South Tees Hospitals NHS
NHS Foundation Trust

Meeting / Committee:	Board of Directors	**Meeting Date:**	May 2012

This paper is for: (Only 1 column to be marked with x as appropriate)	Action/Decision	Assurance X	Information x

Title:	Director of infection prevention and control annual report – April 2011 to March 2012.

Purpose:	To provide surveillance information on healthcare-associated infections and the measures being taken to prevent them.

Summary:	This report summarises surveillance information on MRSA and MSSA bacteraemia, *Clostridium difficile*-associated diarrhoea and other important healthcare-associated infections for the 2011/12 financial year. It also includes a summary of other important aspects of infection control. • The Trust had 2 episodes of Trust-attributed MRSA bacteraemia in 2011/12, below the target of 4 cases. There were 19 cases of Trust-attributed MSSA bacteraemia. There was no official target for MSSA bacteraemia but this was below the number of cases in the preceding year. The Trust had 67 cases of Trust-attributed *Clostridium difficile*-associated diarrhoea which was below the target of 112 cases.

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Recommendation:	The Trust needs all the Divisions to sustain the improvements made in MRSA, MSSA and *C. difficile* cases and to continue to support and engage completely with all measures to reduce healthcare-associated infections.

Implications (mark with x in appropriate column(s)	Legal X	Financial X	Clinical X	Strategic X	Risk & Assurance X

DIRECTOR OF INFECTION PREVENTION AND CONTROL ANNUAL REPORT APRIL 2011 TO MARCH 2012

1. The Trust has achieved its MRSA bacteraemia target for 2011/12. There were 8 cases, 2 of which were classed as Trust-attributed. This is below the target of 4 Trust-attributed cases. There has been a 67% reduction in Trust-attributed MRSA bacteraemia cases compared to 2010/11.

2. The Trust was given no target on MSSA bacteraemia for 2011/12. There were 69 cases, 19 of which were Trust-attributed. There has been a 27% reduction in Trust-attributed MSSA bacteraemia cases compared to 2010/11.

3. The Trust has achieved its *Clostridium difficile* target for 2011/12. There were 67 cases of Trust-attributed *Clostridium difficile*-associated diarrhoea and the target was 112 cases or fewer. There has been a 46% reduction in the number of cases of Trust-attributed *Clostridium difficile*-associated diarrhoea compared to 2010/11.

4. The Trust had 1 case of bacteraemia due to glycopeptide-resistant enterococci in 2011/12. There is an 87% reduction compared to 2010/11.

5. ESBL-producing coliforms cause a large number of infections and they are the commonest multi-drug resistant Gram negative organisms affecting the Trust and the local community. In 2011/12 the Trust had 25 cases of bacteraemia due to ESBL-producing coliforms, which represents a 26% reduction compared to 2010/11.

6. During the winter months, outbreaks of Norovirus infection cause severe disruption to the Trust. Nationally there has been a steady rise in the number of outbreaks of Norovirus year on year. Prior to this year the Trust had been steadily decreasing the number of outbreaks of Norovirus affecting our patients over the previous four years. However this winter there has been a considerable increase in the number of outbreaks of Norovirus compared to 2010/11.

7. The Trust continues to make strong commitments to the 'Saving Lives' and 'clean**your**hands' campaigns.

8. A number of training initiatives are being utilised to deliver the infection prevention and control-related training which is appropriate to the needs of staff with different degrees of responsibility for infection prevention and control.

9. Root cause analysis is performed on all MRSA bacteraemia episodes and a case review chaired by the medical director or director of nursing and patient safety is held. This has resulted in valuable lessons being learnt. Root cause analyses are also performed for Trust-attributed MSSA bacteraemias followed by a departmental case review.

10. Audits of death certificates where *Clostridium difficile* was the definite or probable main cause are continuing at FHN and JCUH. There has been an improvement in the audited standards of care and a fall in case fatality from *Clostridium difficile* infection.

11. An annual infection prevention and control nursing report has been produced to highlight specific PC team activities including environmental audits, patient surveillance, IPC training and IPC advice line contact.

INTRODUCTION

This annual report summarises information on healthcare-associated infections for the period 1st April 2011 to 31st March 2012. The report includes a summary of alert organisms and conditions for the Chief Executive, Board of Directors and Management Group. It includes breakdowns on meticillin-resistant *Staphylococcus aureus* (MRSA), meticillin-sensitive *Staphylococcus aureus* (MSSA) and *Clostridium difficile*-associated diarrhoea by clinical area. The report also includes a summary of the initiatives which have been undertaken to reduce healthcare-associated infections.

It has been estimated that healthcare-associated infections cost the NHS over £1 billion per year. During 2006, the Department of Health brought out a 'productivity calculator' to enable Trusts to calculate how much money healthcare-associated infections may be costing them. Using this tool we estimated that based on our MRSA bacteraemia rate in 2003/4 (the national baseline year), healthcare-associated infections were costing South Tees Hospitals NHS Trust around £12 million annually. This figure remained relatively constant between 2003/4 and 2007/8. The productivity calculator suggests that the reduction in MRSA bacteraemia cases we had in 2011/12 compared to the 2003/4 baseline year has saved the Trust £252,677 and 667 bed days in the current financial year. If we have achieved similar reductions for all other healthcare-associated infections it will have saved the Trust around £10.5 million and 27,725 in-patient bed days per year.

The contents of the report are as follows:

1. Surveillance data
   - 1.1. MRSA bacteraemia
   - 1.2. MSSA bacteraemia
   - 1.3. *Clostridium difficile*-associated diarrhoea
   - 1.4. Surveillance for other alert organisms
   - 1.5. Surveillance for other alert conditions
   - 1.6. Orthopaedic surveillance
2. Outbreaks
3. 'Saving Lives'; a delivery programme to reduce healthcare-associated infection including MRSA
4. Hand hygiene
5. Antibiotic prescribing
6. Staff training
7. Audit activities with important clinical governance implications
   - 7.1. MRSA root cause analysis
   - 7.2. *Clostridium difficile* death certificate audit
8. Glossary of terms

Attachments:
MRSA clinical incident report summary 2011-2012
Clostridium difficile death certificate audit for JCUH 2011-2012
Clostridium difficile death certificate audit for FHN 2011-2012

1. SURVEILLANCE DATA

1.1 MRSA bacteraemia

The Department of Health set acute hospital trusts the target of reducing MRSA bacteraemia by 60% by the end of the 2007/2008 financial year compared to the baseline figure recorded in 2003/2004 (South Tees Hospitals target for 2007/8 was 27 cases based on a baseline of 69 cases). After 2007/8 they decided that targets could be set by the Strategic Health Authorities and our target for 2008/9 was 32 total cases and for 2009/10 it was 24 total cases and for 2010/11 it was 7 Trust-attributed cases. For 2011/12 the target was 4 Trust-attributed cases. Trust-attributed MRSA bacteraemia cases are defined as episodes which occurred among inpatients, excluding patients where the first positive blood culture sample was submitted on the day of hospital admission or the following day. Between April 2011 and March 2012, there were 8 episodes of MRSA bacteraemia (6 from JCUH, 2 from FHN) of which 2 were classed as Trust-attributed (2 from JCUH, 0 from FHN). In 2010/11 there were 11 cases in total (6 of which were Trust-attributed); in 2009/10 there were 13 cases; in 2008/09 there were 24 cases; in 2007/08 there were 60 cases. Therefore there was a 27% reduction in 2011/12 compared to last year (67% reduction in Trust-attributed cases), 38% compared to 2 years ago, 67% compared to 3 years ago and 87% compared to 4 years ago. The target for 2012/13 is 3 Trust-attributed cases.

Figures 1 and 2 show the quarterly number of MRSA bacteraemia cases since 2001 detected by the JCUH and FHN laboratories respectively.

Figure 1: Quarterly MRSA bacteraemia at JCUH

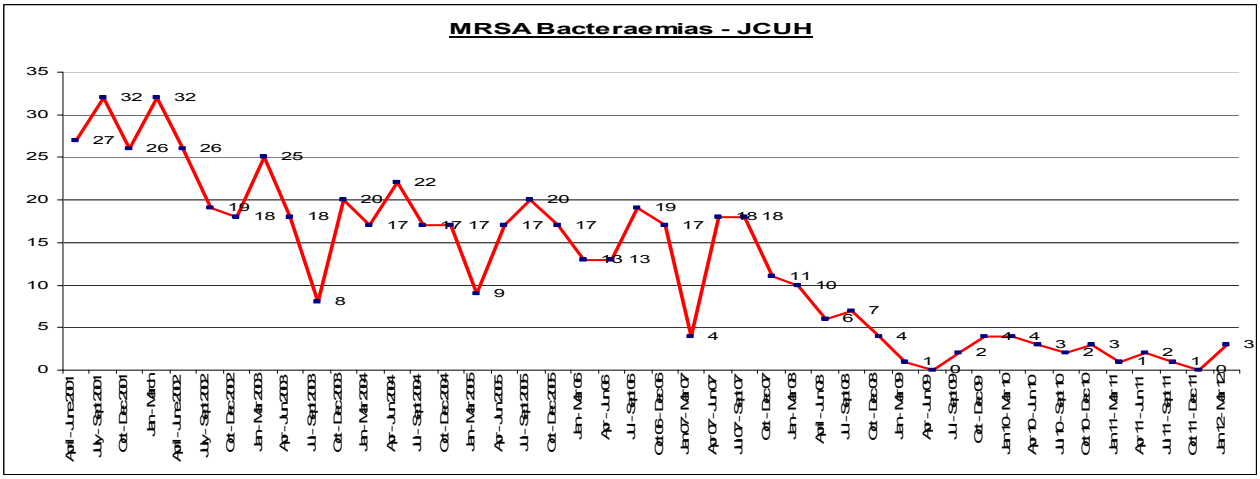


Figure 2: Quarterly MRSA bacteraemia at FHN

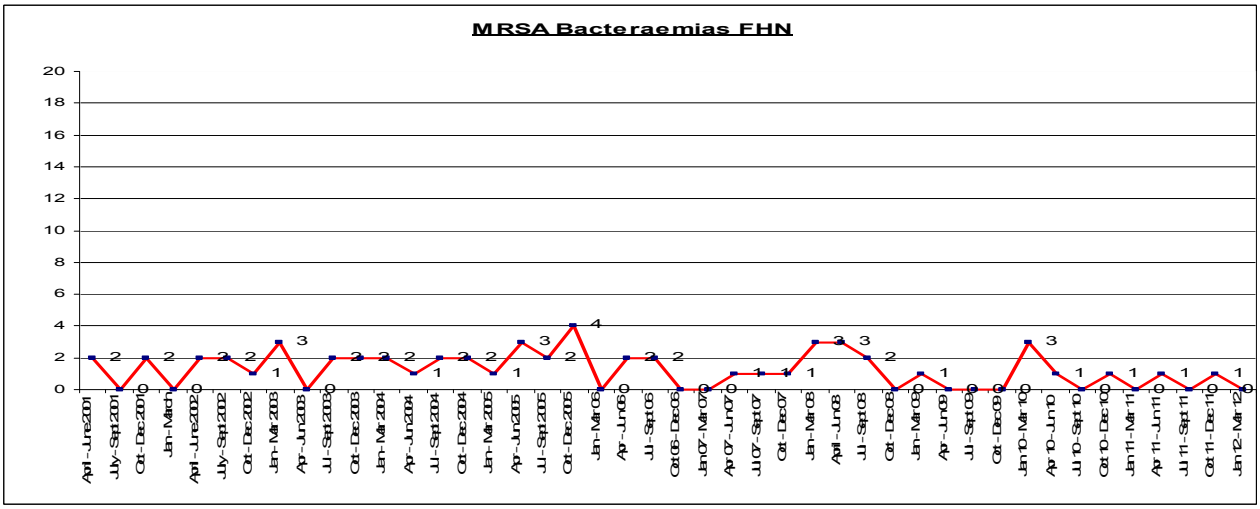


Table 1 shows the locations of the patients when the MRSA bacteraemia occurred. This does not necessarily indicate the location where MRSA was acquired, which will often be unknown. The purpose of including this table is to indicate where interventions to reduce MRSA could be targeted. It is important that the information is not used to make comparisons nor to attribute blame. When MRSA bacteraemia is first diagnosed in the accident and emergency department or medical admission unit this does not necessarily mean that community services were responsible. The patient may have acquired MRSA in the community or during a previous hospital attendance weeks, months or even years previously. Further information on this is provided by the root cause analyses summarised in section 7.1.

Table 1: MRSA by clinical area April 2011 to March 2012

Hospital	Location	Number of episodes
JCUH	Ward 1	1
JCUH	Ward 3	1
JCUH	Ward 15	1
JCUH	Ward 28	1
JCUH	Ward 36	1
JCUH	Accident and Emergency	1
FHN	Medical Admission Unit	2
Total		**8**

Information on the transmission of MRSA colonisation/ infection can be very useful because the numbers are much larger than the bacteraemia numbers. Therefore they are much more statistically robust (i.e. they are less influenced by random variation). Figures 3 and 4 show the weekly incidence of Trust-attributed MRSA colonisation/ infection for JCUH and FHN respectively. Figure 3 shows that MRSA transmission in JCUH has been continuously decreasing since 2003. Figure 4 shows that MRSA transmission at FHN has been generally decreasing, although there has been some fluctuation in this decrease with peaks occurring during the winter months of 2009/10 and 2010/11.

Figure 3: MRSA transmission at JCUH, 2003-2012

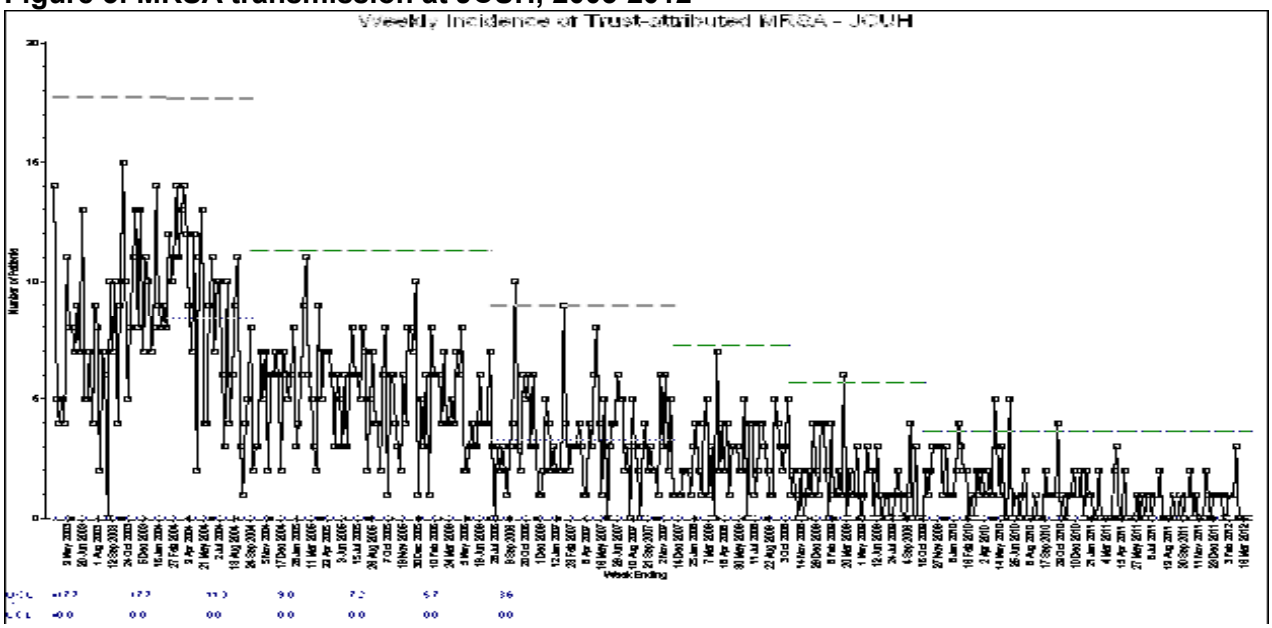
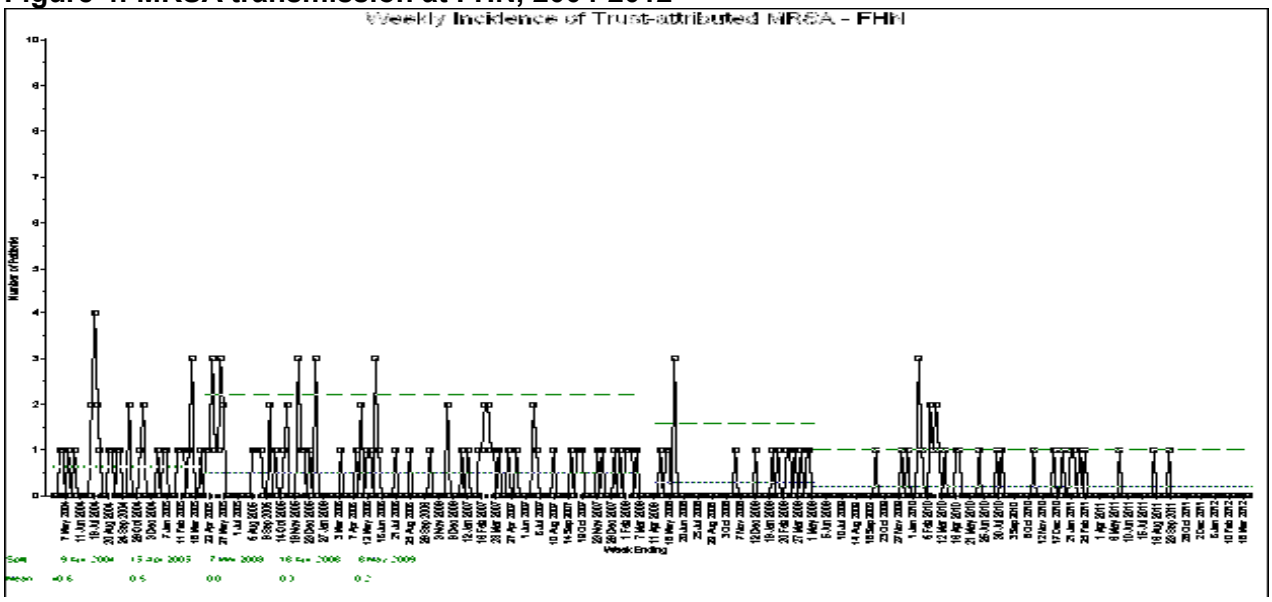


Figure 4: MRSA transmission at FHN, 2004-2012



The weekly incidence of Trust-attributed MRSA colonisation/infection is the most reliable measure of a Trust's success in controlling MRSA transmission. The data in figures 3 and 4 indicate that improvements in hand hygiene, use of personal protective equipment (PPE) and isolation over several years have reduced the risk of patients acquiring MRSA at the Trust. The fall in MRSA transmission will only lead to a fall in MRSA bacteraemia if it leads to a fall in overall MRSA prevalence in the Trust. This is because the MRSA prevalence indicates the number of patients at risk of developing an MRSA bacteraemia. Figures 5 and 6 show the prevalence of MRSA at JCUH and FHN. Figure 5 shows that there has been a steady fall in prevalence at JCUH between 2002 and 2012 but this is much less marked than the fall in MRSA bacteraemia cases. Figure 6 shows that there has been little change in MRSA prevalence at FHN since 2004. These data indicate that improvements in hand hygiene, PPE use, isolation and other general infection control practices, which have reduced MRSA transmission, have helped prevent an increase in MRSA prevalence and have subsequently helped prevent an increase in MRSA bacteraemia, but they are not responsible for the major fall in MRSA bacteraemia cases we have seen in the last 4 years.

Figure 5: Point prevalence of MRSA at JCUH at the end of each week, 2002-2012

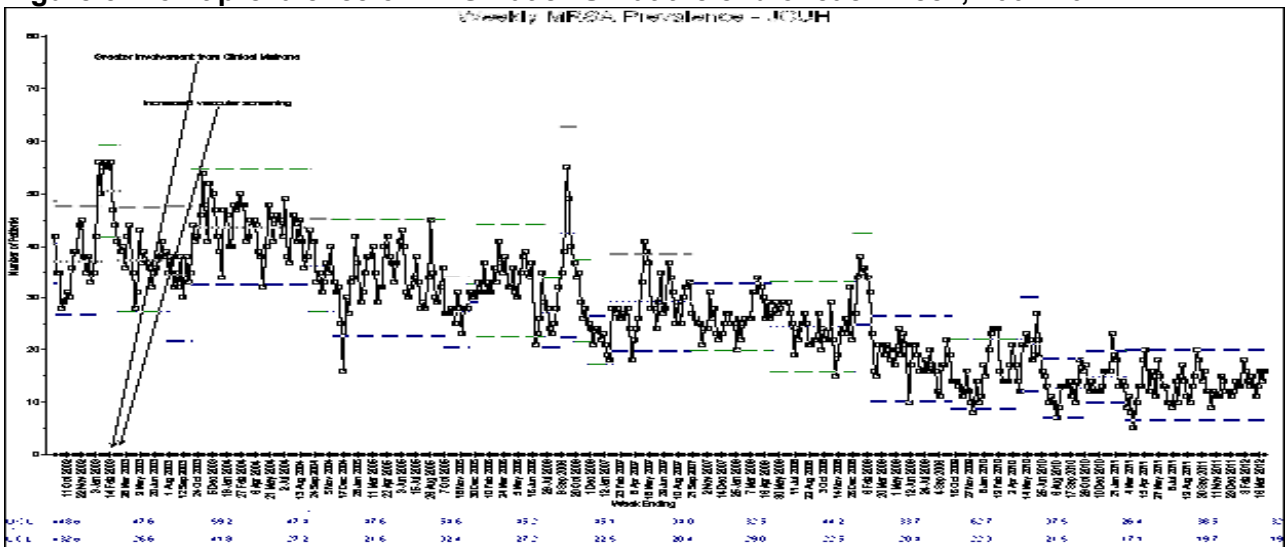


Figure 6: Point prevalence of MRSA at FHN at the end of each week, 2004-2012

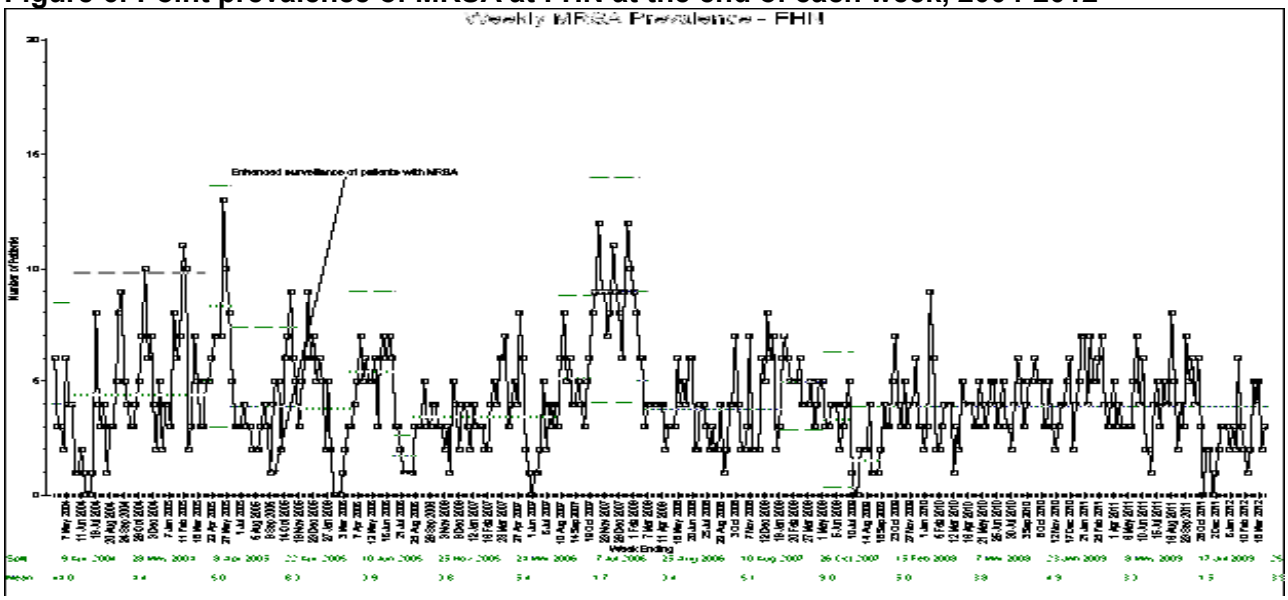
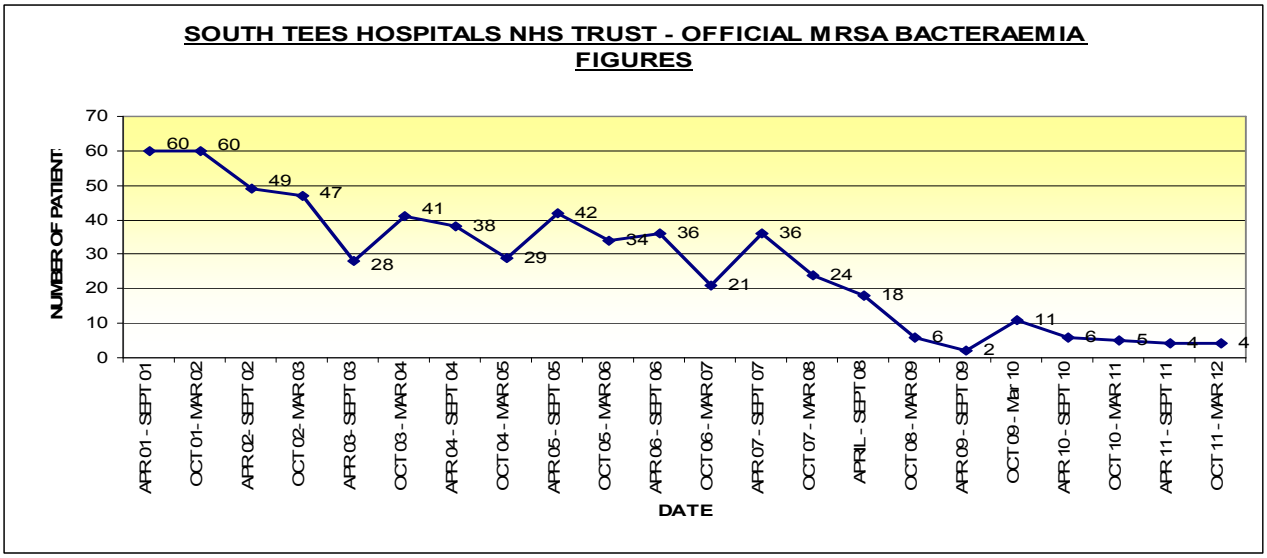


Figure 7 shows a substantial decrease in MRSA bacteraemia at the Trust since the Department of Health began mandatory reporting in 2001. In 2011/12 there was a 93% reduction in total cases compared to 2001/2. The Trust should take pride in having achieved a sustained decrease in MRSA bacteraemia at a time when services have been developing rapidly. If the Trust had not taken additional measures to reduce MRSA over the past 10 years it is inevitable that MRSA bacteraemia would have risen substantially. This is because there has been expansion of high risk services such as renal dialysis, intensive care, cardiothoracic medicine, vascular surgery and haematology/oncology. This service expansion has been more rapid in our Trust than it has been in most other large acute trusts because South Tees Hospitals NHS Foundation Trust has been through a process of transition from being essentially a district general hospital to becoming a major tertiary referral centre.

Figure 7: Official MRSA bacteraemia figures for the Trust, 2001-2012



Since June 2006 every episode of MRSA bacteraemia has been investigated as a clinical incident to help identify lessons to be learnt and to guide improvements in practice. Since February 2008 the medical director and/or director of nursing and patient safety/DIPC/deputy chief executive hold a case review meeting with the appropriate clinical staff. This has enabled a number of lessons to be learnt and has helped the Trust to focus attention on avoidable causes of MRSA bacteraemia (see section 7.1). The key methods of controlling MRSA are prevention of transmission, eradication of colonisation and prevention of colonised patients developing infections. The specific measures are:

- Prevention of transmission:
  - Hand hygiene
  - Appropriate dress code to enable hand hygiene
  - Appropriate use of personal protective equipment
  - Isolation and barrier nursing
  - Cleaning and maintenance of high risk environments (including theatres)
  - Decontamination of medical equipment
  - Avoidance of over-use of broad-spectrum antibiotics (especially ciprofloxacin and other quinolones and intravenous cephalosporins)

- Eradication of MRSA colonisation (which also helps prevent transmission)
  - Screening of patients
  - Use of MRSA decolonisation therapy (Octenisan™ and nasal mupirocin)

- Prevention of colonised patients developing infections
  - Good use of aseptic technique when performing invasive procedures and handling intravenous cannulae and urinary catheters
  - Avoidance of unnecessary intravenous cannulae and urinary catheters
  - Regular inspection of intravascular cannulae and prompt removal when there are signs of infection
  - Use of MRSA decolonisation therapy
  - Appropriate choice of antibiotics for surgical prophylaxis

- Early detection of infections and prompt, appropriate treatment

Since 2005 the Trust's efforts to reduce MRSA bacteraemia have been primarily based on the prevention of transmission (based on measures such as the World Health Organisation's 'My five moments for hand hygiene' campaign), use of eradication therapy and prevention of colonised

patients developing infections (based on measures such as the 'Saving Lives' high impact interventions). These interventions and the audits associated with them promote and assure best practice in hand hygiene, aseptic technique, central and peripheral venous cannula care, indwelling urinary catheter care, wound care and care of the ventilated patient.

1.2 MSSA bacteraemia

Between April 2011 and March 2012 there were 69 episodes of MSSA bacteraemia (60 from JCUH lab and 9 from FHN lab). 19 of these cases were classified as Trust-attributed (18 from JCUH lab and 1 from FHN lab), where the definition is the same as for Trust-attributed MRSA bacteraemias. The total and Trust-attributed MSSA bacteraemia figures have decreased 22% and 27% respectively compared to 2010/11. There was no target for MSSA bacteraemia in 2011/12.

Aseptic technique, good intravenous line care and prevention of surgical site infections are all important for the prevention of MSSA bacteraemia. Table 2 shows the locations of the patients at the time the MSSA bacteraemia occurred. This does not necessarily indicate the location where MSSA was acquired, which will often be unknown. Many patients are likely to be carriers of MSSA before admission to hospital as it is commonly found as part of the normal body flora.

Table 2: MSSA by clinical area April 2011 to March 2012

Hospital	Location	Number of episodes
JCUH	Accident and Emergency	14
JCUH	Ward 1	8
JCUH	Ward 8	4
JCUH	Ward 15	3
JCUH	Intensive care unit 3	3
JCUH	Neonatal unit	3
JCUH	Ward 4	2
JCUH	Ward 21	2
JCUH	Cardiac Care Unit	2
JCUH	Renal dialysis unit	2
JCUH	Ward 2	1
JCUH	Ward 11	1
JCUH	Ward 12	1
JCUH	Ward 14	1
JCUH	Ward 18	1
JCUH	Ward 22	1
JCUH	Ward 27	1
JCUH	Ward 29	1
JCUH	Ward 33	1
JCUH	Ward 34	1
JCUH	Ward 36	1
JCUH	Cardiothoracic intensive care	1
JCUH	Intensive care unit 2	1
JCUH	General High Dependency Unit	1
JCUH	Haematology Day Unit	1
JCUH	Radiotherapy Outpatient Unit	1
FHN	Medical Admissions Unit	1
FHN	Accident and Emergency	5
FHN	Romanby ward	1
FHN	Ainderby	1
FHN	Children's unit	1
Other	Darlington dialysis centre	1
Total		**69**

As MSSA is part of the normal flora of many patients, screening and targeted decolonisation therapy are not generally recommended. The key measures to prevent MSSA bacteraemia are as follows:

- Prevention of transmission:
  - Hand hygiene
  - Appropriate dress code to enable hand hygiene
  - Appropriate use of personal protective equipment
  - Cleaning and maintenance of high risk environments (including theatres)
  - Decontamination of medical equipment

- Prevention of colonised patients developing infections
  - Good use of aseptic technique when performing invasive procedures and handling intravenous cannulae and urinary catheters
  - Avoidance of unnecessary intravenous cannulae and urinary catheters
  - Regular inspection of intravascular cannulae and prompt removal when there are signs of infection deputy
  - Appropriate choice of antibiotics for surgical prophylaxis

- Early detection of infections and prompt, appropriate treatment

Over the last two years efforts to reduce MSSA bacteraemia have been primarily based on the 'Saving Lives' high impact interventions. These interventions and the audits associated with them promote and assure best practice in hand hygiene, aseptic technique, central and peripheral venous catheter care, indwelling urinary catheter care, wound care and care of the ventilated patient.

Since February 2008 the medical director and deputy CEO/director of nursing and patient safety (DIPC) has instructed a root cause analysis (RCA) to be performed and a case review meeting held within the relevant clinical division/directorate for every MSSA bacteraemia. In May 2011 it was agreed at the infection prevention action group only trust attributed cases of MSSA bacteraemia required an RCA.

1.3 *Clostridium difficile*-associated diarrhoea

The total figure for *C. difficile* cases for April 2011 to March 2012 is 142 if all patients, over 2 years old, are included (108 from JCUH lab and 34 from FHN lab). In 2010/11 there were 267 cases; in 2009/10 there were 293 cases; in 2008/9 there were 492 cases; in 2007/8 there were 594 cases. Therefore there has been a 47% reduction compared to last year; a 52% reduction compared to 2 years ago; a 71% reduction compared to 3 years ago; and a 76% reduction compared to 4 years ago.

The Trust target for 2011/12 was to have no more than 112 cases of Trust-attributed *C. difficile* infection. Trust-attributed means all cases occurring among inpatients in our trust excluding patients where the first positive sample was submitted on the day of admission or during the next two days (note the definition is different to that for MRSA and MSSA bacteraemia). Between April 2011 and March 2012 the Trust had 67 patients in this category (55 from JCUH and 12 from FHN) which is well below the specified target. In 2010/11 there were 125 cases; in 2009/10 there were 141 cases; in 2008/9 there were 264 cases; in 2007/8 there were 323 cases in this category, therefore there has been an 46% decrease compared to last year; a 52% decrease compared to 2 years ago; a 75% decrease compared to 3 years ago; and a 79% decrease compared to 4 years ago.

Figures 10 and 11 show the weekly numbers of *C. difficile* cases among inpatients at JCUH and FHN respectively.

Figure 10: *Clostridium difficile* cases at JCUH, 2006-2012

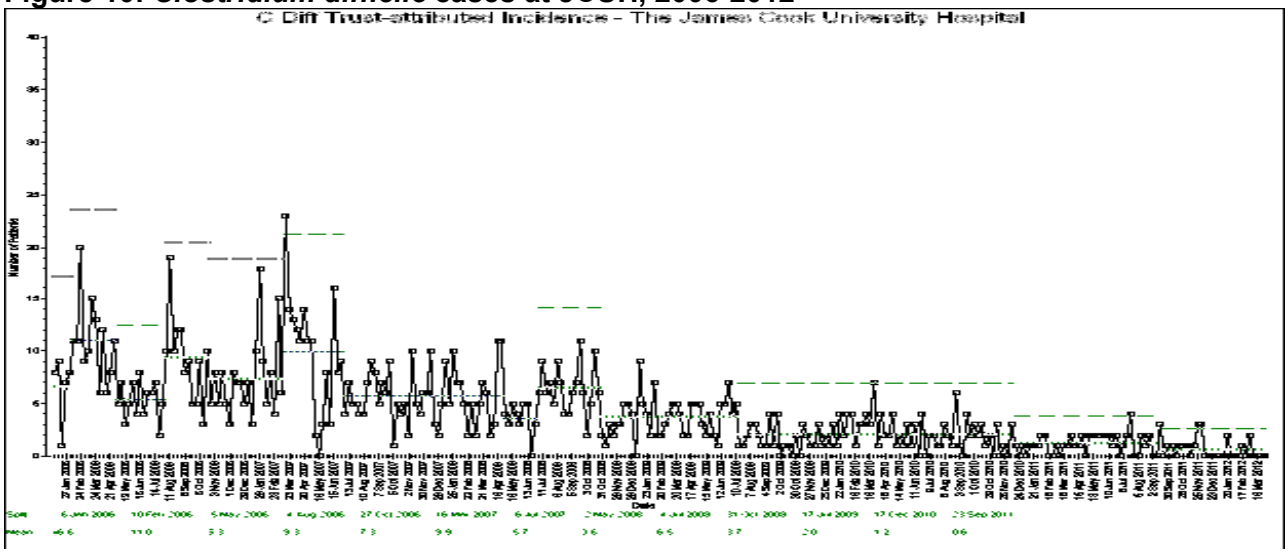


Figure 11: Clostridium difficile cases at FHN, 2006-2012

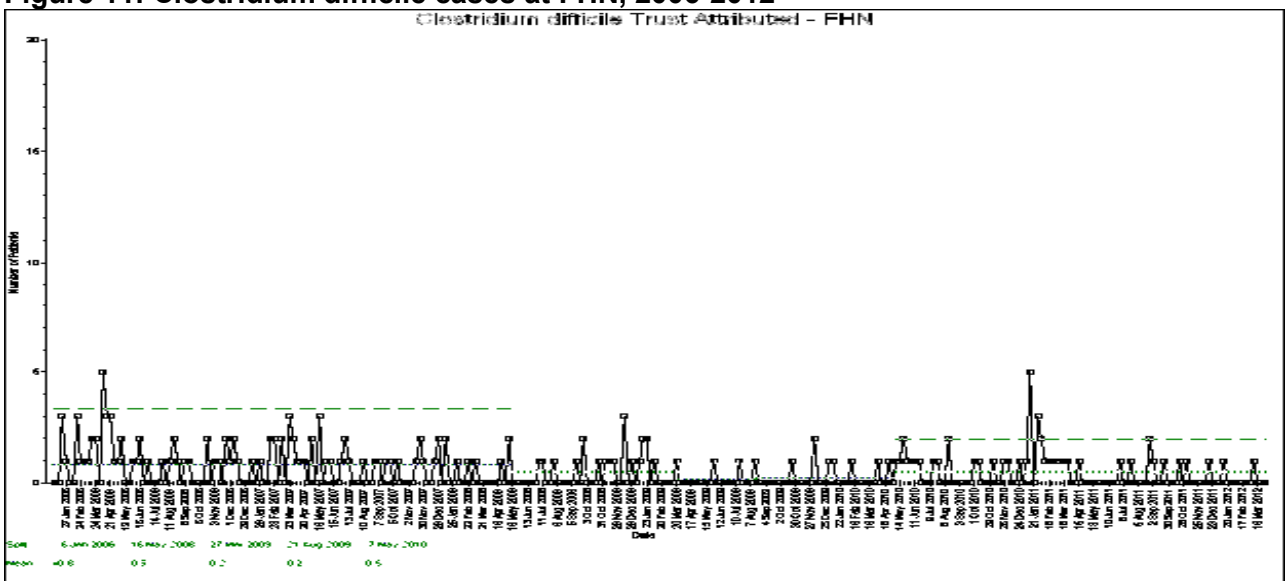


Table 3 shows the distribution of patients who had *C. difficile* isolated during the year. This does not necessarily indicate the location where *C. difficile* was acquired, which will often be unknown. A very small proportion of patients may have been carrying the bacteria before they were admitted to hospital (around 2% of the healthy population are *C. difficile* carriers).

As required by national *C. difficile* guidance, the Trust monitors how many of the patients who develop *C. difficile* die within the following 30 days, regardless of cause. Since April 2009, 156/697 (22%) have died during the 30 day follow-up period. Prior to the introduction of the *C. difficile* ward round the case fatality rate was 25%. Since the introduction of this ward round in January 2011 case fatality has fallen to 14%.

Table 3: *C. difficile* by clinical area April 2011 to March 2012

Hospital	Location	Number of episodes
JCUH	Ward 15	10
JCUH	Ward 1	8
JCUH	Ward 7	8
JCUH	Ward 8	8
JCUH	Intensive care unit 3	6
JCUH	Ward 4	5
JCUH	Ward 9	5
JCUH	Ward 3	4
JCUH	Ward 10	1
JCUH	Ward 11	1
JCUH	Ward 12	3
JCUH	Ward 29	3
JCUH	Ward 14	2
JCUH	Ward 25	2
JCUH	Intensive care unit 2	2
JCUH	Surgical high dependency unit	2
JCUH	Endoscopy outpatients	2
JCUH	Ward 18	1
JCUH	Ward 24	1
JCUH	Ward 27	1
JCUH	Ward 28	1
JCUH	Ward 31	1
JCUH	Ward 34	1
JCUH	Ward 37	1
JCUH	General high dependency unit	1
JCUH	Accident and emergency	1
JCUH	Coronary care unit	1
FHN	Ainderby ward	3
FHN	Romanby ward	6
FHN	Medical admissions unit	6
FHN	Mowbray unit	2
FHN	Children's unit	1
FHN	Intensive care unit	2
FHN	Gara ward	1
FHN	Haematology outpatients	1
Redcar Primary Care Hospital		2
Carter Bequest Hospital		2
Lambert Hospital		1
Non-Trust location		33
Total		**142**

1.4 Surveillance for other alert organisms

ESBL-producing coliforms are highly antibiotic-resistant Gram-negative bacteria. The majority of isolates of these organisms are from urinary tract infections, but they also cause wound infections, pneumonia and bacteraemia. The majority of infections are community-acquired. For making comparisons between years the data on bacteraemia is most valid. They are not included in mandatory national surveillance. In 2011/12 there were 25 bacteraemias due to ESBL-producing

coliforms, which is a 26% decrease compared to 2010/11 and a 39% decrease compared to 2009/10.

Glycopeptide-resistant Enterococci are highly antibiotic-resistant Gram-positive bacteria. The majority of infections are healthcare-associated. They are included in mandatory national surveillance. In 2011/12 there was 1 bacteraemia caused by glycopeptide-resistant Enterococci, which is an 87% decrease compared to 2010/11.

Table 4: Other alert organisms detected in 2011/12

	Total for 2011/2012	Total for 2010/2011
Bacteraemia due to glycopeptide-resistant enterococci	1	8
Bacteraemia due to E. coli (Trust-attributed cases since April 2011 in brackets using MRSA definition)	352 (107)	338 (NA)
ESBL producing coliform infections - sample taken in community - sample taken in our trust - bacteraemias	976 571 405 25	1064 660 404 34
Other alert organisms - hospital-acquired invasive group A streptococcus - all other alert organisms	 0 0	 1 0

1.5 Surveillance for other alert conditions

See section 7.2 for further information on toxic megacolon and deaths which were potentially linked to *C. difficile*.

There was a single case of hospital-acquired invasive group A streptococcus infection in 2010/11. No cases of any of the other alert conditions included in the surveillance policy (HIC 29) have been identified since April 2006.

Legionella was detected in the water supply in several areas tested last year. The latest round of testing has been negative. Repeat testing is planned for March 2012.

1.6 Orthopaedic surgical site infection surveillance

The division of trauma conduct mandatory orthopaedic surgical site infection surveillance at both the JCUH and FHN sites for a three month period within the year.

2. OUTBREAKS

During the winter months each year there have been outbreaks of Norovirus infection, which have caused significant disruption to the Trust. The Trust was particularly seriously affected by Norovirus during the winter of 2006/2007. During the winter of 2010/11 the situation improved

dramatically at JCUH, where there were no outbreaks of Norovirus. Unfortunately this was not sustained this year and we have been significantly affected by Norovirus outbreaks.

When patients are admitted with Norovirus-related gastroenteritis it is very difficult to prevent them infecting other patients and staff on the same ward because the virus is airborne and spread by inhalation. Substantial efforts need to be made to prevent the spread of Norovirus because it can cause serious disruption to the Trust's services due to prolonging length of stay and blocking beds. Although ward closures may cause some disruption to services, overall they reduce the total disruption caused by the outbreak.

In total between April 2011 and March 2012 there were 14 hospital outbreaks of Norovirus infection (6 at JCUH and 6 at FHN and 2 at community hospitals). The Health Protection Agency report that there was considerable Norovirus outbreak activity nationally, regionally and locally in the community.

Table 6: Comparison of the number of patients and staff affected by winter vomiting disease during outbreaks at JCUH and FHN between 2006/7 and 2011/12

Year	Patients affected	Staff affected
2006/7	606	151
2007/8	221	82
2008/9	187	54
2009/10	215	102
2010/11	40	30
2011/12*	250	114

*In order to ensure comparability between years the community hospitals are excluded from this table.

During 2010/11 there was a cluster of cases of severe *C. difficile* at FHN. This outbreak was officially declared over in August 2012.

3. 'SAVING LIVES'; A DELIVERY PROGRAMME TO REDUCE HEALTHCARE-ASSOCIATED INFECTION INCLUDING MRSA

'Saving Lives' consists of several high impact intervention (HII) audit tools. These were first implemented across the Trust during 2006 and they have continued throughout 2011/12. An electronic data entry system was introduced in 2007 and this was revised in 2008. There are currently some problems with this system and these have been difficult to solve. Saving Lives remains a major component of the Trust's strategy to combat healthcare-associated infections.

4. HAND HYGIENE

Hand hygiene compliance is continually monitored by clinical staff through monthly 'clean**your**hands' audits. The audit tool is based on the World Health Organisation 'My 5 moments for hand hygiene' guidance. Clinical areas should identify areas of non-compliance at the time of audit, develop individual action plans and access ongoing compliance data via the Trust's intranet. Trust-wide compliance data is collated by division.

The '5 moments of care for hand hygiene' are:

- Before patient contact
- Before performing a clean or aseptic procedure
- After exposure to the patient's body fluids
- After patient contact

- After contact with the patient's surroundings

The 'My 5 moments of care' remains a major component of the Trust's strategy to combat healthcare-associated infections.

5. ANTIBIOTIC PRESCRIBING

In January 2008, the Trust appointed an antibiotic pharmacist, who works closely with the infection control team. The activities carried out by the antibiotic pharmacist include:

1. Antibiotic ward rounds
2. Prescribing audits
3. Service developments

The antibiotic pharmacist role has become a key part of the Trust's infection prevention and control measures. It would be worth employing additional antibiotic pharmacists to increase the work which could be carried out.

6. STAFF TRAINING

A detailed training strategy is included in the infection prevention and control team's three year strategy. All staff working in the Trust should receive infection control training during their induction course and they should all access an infection control update during mandatory training. Ideally clinical staff should also complete an appropriate Department of Health 'e-learning' programme and assessment. Staff members' appraisals should be used to identify their individual infection prevention and control training needs and the most relevant training programmes.

Clinical matrons have a key role in ensuring there are good infection control practices within their clinical areas. All clinical matrons must attend the infection prevention and control 4-day course and ward managers are encouraged to attend. Infection prevention and control link practitioners should also attend this course and/or the 13-day infection prevention and control course based at Teesside University.

The role of the infection prevention and control link practitioner was formally developed in all clinical areas. Key points include one day per month (7.5 hours) of protected time to complete audits, attend training sessions, conduct clinically based training and competencies.

7. AUDIT ACTIVITY WITH IMPORTANT CLINICAL GOVERNANCE IMPLICATIONS

Two audits will be summarised here because they have important clinical governance implications.

7.1 MRSA root cause analysis

Since June 1st 2006, a root cause analysis has been performed on each case of MRSA bacteraemia. In 2011/12, 8 episodes of bacteraemia were investigated. Three of these patients died during the current admission. A report has been produced on these MRSA bacteraemias for those who require more detail than is available in the current summary (see attached document).

An avoidable causal factor, related to our trust, was identified in 0 bacteraemias (see table 6). In 1 case a primary care factor was felt to be a contributor to the MRSA bacteraemia. In 0 cases an avoidable causal factor was found in relation to the care delivered by another acute NHS trust.

The causes of MRSA bacteraemia are summarised in table 6. The most common causes were parotitis and community-acquired pneumonia.

Table 6: Summary of MRSA bacteraemia episodes 2011/12

Cause	Number of episodes (Trust-attributed cases)	Number where an avoidable factor was identified in our Trust	Number of patients who died due to MRSA or who died during the current episode of illness
Parotitis	2 (2)	0	1
Community-acquired pneumonia	2 (0)	0	0
Catheter-associated urinary tract infection	1 (0)	0	0
Oesophageal cancer	1 (0)	0	1
Unknown	2 (0)	0	1
Total	**8** (2)	**0**	**3**

7.2 *C. difficile* death certificate audit

During 2007 the Healthcare Commission published a report on an investigation into deaths which had occurred at Maidstone and Tunbridge Wells NHS Trust which were caused by *C. difficile*. In response to this, in 2007/8 we audited all deaths, from April 2005 to March 2008, at South Tees Hospitals where *C. difficile* was recorded on the death certificate. This was a similar method to that used by the Healthcare Commission. This audit was repeated in 2008/9, in 2009/10, in 2010/11 and in 2011/12. Separate audits are now produced for JCUH and FHN.

In 2011/12, there were 7 cases included in the audit of JCUH cases. The death certificate counterfoils indicated that for 3 of these patients *C. difficile* or toxic megacolon was recorded as the primary cause of death (under Ia). For 4 patients *C. difficile* was recorded as a contributing factor in the patient's death (see table 7). In the infection control doctor's assessment, *C. difficile* was the main cause of death (part Ia) for 3 patients and was a contributing factor (part II) for 4 patients, confirming the reliability of the death certificates. For 1 of the 7 patients where it was felt that *C. difficile* should have been included in the death certificate a single deficiency in care was identified. The care of patients who died with *C. difficile* was better than in all of the previous audits.

Table 7: Classification of cases where *C. difficile* was entered on the death certificate, 2011-2012

Section of death certificate	Number of death certificates	How this audit would have classified the death certificate
Ia (ie main cause)	3	3
Ib (predisposing factor)	0	0
Ic (predisposing factor)	0	0
II (contributory cause)	4	4
Was not or would not have been included on death certificate	0	0
Unable to complete death certificate (ie post-mortem was needed but not performed)	NA	0

For those who require more details of this audit the report is attached to this infection control report for both JCH and FHN.

8. GLOSSARY OF TERMS

Bacteraemia Infection identified in a patient's blood

'Cleanyourhands' A campaign by the National Patient Safety Agency to promote hand hygiene. The three components are availability of alcohol gel or alternative hand hygiene facilities at every point of patient contact, an eye-catching poster campaign which changes monthly and a monthly observational audit.

Clostridium difficile A bacteria which causes diarrhoea, most frequently in elderly patients who have taken antibiotics. The Department of Health collects data on these infections in patients over 65 years who have the toxin produced by this organism detected in their stools. Although the data is presented by Trust, the patients with the illness may be in hospital or in the community. Most cases of *Clostridium difficile*-associated diarrhoea are not severe. However severe disease is becoming more common in some parts of the country and outbreaks have occurred in some hospitals. South Tees has not experienced outbreaks of severe infection.

DIPC Director of Infection Prevention and Control. The DIPC is the director of nursing. She has corporate responsibility for infection control and healthcare-associated infections on the Trust Board.

Extended spectrum beta-lactamase (ESBL) producing coliforms
Coliforms are bacteria which live in the intestines. If a patient is given antibiotics they can acquire coliforms which are resistant to powerful beta-lactam antibiotics (e.g. all penicillins and cephalosporins). These bacteria are difficult to treat because they are resistant to most commonly used antibiotics. ESBL-producing coliforms are not a part of national mandatory surveillance.

Glycopeptide-resistant enterococci (GRE)
Enterococci are bacteria which live in the intestines. If a patient is given antibiotics they can acquire Enterococci which are resistant to powerful glycopeptide antibiotics (e.g. Vancomycin). These bacteria

	do not often cause infections but when they do they are difficult to treat because they are resistant to most commonly used antibiotics. These infections are extremely rare in our Trust, but some hospitals have a major problem. National mandatory surveillance includes episodes of GRE bacteraemia.
HCAI	Healthcare-associated infection. This term refers to infections that are related to the care delivered by healthcare providers. It does not necessarily infer that the patient is an inpatient. Also it does not necessarily infer that the organism responsible was acquired from the healthcare provider. Many HCAIs are caused by the patient's own bacterial flora, which establish an infection because of a healthcare-related procedure (e.g. an operation).
Hospital-acquired	This term is often used for infection or colonisation which is first identified more than 48 hours after admission. However the definition is not perfect as patients who satisfy this criteria may have had unknown infection or colonisation prior to admission.
MSSA	Meticillin-sensitive *Staphylococcus aureus* is not a part of national mandatory reporting.
MRSA	Meticillin-resistant *Staphylococcus aureus*. The Department of Health collects data on bloodstream infections (bacteraemia) due to this infection. Although the data is presented by Trust, the patients with the illness may be in hospital or in the community.
PEAT	Patient environment action team. This is an audit of the patient environment.
Saving Lives	A delivery programme produced by the Department of Health to reduce healthcare-associated infections including MRSA. South Tees is fully committed to this programme.
Surgical site infection	This is a wound infection which occurs after a patient has had an operation. Wounds can be classified as 'superficial' or 'deep'. A superficial wound is one which affects the skin and is usually straightforward to treat. A deep wound is more serious and it may require removal of a new prosthetic joint.

Appendix 1

South Tees Hospitals NHS
NHS Trust

Audit of deaths where Clostridium difficile was included on the death certificate at JCUH

CLINICAL AUDIT DATABASE NO. 1685

April 2011 - March 2012

Audit Report By:

Richard Bellamy

Lead Clinician;

Richard Bellamy

1. Background & Aims

During 2007 the Healthcare Commission published a report on an investigation into deaths which had occurred at Maidstone and Tunbridge Wells NHS Trust which were caused by Clostridium difficile. Following the publication of this audit it was decided to attempt to identify how many deaths at South Tees Hospitals NHS Trust may have been caused by Clostridium difficile. It was decided that we would audit deaths where Clostridium difficile was recorded on the death certificate. This is a similar method to that used by the Healthcare Commission. In the first report death certificates were examined from all wards at JCUH and FHN from April 2005 to March 2008 inclusive (ie 36 months). I examined the cases in detail to determine if Clostridium difficile had contributed to each patient's death and if it had been the primary cause of death. A second cycle of this audit prospectively covered the period April 2008 to March 2009, the third annual report cycle prospectively covered 1st April 2009 to 31st March 2010 and the third annual report cycle prospectively covered 1st April 2010 to 31st March 2011 for JCUH site only. This is the fifth report and prospectively covers 1st April 2011 to 31st March 2012 for JCUH site. FHN is now covered separately.

I have attempted to determine whether there were deficiencies in the care of patients with Clostridium difficile by examining the same factors considered by the healthcare commission:

- Use of inappropriate broad-spectrum antibiotics
- Whether the patient had appropriate investigations
- Whether appropriate specialists were involved in the patient's care
- Whether the patient received appropriate treatment for Clostridium difficile
- Whether there was adequate management of the patient's nutritional needs
- Whether there was adequate management of the patient's hydration needs
- Whether skin care had been adequate
- Whether there had been other deficiencies in care which may have contributed to the patient's death

2. Objective of Audit

To determine how many patients at James Cook University Hospital died as a direct result of Clostridium difficile infection between April 2011 and March 2012.

To determine how many patients at James Cook University Hospital died between April 2011 and March 2012 where Clostridium difficile contributed to the cause of death.

To determine whether patients, who died directly from Clostridium difficile or where this was a contributing factor, were correctly managed.

3. Standards of care to be measured

For patients who died from Clostridium difficile:

- 100% should not have received inappropriate broad-spectrum antibiotics
- 100% should have had appropriate investigations
- 100% should have had appropriate specialists involved in their care
- 100% should have received appropriate treatment for Clostridium difficile
- 100% should have had adequate management of their nutritional needs

- 100% should have had adequate management of their hydration needs
- 100% should have had adequate skin care (ie should not have developed a pressure sore).
- 100% should not have had any other deficiencies in care which may have contributed to their death

4. Method

This was a prospective audit. All consultants and ward managers were informed that Dr Bellamy must be informed of any deaths where Clostridium difficile was recorded on the death certificate. Since January 2011 all cases were seen by the weekly Clostridium difficile ward round and this ensured all Clostridium difficile-associated deaths were identified. After identifying the deaths, the patients' notes were reviewed along with all radiological investigations and all results on the pathology database. A standard pro-forma was completed from the former Healthcare Commission (see Appendix 1). As this did not identify deficiencies in care and lacked details, a further root cause analysis form was completed, which was based on the information collected by the Healthcare Commission at Maidstone and Tunbridge Wells (see Appendix 2).

5. Findings

7 death certificates were identified where Clostridium difficile (or a recognisable abbreviation) or pseudomembranous colitis had been recorded on the death certificate. 7 deaths were identified prospectively when the doctors concerned informed Dr Bellamy about the death. There were 0 cases where Dr Bellamy and the coroner were not informed.

It is possible that there have been other deaths due to Clostridium difficile between April 2011 and March 2012 which this audit has failed to detect. The reasons for this are as follows:

- The coroner may have completed the death certificate and entered Clostridium difficile, without Dr Bellamy being aware of this.
- The general practitioner may have completed the death certificate if the patient had been discharged from hospital.

The significance of the above reasons is that it is possible that there are additional deaths which have been recorded as Clostridium difficile which are held by the Office for National Statistics which were not identified by this audit. It is extremely unlikely that this will be more than 1-2 cases.

7 patients were included in this audit. The death certificate counterfoils indicated that for 2 of these patients Clostridium difficile or toxic megacolon was recorded as the primary cause of death (under Ia). For 6 patients Clostridium difficile was recorded as a contributing/predisposing factor in the patient's death (for 0 patients it was recorded under Ib, for 2 patients under 1c and for 4 patients under II) (see table 1 for summary).

Table 1: Inclusion of Clostridium difficile in the classification of the cause of death

Section of death certificate	Number of death certificates	How this audit would have classified the death certificate
Ia (ie main cause)	**3**	**3**
Ib (predisposing factor)	**0**	**0**
Ic (predisposing factor)	**0**	**0**
II (contributory cause)	**4**	**4**

Was not or would not have been included on death certificate	**0**	**0**
Unable to complete death certificate (ie post-mortem was needed but not performed)	**NA**	**0**

Careful analysis of the notes did not suggest that any death certificates incorrectly included C. difficile when it was not relevant. In this audit no patients had been insufficiently investigated such that the causes of death could not be ascribed.

In my assessment Clostridium difficile was the definite or probable main cause of death for 3 patients and the possible main cause of death for 1 patient. It was judged to be unlikely to be the main cause of death or not the main cause for 3 patients. Among the 4 patients for whom Clostridium difficile was not the main cause of death, it was judged that for all 4 patients it was probably a contributing/predisposing factor. It was judged to be unlikely or not to have been a contributing/predisposing factor for 0 patients (see table 2 for classification). If I had completed the death certificates myself I would have coded Clostridium difficile as the main cause of death (Ia) for 3 patients and as a contributing factor (II) for 4 patients. In the audit this year there were no cases for which I could not have completed the death certificate and a coroner's post-mortem would have been needed. See table 1 for summary.

Table 2: Cases where Clostridium difficile was judged to be the main cause or a contributing/predisposing cause of death

	Main cause of death	Contributing/predisposing factor (excluding cases where classed as definite, possible or probable main cause of death)
Definite	2	3 (1)
Probable	1	4 (4)
Possible	1	0
Unlikely	3	0
Not involved	0	0
Unable to answer	0	0

For the 7 patients where Clostridium difficile was judged to have been appropriate to write on the death certificate as a contributing/predisposing factor or as the main cause of death the following deficiencies in care were identified:

- 0/7 had received inappropriate broad-spectrum antibiotics.
- 0/7 had not had appropriate investigations (eg an abdominal X ray).
- 0/7 did not have appropriate specialists (gastroenterologists, infectious disease physicians or microbiologists) involved in their care.
- 0/7 did not receive appropriate initial treatment for Clostridium difficile. 0/7 did not receive vancomycin at a time when it was indicated. In 1/7 there was a significant delay in starting treatment.
- 0/7 did not have an adequate assessment of their nutritional needs and 0/7 probably became malnourished despite this.

- 0/7 did not have adequate monitoring of fluid balance and 0/7 suffered clinically important dehydration as a result.
- 0/7 did not have an adequate assessment of skin condition and 0/7 developed a pressure sore.
- 0/7 had other deficiencies in care which may have contributed to death.

6. Conclusions

This audit identified 3 patients where Clostridium difficile had definitely or probably been the main cause of death. A further 4 cases were identified where it was definitely or probably a contributory factor. This is many fewer than was found in the Healthcare Commission investigation at Maidstone and Tunbridge Wells and also a decrease compared to 2008/9 and 2009/10 and similar to 2010/11.

For 1 of the 7 patients where it was felt that Clostridium difficile should have been included in the death certificate a single deficiency in care was identified. The care of patients who died with Clostridium difficile was better than in all of the previous audits.

The coroner was notified of all cases where Clostridium difficile had been recorded on the death certificate. This was better than previous audits.

7. Recommendations

1. For any patient who has severe Clostridium difficile infection a gastroenterologist, infectious diseases physician or microbiologist should be consulted about his/her care. This is to ensure the patient receives appropriate management and treatment.
2. Patients who die where Clostridium difficile may have contributed to the death should be discussed with the coroner. Dr Bellamy should also be informed.

8. Action Plan

1. This report will be presented to the Infection Prevention Action Group and included as an appendix to the infection control annual report.
2. The Clostridium difficile multi-disciplinary ward round will continue at JCUH.
3. This audit should continue so that all future deaths where Clostridium difficile is recorded on the death certificate will be analysed using the root cause analysis tool and Healthcare Commission tool.

Acknowledgements

I am very grateful to Safeena Ali and Maria Taylor in clinical audit for diligently checking the death certificate books to ensure that I had been notified about all patients where Clostridium difficile had contributed to the death.

Reviewers had to make a judgment on the likelihood of *C. difficile* infection (CDI) contributing to or being the main cause of an individual's death **based on their review of that person's records / case notes**. Each case was assessed by at least two reviewers who then discussed their assessment of contribution / cause of death and agreed a joint assessment.

The questions below were used to help reviewers make these judgments – they **were not** in themselves used to determine the final assessments directly.

Appendix 1: Healthcare Commission audit tool

Cause of Death

Please specify if and how CDI was mentioned on the patient's death certificate

☐ Yes If Yes, Category
☐ No
☐ Unable to determine

How would you categorise the patient's condition on admission?

☐ The patient had an acute or chronic condition expected to be rapidly fatal within 1 month

☐ The patient had an acute or chronic condition expected to be fatal within 1-12 months

☐ The patient had an acute or chronic condition expected to be fatal in over 12 months

☐ The patient had an acute or chronic condition not expected to be fatal

☐ Insufficient data to categorise as above

If insufficient data, please specify

Was there evidence that the patient was recovering from the illness for which they were admitted?

☐ Yes ☐ No ☐ N/A ☐ Unable to determine

Was there evidence that the patient died as a direct result of the admitting illness?

☐ Yes ☐ No ☐ N/A ☐ Unable to determine

Aside from CDI, what other serious illnesses were diagnosed in hospital?

Illness	Comment on severity

Was there evidence that diarrhoea and / or other symptoms and signs of CDI had improved before death?

☐ Yes ☐ No ☐ N/A ☐ Unable to determine

Was any of the following present after diagnosis of CDI?

Marker	Yes	No	Not measured or recorded
White cell count > 15,000	☐	☐	☐
Creatinine level > 150	☐	☐	☐
Albumin level < 25	☐	☐	☐
CRP level > 50	☐	☐	☐
Fever $\geq$ 38^{o}C	☐	☐	☐
Abdominal pain, tenderness or distension	☐	☐	☐
Diarrhoea > 5 times a day	☐	☐	☐
Deterioration in mental status not explicable by other illness	☐	☐	☐

Was there evidence that the clinical course was:

	Yes	No	Unable to determine
Compatible with death from an admission illness?	☐	☐	☐

Compatible with death from a pre-existing illness?	☐	☐	☐
Compatible with death from a complicating illness (not CDI)?	☐	☐	☐
Compatible with severe CDI?	☐	☐	☐
Compatible with death from CDI?	☐	☐	☐

Does the evidence suggest that in this patient CDI:

	Definitely	Probably	Possibly	Unlikely	No
Contributed to this patient's death?	☐	☐	☐	☐	☐
Was the primary cause of death?	☐	☐	☐	☐	☐

Please comment on the above:

Appendix 2: Clostridium difficile death certifcation audit form (following items covered in the Maidstone and Tunbridge Wells investigation)

Patient's name

Date of birth

Hospital number

Dates of positive C difficile positive samples

Date of death

Coding of death certificate

- Ia
- Ib
- Ic
- II

Description of patient episode

Was the patient appropriately assessed for C difficile disease (radiology etc)?

Were appropriate speciailists involved (gastroenterology, ID or microbiology)?

Did the patient receive broad-spectrum antibiotics which were inappropriate?

Was the patient given appropriate treatment for C difficile infection?

Was this treatment commenced prior to the stool result being available, at diagnosis of C difficile or only after unacceptable delay?

Was the patient treated with oral vancomycin?

Was fluid balance monitored appropriately?

Was dehydration appropriately managed?

Was nutritional status adequately assessed?

Was feeding provided appropriately?

Was the patient isolated?

Did isolation occur when diarrhoea began or only when C difficile diagnosed?

Did the patient have an assessment of pressure areas?

Did the patient develop a pressure sore during the episode?

Were there any other apparent deficiencies in care?

Post-mortem information

Conclusion

Lessons learnt

Did C difficile contribute to the patient's death?

1. Definite (post-mortem findings and/or Ia or lower and bowel symptoms, hydration or nutrition definitely contributed to death)
2. Probable (Ib or lower and bowel symptoms, hydration or nutrition probably contributed to death)
3. Possible (Ib or lower and unclear whether bowel symptoms, hydration or nutrition probably contributed to death)
4. Unlikely (diarrhoea not significant prior to death)
5. No (response to treatment, asymptomatic prior to death)

Was C difficile the main cause of the patient's death?

1. Definite (post-mortem findings and/or Ia and compatible with information in notes)
2. Probable (Ib or lower and no other reasonable cause of death)
3. Possible (Ib or lower and other reasonable cause of death found in addition)
4. Unlikely (diarrhoea not significant prior to death)
5. No (response to treatment, asymptomatic prior to death)

Given all of the information how would I have coded death certificate?

Ia
Ib
Ic
II

Signature_____ GMC number_____

Appendix 2

South Tees Hospitals NHS
NHS Trust

Audit of deaths where Clostridium difficile was included on the death certificate at FHN

CLINICAL AUDIT DATABASE NO. 3703

1st April 2011 – 31st March 2012

Audit Report By;

John Hovenden

Lead Clinician;

John Hovenden

1. Background & Aims

During 2007 the Healthcare Commission published a report on an investigation into deaths which had occurred at Maidstone and Tunbridge Wells NHS Trust which were caused by Clostridium difficile. Following the publication of this audit it was decided to attempt to identify how many deaths at South Tees Hospitals NHS Trust may have been caused by Clostridium difficile. It was decided that we would audit deaths where Clostridium difficile was recorded on the death certificate. This is a similar method to that used by the Healthcare Commission. In the first report death certificates were examined from all wards at JCUH and FHN from April 2005 to March 2008 inclusive (ie 36 months). Dr Bellamy examined the cases in detail to determine if Clostridium difficile had contributed to each patient's death and if it had been the primary cause of death. A second cycle of this audit prospectively covered the period April 2008 to March 2009 and the third annual report cycle prospectively covered 1st April 2009 to 31st March 2010. A fourth report was recently produced by Dr R Bellamy, covering the period 1st April 2010 to 31st March 2011 for JCUH site only, and a separate report was produced by Dr Hovenden for the FHN site for the period 1st April 2010 to 31st March 2011. This is a report for 1st April 2011 to 31st March 2012 for the FHN site, and is the second such report for the FHN site.

I have attempted to determine whether there were deficiencies in the care of patients with Clostridium difficile by examining the same factors considered by the healthcare commission:

- Use of inappropriate broad-spectrum antibiotics
- Whether the patient had appropriate investigations
- Whether appropriate specialists were involved in the patient's care
- Whether the patient received appropriate treatment for Clostridium difficile
- Whether there was adequate management of the patient's nutritional needs
- Whether there was adequate management of the patient's hydration needs
- Whether skin care had been adequate
- Whether there had been other deficiencies in care which may have contributed to the patient's death

2. Objective of Audit

To determine how many patients at Friarage Hospital, Northallerton died as a direct result of Clostridium difficile infection between 1st April 2011 and 31st March 2012.

To determine how many patients at Friarage Hospital, Northallerton died between 1st April 2011 and 31st March 2012 where Clostridium difficile contributed to the cause of death.

To determine whether patients who died directly from Clostridium difficile, or where this was a contributing factor, were correctly managed.

3. Standards of care to be measured

For patients who died from Clostridium difficile:

- 100% should not have received inappropriate broad-spectrum antibiotics
- 100% should have had appropriate investigations
- 100% should have had appropriate specialists involved in their care
- 100% should have received appropriate treatment for Clostridium difficile
- 100% should have had adequate management of their nutritional needs
- 100% should have had adequate management of their hydration needs

- 100% should have had adequate skin care (ie should not have developed a pressure sore).
- 100% should not have had any other deficiencies in care which may have contributed to their death

4. Method

This was a prospective audit. All consultants and ward managers were informed that Dr Bellamy must be informed of any deaths where Clostridium difficile was recorded on the death certificate. Dr Bellamy has informed Dr Hovenden of such deaths at FHN. Since 15th March 2011 all cases were seen on the weekly Clostridium difficile ward round and this has ensured all Clostridium difficile-associated deaths were identified. After identifying the deaths, the patients' notes were reviewed along with all radiological investigations and all results on the pathology database. A standard pro-forma was completed from the Healthcare Commission (see Appendix 1). As this did not identify deficiencies in care and lacked details, a further root cause analysis form was completed, which was based on the information collected by the Healthcare Commission at Maidstone and Tunbridge Wells (see Appendix 2).

5. Findings

One death certificate was identified where Clostridium difficile was recorded on the death certificate.

It is possible that there have been other deaths due to Clostridium difficile between 1st April 2011 and 31st March 2012 which this audit has failed to detect. The reasons for this are as follows:

- The coroner may have completed the death certificate and entered Clostridium difficile, without Dr Hovenden being aware of this.

- The general practitioner may have completed the death certificate if the patient had been discharged from hospital.

- A patient may have died of Clostridium difficile and this information included on the death certificate, but Dr Hovenden not informed of the death.

The significance of the above reasons is that it is possible that there are additional deaths which have been recorded as Clostridium difficile which are held by the Office for National Statistics which were not identified by this audit. It is extremely unlikely that this will be more than 1-2 cases.

One patient was included in this audit. The death certificate counterfoil indicated that for this patient Clostridium difficile was recorded as a predisposing factor in the patient's death (under Ib).

In my assessment, Clostridium difficile was a possible contributor to the death of the patient, and a possible main cause of death. I would not have completed the death certificate and a coroner's post-mortem would have been needed.

For this patient:

- an inappropriate broad-spectrum antibiotic was administered.
- the patient did not receive appropriate investigations (eg an abdominal X ray).
- appropriate specialists (gastroenterologists, infectious disease physicians or microbiologists) were involved in the care.
- the patient did not receive appropriate initial treatment for Clostridium difficile, as initial assessment was inadequate. The patient did not receive vancomycin at a time when it may have been indicated, due to inadequate assessment.
- the patient did not have an adequate assessment of nutritional needs at all times of care. There was no evidence for malnourishment during the hospital admission.
- the patient did not have adequate monitoring of fluid balance
- the patient did not have an adequate assessment of skin condition, but did not develop a pressure sore.
- malnutrition scoring was not performed adequately, and urine specimens were not submitted to the laboratory when indicated (this may have influenced antibiotic administration).

6. Conclusions

This audit identified one patient where Clostridium difficile possibly contributed to death, and possibly was the main cause of death. It is my opinion that I could not have completed the death certificate without a post-mortem examination. This is a much lower number of deaths than in the previous year (when an outbreak was at its peak). Audit data, individualised to the FHN for prior years, is not available.

Deficiencies in care were identified in this case.

7. Recommendations

3. For any patient who has severe Clostridium difficile infection a gastroenterologist, infectious diseases physician or microbiologist should be consulted about his/her care. This is to ensure the patient receives appropriate management and treatment.
4. Patients who die where Clostridium difficile may have contributed to the death should be discussed with the coroner. Dr Bellamy should also be informed.
5. The monitoring and management of fluid balance recording requires regular audit.

8. Action Plan

4. This report will be presented to the Infection Prevention Action Group and be included as an appendix to the infection control annual report.
5. The Clostridium difficile multi-disciplinary ward round will continue at FHN, and will try to re-recruit a consultant gastro-enterologist.
6. This audit should continue so that all future deaths where Clostridium difficile is recorded on the death certificate will be analysed using the root cause analysis tool and Healthcare Commission tool.

Reviewers had to make a judgment on the likelihood of *C. difficile* infection (CDI) contributing to or being the main cause of an individual's death **based on their review of that person's records / case notes**. Each case was assessed by at least two reviewers who then discussed their assessment of contribution / cause of death and agreed a joint assessment.

The questions below were used to help reviewers make these judgments – they **were not** in themselves used to determine the final assessments directly.

Appendix 1: Healthcare Commission audit tool

Cause of Death

Please specify if and how CDI was mentioned on the patient's death certificate

☐ Yes If Yes, Category
☐ No
☐ Unable to determine

How would you categorise the patient's condition on admission?

☐ The patient had an acute or chronic condition expected to be rapidly fatal within 1 month

☐ The patient had an acute or chronic condition expected to be fatal within 1-12 months

☐ The patient had an acute or chronic condition expected to be fatal in over 12 months

☐ The patient had an acute or chronic condition not expected to be fatal

☐ Insufficient data to categorise as above

If insufficient data, please specify

Was there evidence that the patient was recovering from the illness for which they were admitted?

☐ Yes ☐ No ☐ N/A ☐ Unable to determine

Was there evidence that the patient died as a direct result of the admitting illness?

☐ Yes ☐ No ☐ N/A ☐ Unable to determine

Aside from CDI, what other serious illnesses were diagnosed in hospital?

Illness	Comment on severity

Was there evidence that diarrhoea and / or other symptoms and signs of CDI had improved before death?

☐ Yes ☐ No ☐ N/A ☐ Unable to determine

Was any of the following present after diagnosis of CDI?

Marker	Yes	No	Not measured or recorded
White cell count > 15,000	☐	☐	☐
Creatinine level > 150	☐	☐	☐
Albumin level < 25	☐	☐	☐
CRP level > 50	☐	☐	☐
Fever $\geq$ 38^{o}C	☐	☐	☐
Abdominal pain, tenderness or distension	☐	☐	☐
Diarrhoea > 5 times a day	☐	☐	☐
Deterioration in mental status not explicable by other illness	☐	☐	☐

Was there evidence that the clinical course was:

	Yes	No	Unable to determine
Compatible with death from an admission illness?	☐	☐	☐

Compatible with death from a pre-existing illness?	☐	☐	☐
Compatible with death from a complicating illness (not CDI)?	☐	☐	☐
Compatible with severe CDI?	☐	☐	☐
Compatible with death from CDI?	☐	☐	☐

Does the evidence suggest that in this patient CDI:

	Definitely	Probably	Possibly	Unlikely	No
Contributed to this patient's death?	☐	☐	☐	☐	☐
Was the primary cause of death?	☐	☐	☐	☐	☐

Please comment on the above:

Appendix 2: Clostridium difficile death certifcation audit form (following items covered in the Maidstone and Tunbridge Wells investigation)

Patient's name

Date of birth

Hospital number

Dates of positive C difficile positive samples

Date of death

Coding of death certificate

- Ia
- Ib
- Ic
- II

Description of patient episode

Was the patient appropriately assessed for C difficile disease (radiology etc)?

Were appropriate speciailists involved (gastroenterology, ID or microbiology)?

Did the patient receive broad-spectrum antibiotics which were inappropriate?

Was the patient given appropriate treatment for C difficile infection?

Was this treatment commenced prior to the stool result being available, at diagnosis of C difficile or only after unacceptable delay?

Was the patient treated with oral vancomycin?

Was fluid balance monitored appropriately?

Was dehydration appropriately managed?

Was nutritional status adequately assessed?

Was feeding provided appropriately?

Was the patient isolated?

Did isolation occur when diarrhoea began or only when C difficile diagnosed?

Did the patient have an assessment of pressure areas?

Did the patient develop a pressure sore during the episode?

Were there any other apparent deficiencies in care?

Post-mortem information

Conclusion

Lessons learnt

Did C difficile contribute to the patient's death?

6. Definite (post-mortem findings and/or Ia or lower and bowel symptoms, hydration or nutrition definitely contributed to death)
7. Probable (Ib or lower and bowel symptoms, hydration or nutrition probably contributed to death)
8. Possible (Ib or lower and unclear whether bowel symptoms, hydration or nutrition probably contributed to death)
9. Unlikely (diarrhoea not significant prior to death)
10. No (response to treatment, asymptomatic prior to death)

Was C difficile the main cause of the patient's death?

6. Definite (post-mortem findings and/or Ia and compatible with information in notes)
7. Probable (Ib or lower and no other reasonable cause of death)
8. Possible (Ib or lower and other reasonable cause of death found in addition)
9. Unlikely (diarrhoea not significant prior to death)
10. No (response to treatment, asymptomatic prior to death)

Given all of the information how would I have coded death certificate?

Ia
Ib
Ic
II

Signature_____ GMC number_____

Appendix 3

South Tees Hospitals NHS
NHS Trust

Audit of clinical incident investigations on patients with MRSA bacteraemia

CLINICAL AUDIT DATABASE NO. 2376

April 2011 - March 2012

Audit Report By:

Richard Bellamy

Lead Clinician;

Richard Bellamy

Report on clinical incident investigations on patients with MRSA bacteraemia: April 1st 2011 to 31st March 2012

1. Summary

This report summarises the findings of clinical incident investigations on 8 episodes of MRSA bacteraemia between April 1st 2011 and 31st March 2012. 3 of these patients died during the current admission. An avoidable causal factor was identified in 0 bacteraemias. In 1 case a primary care factor was felt to be a contributor to the MRSA bacteraemia. In 0 cases there was an avoidable causal factor in the care delivered in another acute NHS trust. Each year there has been a progressive reduction in MRSA bacteraemia, particularly in Trust-attributed cases. The most frequent causes were community-acquired pneumonia and parotitis (2 cases of each).

2. Introduction

Since June 1st 2006, a clinical investigation has been performed on all cases of MRSA bacteraemia. In April 2007 a report was produced summarising the findings of all of the cases investigated between June 1st 2006 and 31st March 2007. These investigations were commenced following guidance from the Department of Health.[1] The audit has continued ever since. This sixth annual report summarises the cases between April 1st 2011 and March 31st 2012.

3. Methods

Each case at JCUH was investigated by the same consultant infectious diseases physician and each case at FHN was investigated by the same consultant microbiologist. The reports were produced as soon as possible after identification of the MRSA bacteraemia. Draft reports were usually produced within 24 hours of the identification of the bacteraemia at JCUH. The investigation was based on review of the medical and nursing notes, results of investigations and supporting documentation. When appropriate the patient was interviewed and/or examined by the investigator. Staff members caring for the patient were interviewed when appropriate. Draft reports were circulated to the relevant consultants and senior nursing staff and to colleagues in primary care for comments. Draft reports were revised if additional information became available at a later date, for example from the matron's root cause analysis. Case reviews were subsequently held to discuss the findings of the investigations and to determine what actions could be taken to prevent further cases.

Standard of care:
0% of patients with MRSA bacteraemia should have an avoidable cause attributed to the Trust.

4. Causes of bacteraemia

8 episodes of bacteraemia were investigated: 6 from JCUH and 2 from FHN. 0 patients had had more than one episode of bacteraemia.

An attempt was made to determine if there were identifiable deficiencies in care, which were felt to have been a direct contributor to the bacteraemia. A case was classified as avoidable only if it was felt that the bacteraemia would not have occurred if the deficiencies in care had not occurred. A case was not classified as avoidable if deficiencies in care were identified but it was believed that they did not lead to the bacteraemia. It was also not classified as avoidable if standard protocols were being followed, even if these protocols have subsequently been changed after recognition that they may be leading to excess cases of bacteraemia. An avoidable cause was identified in 0 bacteraemias (0%). This is a great improvement on previous years for example in 2007/2008 an avoidable cause was found in 15 cases. In 1 case a primary care factor was felt to be a contributor to the MRSA bacteraemia. In 0 cases there was an avoidable causal factor in the care delivered in another acute NHS trust.

The causes of bacteraemia are summarised in table 1. The most common causes were community-acquired pneumonia and parotitis (2 cases of each).

Table 1: Summary of MRSA bacteraemia episodes

Cause	**Number of episodes (Trust-attributed cases)**	**Number where an avoidable factor was identified in our Trust**	**Number of patients who died due to MRSA or who died during the current episode of illness**
Parotitis	2 (2)	0	1
Community-acquired pneumonia	2 (0)	0	0
Catheter-associated urinary tract infection	1 (0)	0	0
Oesophageal cancer	1 (0)	0	1
Unknown	2 (0)	0	1
Total	**8** (2)	**0**	**3**

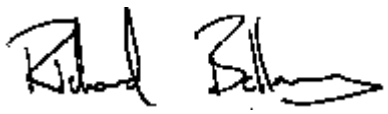
5. How many cases might have been prevented by universal MRSA screening on admission?
This question was asked in previous audits. It is no longer applicable because we have introduced universal screening on admission.

6. Conclusions
Clinical investigation of 8 episodes of MRSA bacteraemia identified 0 cases with an avoidable causal factor at our Trust. This is an improvement on previous years. Additional cases where an avoidable factor could not be identified may also have been caused by unrecorded breakdowns in infection control.

The total number of cases of MRSA bacteraemia continues to fall.

7. Action plan
7. This report will be presented to the Infection Prevention Action Group and included as an appendix to the infection control annual report.

8. This audit should continue as a part of the MRSA case review process to attempt to learn further lessons to prevent MRSA bacteraemia.



Richard Bellamy
Infectious diseases physician

8. References
1. Letter from Duncan Selbie to SHA chief executives dated 9th June 2006.