

**UNIVERSITY HOSPITALS BIRMINGHAM NHS FOUNDATION TRUST
COUNCIL OF GOVERNORS
TUESDAY 18 FEBRUARY 2014**

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| Title: | REPORT ON INFECTION PREVENTION AND CONTROL UP TO 31 DECEMBER 2013 |
| Responsible Director: | Philip Norman, Executive Chief Nurse and Executive Director for Infection Prevention and Control |
| Contact: | Dr Beryl Oppenheim Director of Infection Prevention and Control Ext 16523 |

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| Purpose: | To present an update to the Council of Governors | |
| Confidentiality Level & Reason: | None | |
| Annual Plan Ref: | Strategic Aim 4 : Quality of Services | |
| Key Issues Summary: | <p>This paper sets out the position for the 2013/14 Meticillin-Resistant Staphylococcus Aureus (MRSA) bacteraemia and Clostridium Difficile Infection (CDI) trajectories and provides incidence of Meticillin-Sensitive Staphylococcus Aureus (MSSA) and Escherichia coli (E. coli) bacteraemia within the Trust and supporting actions to ensure continued improved performance.</p> <ul style="list-style-type: none"> • Appendix 1 – Healthcare Associated Infection Delivery Plan for 2013/14 • Appendix 2 – Provides an explanation of the terms used in this report | |
| Recommendations: | The Council of Governors is asked to receive this report on infection prevention and control progress. | |
| Approved by: | Philip Norman Executive Chief Nurse | Date: 6 February 2014 |

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REPORT ON INFECTION PREVENTION AND CONTROL UP TO 31 DECEMBER 2013

PRESENTED BY THE EXECUTIVE CHIEF NURSE

1. Introduction

This paper provides a report on performance against the 2013/14 objectives for meticillin-resistant *Staphylococcus aureus* (MRSA) bacteraemia and *Clostridium difficile* infection (CDI), up to 31 December 2013. It provides an update on performance for meticillin-sensitive *Staphylococcus aureus* (MSSA) bacteraemia and outlines reporting requirements for *Escherichia coli* (*E. coli*) bacteraemia while identifying related infection prevention and control actions.

2. Executive Summary

The annual objective for MRSA bacteraemia is zero avoidable cases. Following a 12 month period of zero hospital acquired cases, disappointingly 3 cases were reported in December (one in Renal Dialysis, one in Urology and one in Older Adult Service). Post Infection Reviews have been completed and Root Cause Analysis Reviews are being arranged.

Key learning is:

- Communicating positive MRSA screening results (Renal)
- Prophylaxis antibiotics pre specific procedure (Urology)
- Urinary catheter care (Older Adult)

The annual objective for CDI for 2013/14 is 56 cases. Performance for December was 4 Trust apportioned post 48 hour cases, all of which were reportable to the Health Protection Agency (HPA) in accordance with Department of Health guidance, meaning that we now have 65 cases to end of December. However with agreement from Commissioners all cases are being reviewed against avoidability criteria; those deemed unavoidable are being excluded from consideration of local penalties.

All incidences of MSSA and *E. coli* bacteraemia continue to be reported in line with the HPA mandatory reporting requirements.

3. Incidents of MRSA Bacteraemia

3.1 MRSA bacteraemias 2013/14

There were 3 cases of MRSA bacteraemia during December, Figure 1 shows the number of Trust apportioned cases of MRSA against the monthly trajectory (April 2011 – December 2013). Monthly incidence of MRSA bacteraemias to end December 2013 is shown in Table 1.

Figure 1: Number of Trust apportioned MRSA cases at UHB against the monthly trajectory (April 2011-December 2013).

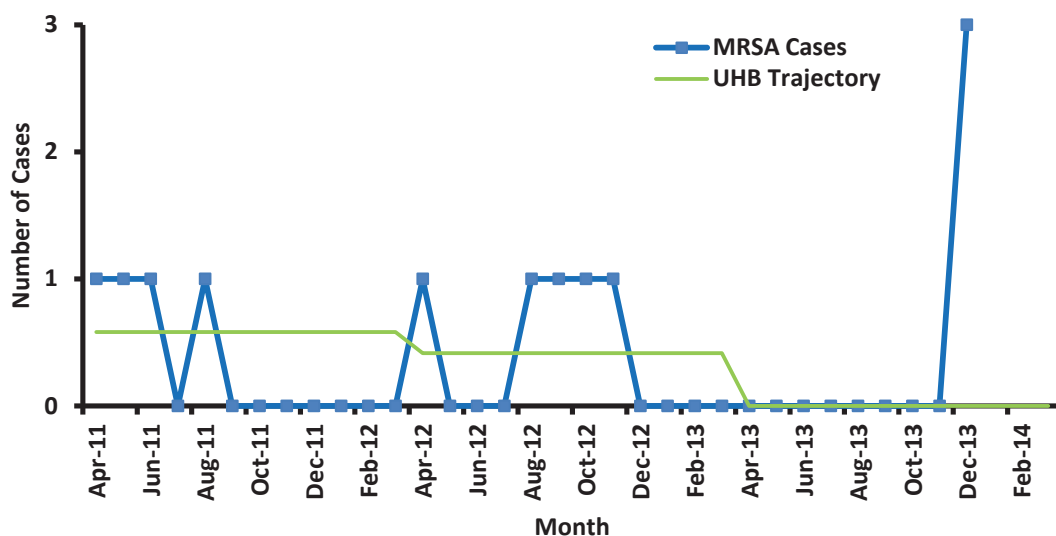


Table 1: Monthly number of MRSA bacteraemias at UHB up to the 31 December 2013.

| Month | Total bacteraemia | Time of bacteraemia acquisition? | |
|----------------|-------------------|----------------------------------|-------------------|
| | | Non Trust apportioned | Trust apportioned |
| April 2013 | 1 | 1 | 0 |
| May 2013 | 0 | 0 | 0 |
| June 2013 | 0 | 0 | 0 |
| July 2013 | 0 | 0 | 0 |
| August 2013 | 0 | 0 | 0 |
| September 2013 | 0 | 0 | 0 |
| October 2013 | 0 | 0 | 0 |
| November 2013 | 0 | 0 | 0 |
| December 2013 | 3 | 0 | 3 |
| Total | 4 | 1 | 3 |

Note: Objective for the financial year 2013/14 is zero.

3.2 Actions to improve performance for MRSA bacteraemia

A renewed focus on clinical practice is required to regain our performance. Issues to be addressed as part of the learning from the recent cases include:

- Improving the clinical management and documentation of all invasive devices including central and peripheral cannulae, urinary catheters, nephrostomies and stents in accordance with Trust policies and procedures.
- Ensuring that all relevant staff are aware of patients' MRSA status and what the implications are.
- Ensuring the optimal management of all patients with MRSA colonisation and infection, including decolonisation treatment, prophylaxis during procedures, and treatment of infections.
- Supporting Divisional staff to improve inter-departmental communication in relation to the movement of patients with known infections.
- Improving screening compliance, especially for long-stay patients.

4. **Episodes of *Clostridium difficile* Infection (CDI)**

4.1 Current Figures

The annual CDI objective for 2013/14 is 56 cases; following the introduction of a new review tool with local Commissioners, unavoidable cases will be discounted for the purposes of locally agreed penalties. Performance for December 2013 was 10 reportable cases of which 4 were post 48 hours and attributable to the Trust. Figure 2 shows the number of Trust apportioned cases of CDI against the monthly trajectory (April 2011 – current). Monthly incidence of CDI to date is shown in Table 2.

Figure 2: Number of Trust apportioned cases of CDI at UHB against the monthly trajectory (April 2011-current).

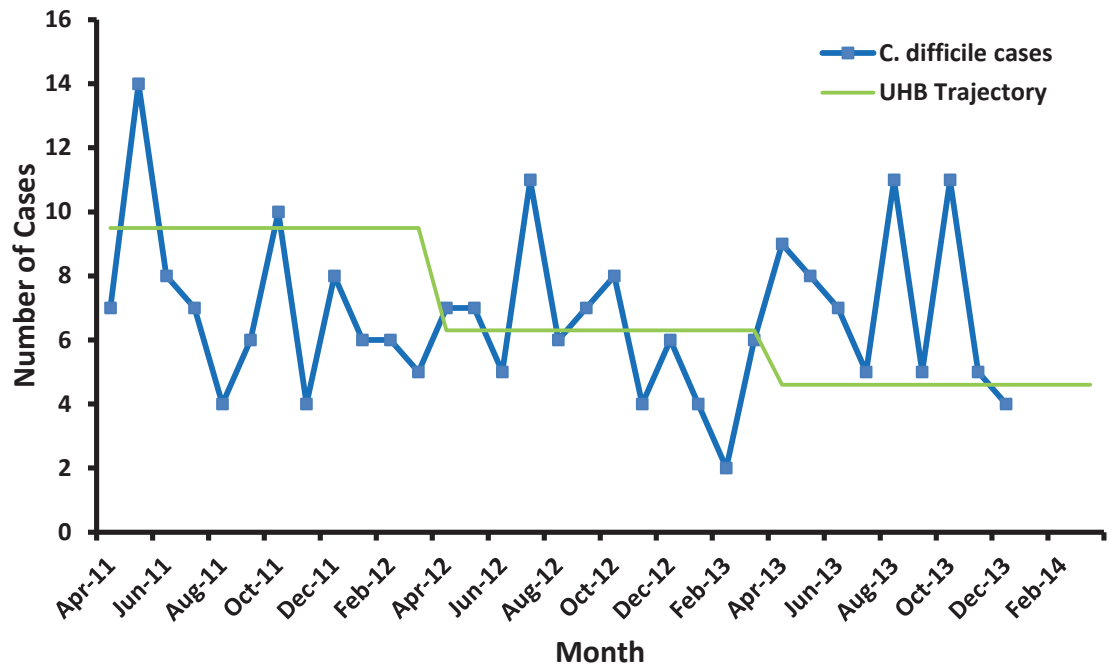


Table 2: Monthly number of CDI cases at UHB up to 31 December 2013.

| Month 2013 | Total number of CDI | Objective (Trust apportioned) Monthly/ (annual) | Time of CDI acquisition | | Commissioners reviewed unavoidable cases | Commissioners reviewed avoidable cases |
|--------------|---------------------|---|-------------------------|-----------------------------------|--|--|
| | | | Pre | Post 48 hours (Trust apportioned) | | |
| April | 10 | 4.6 | 1 | 9 | 7 | 2 |
| May | 12 | 4.6 | 4 | 8 | 6 | 2 |
| June | 9 | 4.6 | 2 | 7 | 6 | 1 |
| July | 8 | 4.6 | 3 | 5 | 5 | 0 |
| August | 18 | 4.6 | 7 | 11 | 7 | 4 |
| September | 6 | 4.6 | 1 | 5 | 5 | 0 |
| October | 16 | 4.6 | 5 | 11 | 9 | 2 |
| November | 7 | 4.6 | 2 | 5 | 3 | 2 |
| December | 10 | 4.6 | 6 | 4 | 3 (+1 pending review) | 0 |
| Total | 96 | 41 (56) | 31 | 65 | 51 (+1) | 13 |

Note: Following the introduction of a new review tool with local Commissioners, unavoidable cases will be discounted for the purposes of locally agreed penalties. The final two columns of the above table provide details of the commissioners reviewed figures for all Trust apportioned cases of CDI.

4.2 Actions to improve performance for CDI 2013/14

Continued focus and challenge will be required to improve performance regardless of systems to exclude certain cases on avoidability grounds. Particular areas to focus on in the immediate future include:

- Continued review of patients bowel management procedures and the appropriateness of stool sampling with clear documentation of the decision making process which has reduced the number of inappropriate samples.
- Reinvigorate the antimicrobial stewardship programme which includes: ensuring that antibiotic prescribing is in line with Trust guidelines; mandating the requirement for a written indication for every antibiotic prescription; and ensuring and documenting an early review of the continuing appropriateness of each prescription. Interviews were held for the new Antimicrobial Pharmacist and it is envisaged that the new appointee will take up post in April 2014.
- Continuation of the rapid reviews by the Infection Prevention & Control team of any area reporting two or more cases of CDI.
- During April - December 2013, due to the higher than expected number of cases of CDI, 50 toxin positive samples from UHB were submitted for ribotyping. Results received to date show 18 different strains.

4.3 Facilities Update

- The environmental monitoring of clinical areas through the monitoring audits continues to exceed the 95% compliance requirements.
- Housekeeping are currently reviewing the requirements for replacement curtains in the Trust and will be making recommendations to meet infection control and privacy and dignity standards.
- The old Queen Elizabeth Hospital areas are being fully supported and monitored to ensure standards are maintained across the Trust.

5. **Other Alert Organisms**

5.1 Multiply resistant gram negative bacteria

There were no cases of carbapenemase producing Enterobacteriaceae, *Pseudomonas aeruginosa* or multi drug resistant *Acinetobacter* reported in December. The transmission of multi drug resistant Gram negative bacteria especially carbapenemase producing Enterobacteriaceae, is a current and ongoing risk to patients and an action plan to address all issues related to prevention of transmission and compliance with burgeoning national guidelines has been developed and is being monitored on a monthly basis.

5.2 Meticillin-sensitive *Staphylococcus aureus* (MSSA) bacteraemia

Reporting of MSSA bacteraemia has been mandatory since 1 January 2011. Performance for December 2013 is 7 cases, 1 of which was Trust apportioned.

5.3 *E. coli* bacteraemia

From 1 December 2011, reporting of *E. coli* bacteraemia has been mandatory. *E. coli* is part of the normal bacterial flora carried by all individuals. It is the commonest cause of clinically significant bloodstream infection. Performance for December 2013 is 5 Trust apportioned and 19 non-Trust apportioned cases.

6. **Outbreaks of Diarrhoea and Vomiting**

There were no wards closed with outbreaks of diarrhoea and/or vomiting in December 2013.

7. **Serious Incidents Requiring Investigation (SIRI) related to Infection Prevention & Control**

All MRSA bacteraemia, and CDI cases which are recorded on Part 1 of the death certificate or during surgery, are reported as Serious Incidents Requiring Investigation (SIRIs). Those deaths on Part 2 of the certificate are of patients considered to have died *with* MRSA or CDI rather than *of* it. There have been no MRSA or CDI deaths reported on Part 1 or 2 of the death certificate for December 2013.

8. **Healthcare Associated Infection Delivery Plan for 2013/14**

The current (2013/14) Healthcare Associated Infection Delivery Plan along with an update of progress as at the end of December 2013 is attached at Appendix 1.

9. **Recommendations**

The Council of Governors is asked to **receive** this report on infection prevention and control progress.

Philip Norman
Executive Chief Nurse and Executive Director for
Infection Prevention and Control

Appendix 1 - Healthcare Associated Infection Delivery Plan University Hospitals Birmingham NHS Foundation Trust: April 2013 to March 2014

| Corporate Objective | Operational actions required | Executive Lead | Operational Lead | Review cycle | Red Amber Green | Progress at December 2013 |
|---|--|----------------|---|--|-----------------|---|
| 1. To achieve a high standard of clinical care delivery that supports adherence to the Trust infection prevention & control policy and associated procedures and reduces the risk of Healthcare Associated Infection (HCAI) | The infection prevention & control (IP&C) team will support the implementation of the new Department of Health guidance 'Zero Tolerance to avoidable Methicillin Resistant Staphylococcus Aureus (MRSA) bacteraemia' | Philip Norman | Joanne Ellison | Monthly at Infection Prevention & Control Group (IPCG) | | Process used to assist in investigation of three cases of MRSA bacteraemia. A number of learning points were identified which will be incorporated into an action plan to be monitored at IPCG. |
| | The IP&C team will lead a review of the Trust MRSA screening process and support the implementation of change in accordance with anticipated national guidance | Philip Norman | Beryl Oppenheim | Monthly at IPCG | | Now in final stages of implementation of changes to screening process. |
| | The IP&C team will continue to focus on supporting clinical staff to ensure a clear focus on multidisciplinary assessment of all patients presenting with type 5/6/7 stool, including daily review of antimicrobial therapy, aperient therapy and proton pump inhibitors | Philip Norman | Joanne Ellison | Monthly at IPCG | | Daily review of stool sample continues. Clinical staff support given around care of patients with diarrhoea. |
| | Continue to improve the time to isolation for patients presenting with type 5/6/7 stool | Philip Norman | Divisional Associate Directors of Nursing | Monthly at IPCG | | IP&C team review isolation and have seen improvements over time. |

Appendix 1 - Healthcare Associated Infection Delivery Plan University Hospitals Birmingham NHS Foundation Trust: April 2013 to March 2014

| Corporate Objective | Operational actions required | Executive Lead | Operational Lead | Review cycle | Red Amber Green | Progress at December 2013 |
|---------------------|--|----------------|------------------|-----------------|-----------------|---|
| | The Director of IP&C will continue to submit monthly data on meticillin-sensitive <i>Staphylococcus aureus</i> (MSSA) and <i>Escherichia coli</i> (<i>E. coli</i>) bacteraemia in line with Mandatory reporting requirements | Philip Norman | Beryl Oppenheim | Monthly at IPCG | | Monthly data continues to be submitted in line with national guidance. |
| | The IP&C team will work with clinical staff to support winter preparedness ahead of the seasonal pressures including seasonal Influenza and Norovirus | Philip Norman | Beryl Oppenheim | Monthly at IPCG | | Plans for winter preparedness in place to include evaluation of in house testing for norovirus. |
| | The IP&C nurse team to support local Back to the Floor (BTFF) reviews as part of the multidisciplinary team. | Philip Norman | Joanne Ellison | Monthly at IPCG | | IP&C team attend BTFF as part of MDT |
| | The IP&C team will undertake immediate review following two cases of Clostridium Difficile Infection (CDI) in the same clinical area. This will include review of: <ul style="list-style-type: none"> • Environmental cleanliness • Hand hygiene compliance • Compliance to use of Personal Protective Equipment (PPE) • Patient isolation procedures • Environmental clutter • Observations of practice | Philip Norman | Joanne Ellison | Monthly at IPCG | | Process instigated when 2 or more cases. |
| | Improve compliance to Trust hand hygiene procedures across all staff groups and among patients and visitors | Philip Norman | Joanne Ellison | Monthly at IPCG | | Monitored at IPCG. All Divisions over 95%. |
| | The Director of IP&C will support clinical staff with the robust implementation of national guidance on variant Creutzfeldt-Jakob Disease (vCJD) | Philip Norman | Beryl Oppenheim | Monthly at IPCG | | New local guidance being developed in line with revised national guidance. |

Appendix 1 - Healthcare Associated Infection Delivery Plan University Hospitals Birmingham NHS Foundation Trust: April 2013 to March 2014

| Corporate Objective | Operational actions required | Executive Lead | Operational Lead | Review cycle | Red Amber Green | Progress at December 2013 |
|---------------------|---|----------------|------------------------------------|-----------------|-----------------|---|
| | The Director of IP&C will lead the development and implementation of a programme of enhanced surveillance for multi-drug resistant microorganisms | Philip Norman | Beryl Oppenheim | Monthly at IPCG | | Enhanced surveillance in place and any multiply resistant organisms reported via monthly reporting process. |
| | Identify, review and reduce the incidence invasive device associated infections at UHB through a re-focus on aseptic non-touch technique and continued improvements in the management of invasive devices | Philip Norman | Beryl Oppenheim & Debby Edwards | Monthly at IPCG | | Audits continue to show sustained good practice in relation to invasive devices. Significant progress in developing systems for recording insertion and maintenance of invasive devices on the Prescribing Information & Communication System (PICS). |
| | The Trust will continue to submit monthly data on urinary tract infection and urethral catheter use as part of the national Safety Thermometer | Philip Norman | Allison Heseltine & Joanne Ellison | Monthly at IPCG | | Monthly data continues to be submitted |
| | The Trust will develop and implement an improvement programme to improve the clinical management of urethral catheters and them reduce catheter associated complications | Philip Norman | Allison Heseltine & Joanne Ellison | Monthly at IPCG | | IP& C team carry out safety thermometer monthly. Any areas of concern discussed with Continance Specialist Nurse. Director of IP&C forming a group to look at pulling all urinary catheter related data together and developing |

Appendix 1 - Healthcare Associated Infection Delivery Plan University Hospitals Birmingham NHS Foundation Trust: April 2013 to March 2014

| Corporate Objective | Operational actions required | Executive Lead | Operational Lead | Review cycle | Red Amber Green | Progress |
|---|---|----------------|----------------------------------|------------------|-----------------|---|
| | The Deputy Medical Director & the Director Infection Prevention & Control will support the implementation of surgical site infection surveillance programme | Philip Norman | Beryl Oppenheim & Mike Hallissey | Monthly at IPCG | | plans for improvements in all aspects of urinary catheter management. |
| 2. To achieve a high standard of environmental cleanliness which reduces the risk of Healthcare Associated Infection (HCAI) | Maintain agreed standards of environmental cleanliness through robust monitoring, feedback and improvement cycles where indicated. | Philip Norman | Karen Johnson | Monthly at IPCG | | <p>Mandatory Trauma & Orthopaedic surveillance continues. In addition we have piloted surveillance of cardiac surgery with results to be presented at an appropriate governance meeting and have started surveillance of neurosurgery cases</p> <p>Environmental monitoring is carried out by the Contracts Team and reports are sent to IP&C team and Facilities team for action. These are reported to IPCG.</p> <p>The Annual PLACE visit was completed on 3rd May 2013 and the results have been submitted and reported.</p> |
| | Implement and participate in the new Department of Health approach to annual environmental review 'Patient Led Assessment of the Care Environment' (PLACE) | Philip Norman | Karen Johnson | Annually at IPCG | | |
| | The IP&C team will work with the New Hospitals Team to ensure IP&C guidance considered in all planned | Philip Norman | Karen Johnson & Joanne | Monthly at IPCG | | All new and refurbishment work is discussed with the |

Appendix 1 - Healthcare Associated Infection Delivery Plan University Hospitals Birmingham NHS Foundation Trust: April 2013 to March 2014

| Corporate Objective | Operational actions required | Executive Lead | Operational Lead | Review cycle | Red Amber Green | IP&C team to ensure compliance |
|--|---|----------------|---------------------------------|-----------------|-----------------|--|
| | refurbishment of retained estate and at every stage of planning in line with national guidance | | Ellyson | | | |
| | The Director of IP&C and Operational Director for Corporate Nursing will Lead on the implementation of new national guidance for the control of <i>Pseudomonas aeruginosa</i> in augmented care | Philip Norman | Beryl Oppenheim & Karen Johnson | Monthly at IPCG | | Water Quality Group now in place. Regular reporting of surveillance and actions monthly and formal report quarterly to IPCG and Board. |
| | The Associate Director of Facilities will Lead the implementation of the annual deep clean programme | Philip Norman | Campbell Strefford | Monthly at IPCG | | Annual deep clean programme in progress and reported through IPCG |
| | The Operational Director for Corporate Nursing and the Director IP&C will jointly lead on ensuring the Trust is compliant with national requirements for decontamination | Philip Norman | Karen Johnson & Beryl Oppenheim | Monthly at IPCG | | The Operational Director chairs the Decontamination Group and the Director of IP&C is a member to ensure national requirements are met. |
| 3. To achieve compliance with prudent prescribing which supports the Trust antimicrobial stewardship programme | Implement a programme of audit that supports delivery of Department of Health audit standards (standard 2) | Philip Norman | Martin Gill & Inderjit Singh | Monthly at IPCG | | Audit programme in place, all audits to date achieve good compliance with Key Performance Indicators for Department of Health Standard 2 |
| | Provide antimicrobial prescribing data to clinicians in an informative way and in a timely manner to support prudent prescribing | Philip Norman | Martin Gill & Inderjit Singh | Monthly at IPCG | | Data presented at Antimicrobial Steering Group, Medicines Management Group |

Appendix 1 - Healthcare Associated Infection Delivery Plan University Hospitals Birmingham NHS Foundation Trust: April 2013 to March 2014

| Corporate Objective | Operational actions required | Executive Lead | Operational Lead | Review cycle | Red Amber Green | Progress |
|--|--|----------------|--|--|-----------------|--|
| | | | | | | and IPCG. |
| | Develop the clinical pharmacy structure to ensure the Trust can achieve antimicrobial stewardship | Philip Norman | Martin Gill & Inderjit Singh | Monthly at IPCG | | Antimicrobial Pharmacist post recruited and successful candidate will take up post on 1 April 2014. |
| 4. To achieve a high standard of clinical care delivery that supports an annual reduction in the incidence of all Healthcare Associated Infection (HCAI) in patients accessing UHB | Support all staff groups to achieve compliance with IP&C mandatory training to ensure a competent and confident workforce | Philip Norman | Mercia Spare & Divisional Associate Directors of Nursing | Monthly at IPCG | | IP&C team deliver Trust and Divisional mandatory training. Compliance increased to 92.5% for December 2013 with all Divisions above 90%. |
| | Finalise and implement the IP&C e-learning package to support a more convenient method of delivering Trust IP&C messages | Philip Norman | Joanne Ellison & Karen Jameson | Monthly at Learning & Development meetings | | New training package forwarded to Information Technology company for first draft of e-learning package |
| 5. To ensure that processes are in place to maximise timely learning from incidents and that where indicated, | The Director of IP&C will lead a review of the current process for IP&C incident investigation and support implementation of change in line with Department of Health guidance on the Post Infection Review (PIR) process. | Philip Norman | Beryl Oppenheim | Monthly at IPCG | | PIR process in place for MRSA bacteraemia and Trust apportioned Clostridium Difficile Infection and working well. |

Appendix 1 - Healthcare Associated Infection Delivery Plan University Hospitals Birmingham NHS Foundation Trust: April 2013 to March 2014

| sustainable actions are implemented to prevent further incidence | Corporate Objective | Operational actions required | Executive Lead | Operational Lead | Review cycle | Red Amber Green | Progress |
|---|--|------------------------------|-----------------------------|------------------|--------------|-----------------|--|
| 6. To provide appropriate data and intelligence to clinical teams in a manner that will support local reductions in the incidence of Healthcare Associated Infection (HCAI) at UHB through clinical improvement | The DIPC will lead the development of IP&C surveillance and information flow to the clinical teams | Philip Norman | Beryl Oppenheim | Monthly at IPCG | | | Development of systems for surveillance of a number of new alert organisms such as glycopeptide resistant enterococcal carriage/infection and new acquisitions of MRSA carriage being developed and will form part of reporting process. |
| 7. To provide the Board of Directors with updates on delivery of the annual Healthcare Associated Infection (HCAI) plan | Annual report for 2013/14 will be developed for Board of Directors | Philip Norman | Beryl Oppenheim & IP&C Team | May 2014 | | | Annual report for 2012/13 has been presented to Board of Directors and report for 2013/14 is in preparation. |

Infection Prevention and Control Report

Explanation of the terms used in the report

Meticillin Resistant *Staphylococcus Aureus* (MRSA) – sometimes referred to as a ‘superbug’

Staphylococcus aureus (also known as staph) is a common type of bacterium (bacteria or germ). It is often carried on the skin and inside the nostrils and throat, and can cause mild infections of the skin such as boils as well as much more serious infections.

MRSA is a form of *Staph aureus* which is resistant to many of the commonly used antibiotics. It is extremely rare for healthy people to carry this bug but it is found in around 1-2% of the population in the United Kingdom. Individuals who have MRSA on their skin and in their nose are described as being ‘colonised’, which does not usually cause harm to people who are healthy.

MRSA can cause infections such as blood stream infections and wound infections, particularly if there is an opportunity for the bacteria to enter the body such as a result of surgery (operation) or catheters (tubes or lines) going into veins. The transmission and risk of MRSA infection, including MRSA blood stream infection, can be addressed effectively if measures are taken to identify MRSA carriers as potential sources, then they are treated (with antibiotic body wash) to reduce the risk of transmission (referred to as decolonisation).

This requires screening of patient populations for MRSA carriage, either before or on admission to hospital, to identify carriers and implement a decolonisation regimen.

***Clostridium Difficile* Infection (CDI)**

Clostridium difficile is a bacterium present in the large bowel of approximately 10% of healthy individuals. It usually causes no problems. However, antibiotics given to treat other infections can suppress the "normal" bacteria in the bowel, leaving the *Clostridium difficile* bacteria to overgrow.

This overgrowth can lead to the production of toxins (poisons), which have an irritant effect on the gut (bowel), causing inflammation of the bowel. Patients can exhibit no symptoms at all, but commonly they have watery diarrhoea, abdominal (tummy) pain and sometimes fever, especially in the elderly and in people who are immunosuppressed (where the immune system is less effective in fighting diseases, for example in individuals who have cancer).

There is also the possibility of person-to-person spread. To prevent such spread, hand washing with soap and water is key, along with isolating the patient to prevent further spread (individual is cared for in single room which is referred to as ‘source isolation’), appropriate antibiotic prescribing (used only when necessary) and for the shortest period that is appropriate and cleaning of the environment to remove *Clostridium difficile* spores (an especially tough form of the bacteria) which may persist in the environment.

Meticillin Sensitive *Staphylococcus Aureus* (MSSA)

MSSA is the term used for the more antibiotic sensitive form of *Staph aureus* and is a common type of bacterium that can live harmlessly on the skin. Around 30 % of people carry *Staph aureus* in their nose or on their skin, causing them no harm. MSSA is not normally a risk to healthy people and the majority of people who carry it do not have symptoms and are not aware they are carrying it. People who have MSSA in their nose or on their skin are said to be 'colonised'.

Sometimes MSSA can cause wound infections including after surgery, abscesses or boils, which may take a long time to heal and can sometimes lead to blood poisoning.

Escherichia coli or *E. coli* infection

E. coli is the name of a germ, or bacterium that is present in the bowel of humans and animals.

There are many types of *E. coli*, and most of them are harmless. But similar to Clostridium Difficile Infection, some can cause problems and symptoms can include bloody diarrhoea. *E. coli* can also be a common cause of urinary and abdominal (tummy) infections including in patients in hospital and some of these cases can also lead to blood stream infections.

Carbapenemase producing Enterobacteriaceae (CPE)

Enterobacteriaceae are a family of bacteria that live in the gastro-intestinal tract (bowel and stomach) of humans and animals. They include bacteria such as *E coli* and Klebsiella. These bacteria are a common cause of infections such as urinary infections, abdominal (tummy) infections and blood stream infections.

A major threat to our being able to treat these infections has been the development in these bacteria of mechanisms to evade the action of antibiotics (bacteria becomes resistant to antibiotics).

Carbapenems are a very important class of antibiotics used to treat the most serious of infections, so bacteria with the ability to evade these groups are a particular threat to all aspects of modern medicine such as surgery, intensive care and organ transplantation.