processed.

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This will allow logging and surveillance of conditions such as rubella, hepatitis, HIV and H1N1, all of which are currently still recorded locally on paper.

### **‘We Couldn’t Work Without It Now’**

Like his colleagues, Dr Keith Morris, Consultant Microbiologist and Infection Control Director, is an enthusiast for the current system. “I set up reports that I am going to want routinely - looking at cases of *C.diff* in particular, or new cases of MRSA. This means I can check that we are keeping control on the numbers of these specific infections. We should be, but are we doing that? This system can tell me that.”

Linking ICNet with the PAS system, he adds, is crucial. “It allows us to identify patients coming in which have MRSA - we know where they are and can track them. It also allows us to look at our new cases and where they are. It helps us determine if there is a potential cross infection or an outbreak.”

This, he points out, means medical staff can intervene if necessary. “If we find a case of *C.diff* in particular, we can phone the ward very quickly and see if that patient is isolated. If not, then they need to be.”

The system can also be manipulated in order to identify areas where there are positive blood cultures. Keith Morris does this on a weekly basis to identify positive cultures in the renal unit. It is then linked in with haemodialysis line surveillance, so his colleagues can check, in the event of a positive culture, if they have removed lines and if a particular organism was causing an infection.

“The one big thing about ICNet for me as an infection control specialist is that I can access the data. That is key. We can put our information on and we use that regularly to do our epidemiological searches. We couldn’t work without it now.”

## SUMMARY

- HAIs are hugely costly both in terms of human life and health expenditure. They are estimated to account for at least £1 billion of healthcare spending across the UK, £183 million of it in Scotland.
- The NHS insists on effective and audited control and monitoring procedures, both in hospitals and at health board level.

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- ICNet's infection case management and surveillance software is designed to facilitate and administer rapid and effective reporting of HAIs.
- Frontline NHS are now empowered by ICNet to closely track patients, quickly trace third party contacts and minimise cross contamination and plan speedy medical intervention.
- ICNet allows for greater precision of long term patient tracking.
- Provision of comprehensive facility for root cause analysis along with full traceability.
- Capability of recording all infection results and providing rapid, robust data.
- Highly flexible data reporting and analysis via an easy-to-use and intuitive computer based front end which includes a graphing function.
- Straightforward and logical software implementation and end user training.
- LabStore module can store and allow analysis of all laboratory results.
- Full statistical process control.

i. C&AG's Report; Four Country Healthcare Associated Infection Prevalence survey 2006: Journal of Hospital Infection (2008) 1–19 and Results from Scottish National HAI Prevalence Survey—Journal of Hospital Infection (2008) 69, 62–68

ii. House of Commons Public Accounts Committee - Reducing Healthcare Associated Infection in Hospitals in England, 52nd Report of Session 2008–09, p13, published 10 November 2009

iii. Anne Elixhauser, Ph.D. and Claudia Steiner, M.D., M.P.H. July 2007. Infections with Methicillin-Resistant Staphylococcus aureus (MRSA) in U.S. Hospitals, 1993–2005. Healthcare Cost and Utilization Project, Statistical Brief number 35.  
<http://www.hcup-us.ahrq.gov/reports/statbriefs/sb35.pdf>

iv. Health Protection Scotland Healthcare Associated Infections Prevalence survey, July 2007

v. Healthcare Environment Inspectorate Announced Inspection Programme September 2009 – 2010. <http://www.nhshealthquality.org/nhsqis/6710.html>

vi. House of Commons Public Accounts Committee - Reducing Healthcare Associated Infection in Hospitals in England, 52nd Report of Session 2008–09, p11, published 10 November 2009

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