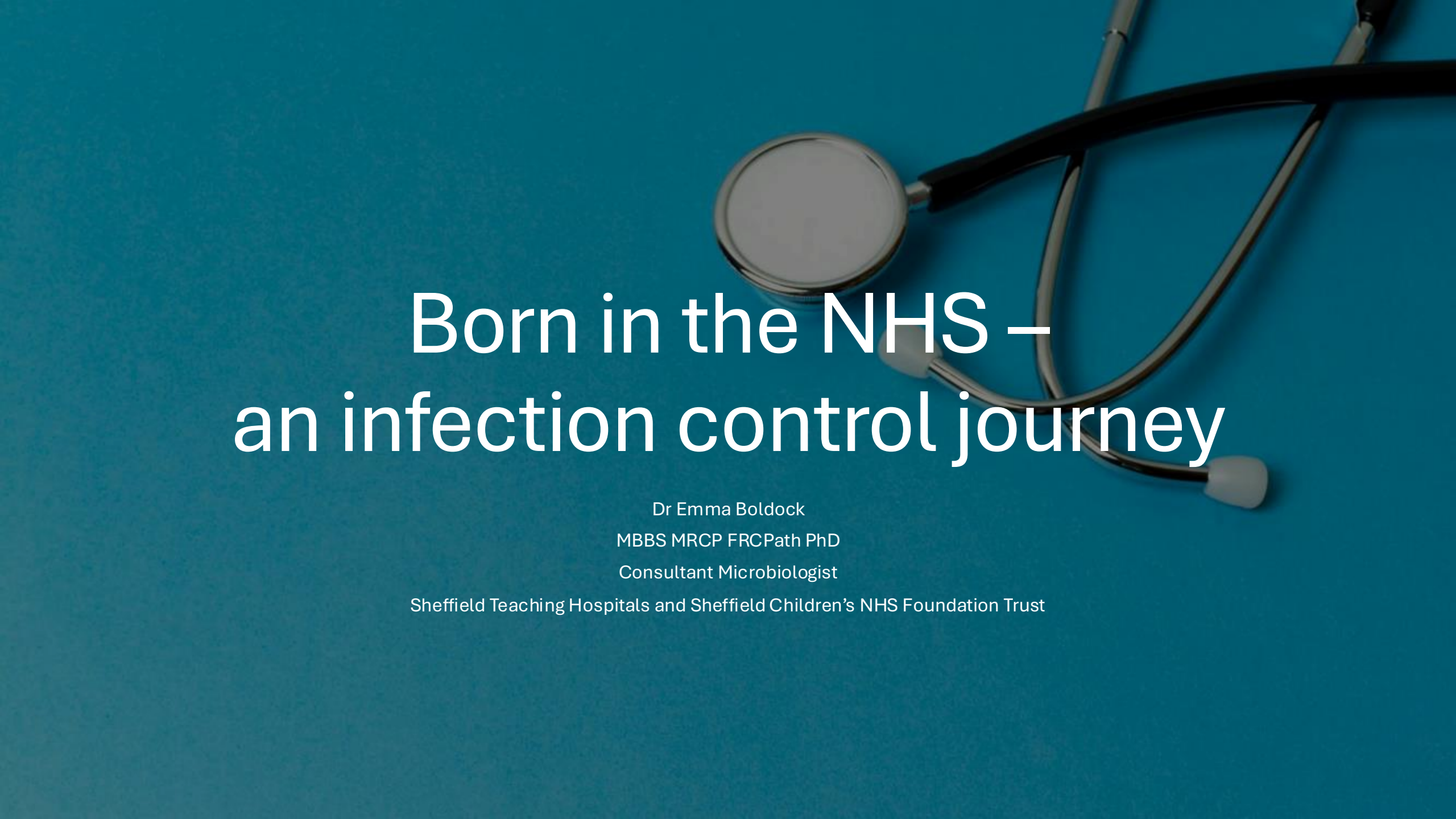
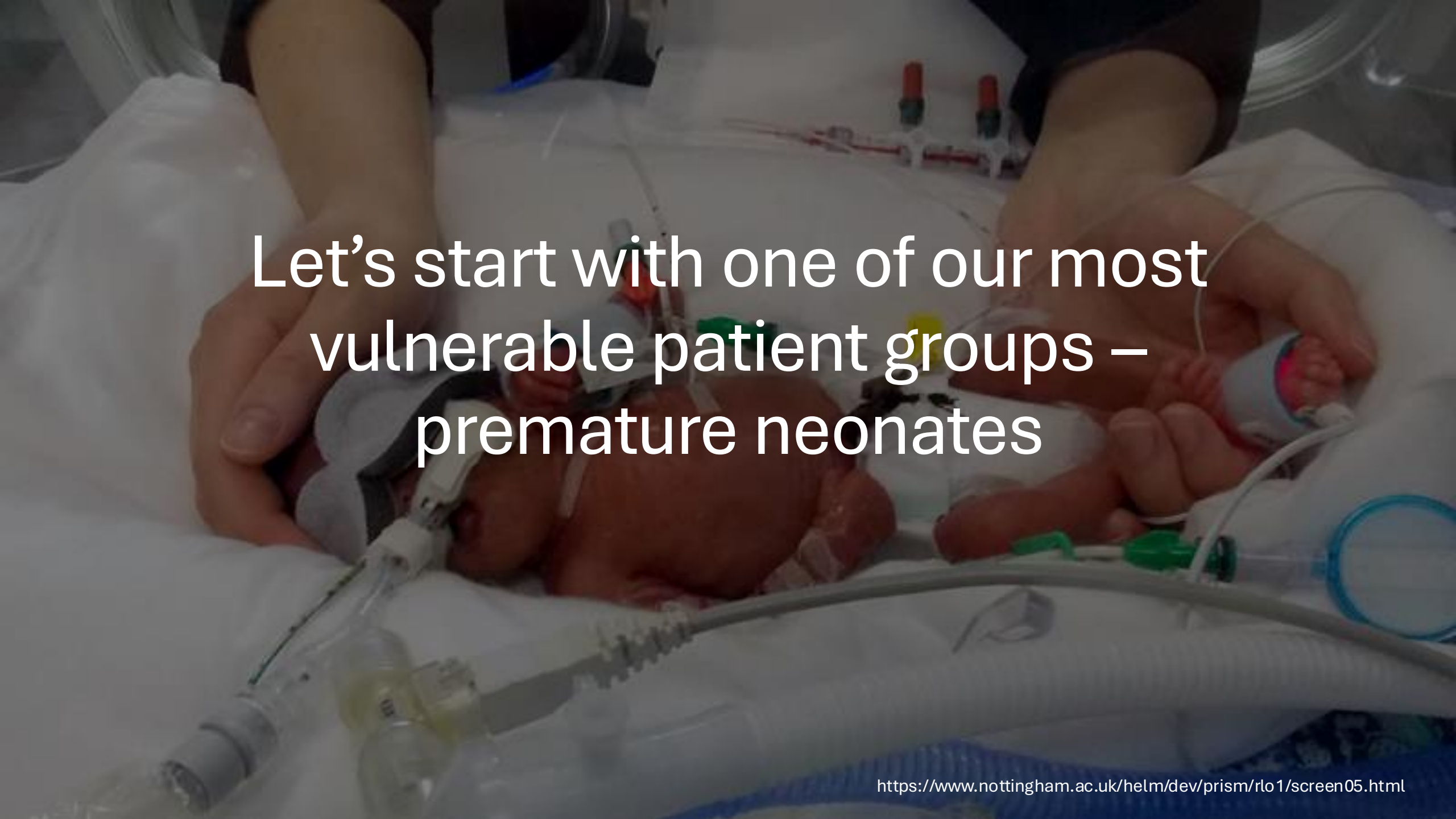


Born in the NHS – an infection control journey

Dr Emma Boldock
MBBS MRCP FRCPath PhD
Consultant Microbiologist
Sheffield Teaching Hospitals and Sheffield Children's NHS Foundation Trust

Intro/session outline

- Update 1 – The built environment
- Update 2 – Water safe care
- Update 3 – *Candida auris*
- Update 4 – Multi-drug resistant Gram negative pathogens
- Update 5 – Sustainable Infection Prevention & Control



Let’s start with one of our most vulnerable patient groups – premature neonates

https://www.nottingham.ac.uk/helm/dev/prism/rlo1/screen05.html

How do we protect patients from infection?

Hand hygiene: WHO 5 moments and alcohol hand rub/use of soap and water

Personal protective equipment (gloves, apron/gown, masks, eye protection)

Standard and transmission-based precautions (contact, droplet, airborne)

Aseptic Non-Touch Technique (ANTT): maintain a sterile field and avoid contamination of key parts/sites

Environmental cleaning and equipment decontamination

Antimicrobial stewardship and appropriate prescribing

Surveillance, outbreak management, and staff education

National infection prevention and control manual (NIPCM) for England

This is an evidence-based practice manual for use by all those involved in care provision in England. It should be adopted as mandatory guidance in NHS settings or settings where NHS services are delivered, and the principles should be applied in all care settings.

Born at 24 weeks into a UK NHS neonatal unit

- Infection prevention is key
- Respiratory: Invasive or non-invasive ventilation
- Cardiovascular: Venous and arterial access for fluids/cardiovascular support/medications/sampling
- Nutrition: long line inserted for parental nutrition
- Infection: blood cultures, lumbar puncture
- Standard and surgical ANTT
- Likely placed in a neonatal intensive care bay, other babies and families in adjacent spaces

Update 1: the built environment

- New Hospitals Programme
- 2020 commitment to build 40 new hospitals by 2030
- January 2025, the new government reset the New Hospital Programme, to put it on a more realistic timetable
- £3 billion of funding a year to complete 41 hospital schemes over approximately the next twenty years
- Intends to build advanced hospitals, using a standardised design to reduce costs and improve how hospitals operate
- How is this relevant to our premature neonate?





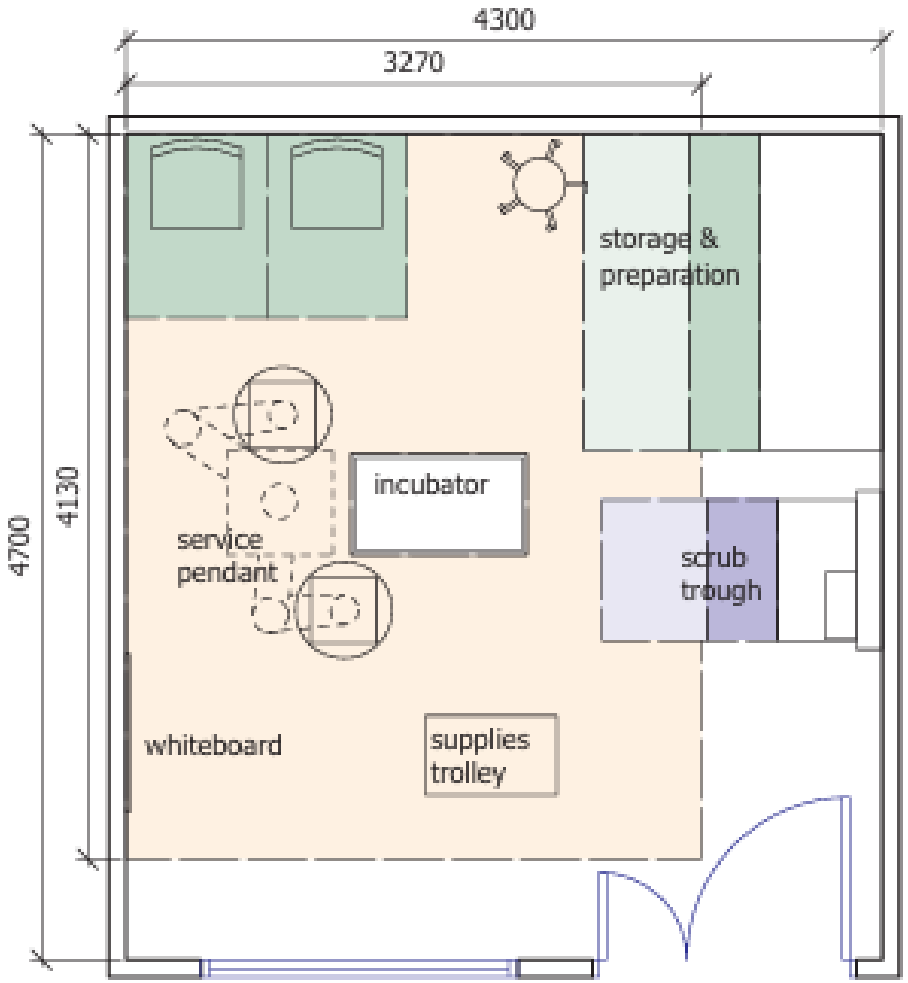
The primary aim of IPC is to **prevent the spread of infection** between patients, visitors and staff by control or containment of potentially pathogenic organisms.

https://evolutamente.it/en/Low-maternal-iron-levels-in-the-early-stage-of-fetal-growth-can-heavily-affect-the-baby%27s-future-health/

Health Building Note 09-03:
Neonatal units

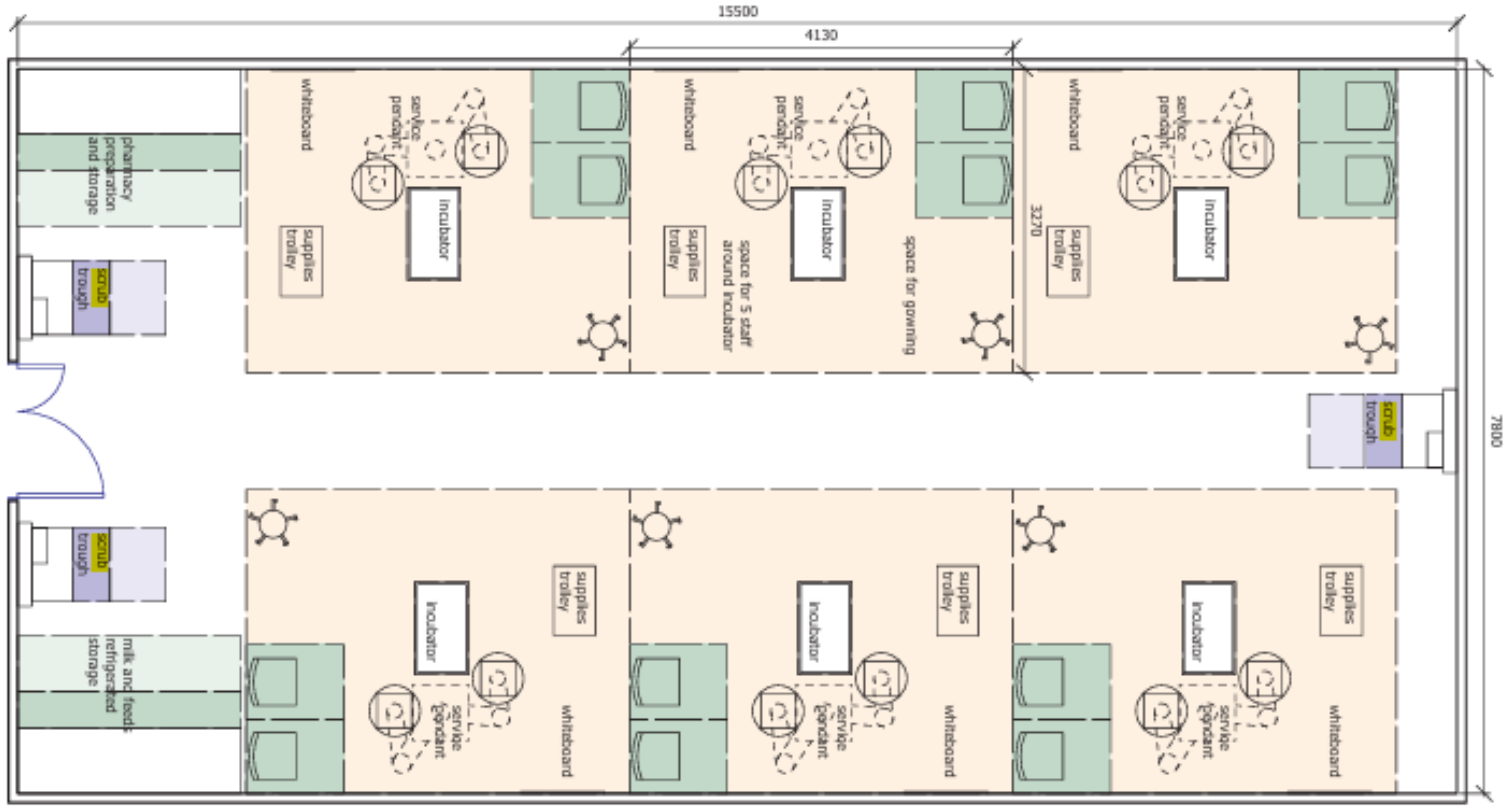
- 20 sq m^2 per cot space
- Existing facility – 80% of recommended area is acceptable
- Includes pharmacy preparation, including controlled drugs, refrigerated storage of milk and feeds
- Clinical hand-washing/scrub sinks and local disposale

Figure 4 Intensive care single-cot room: example layout



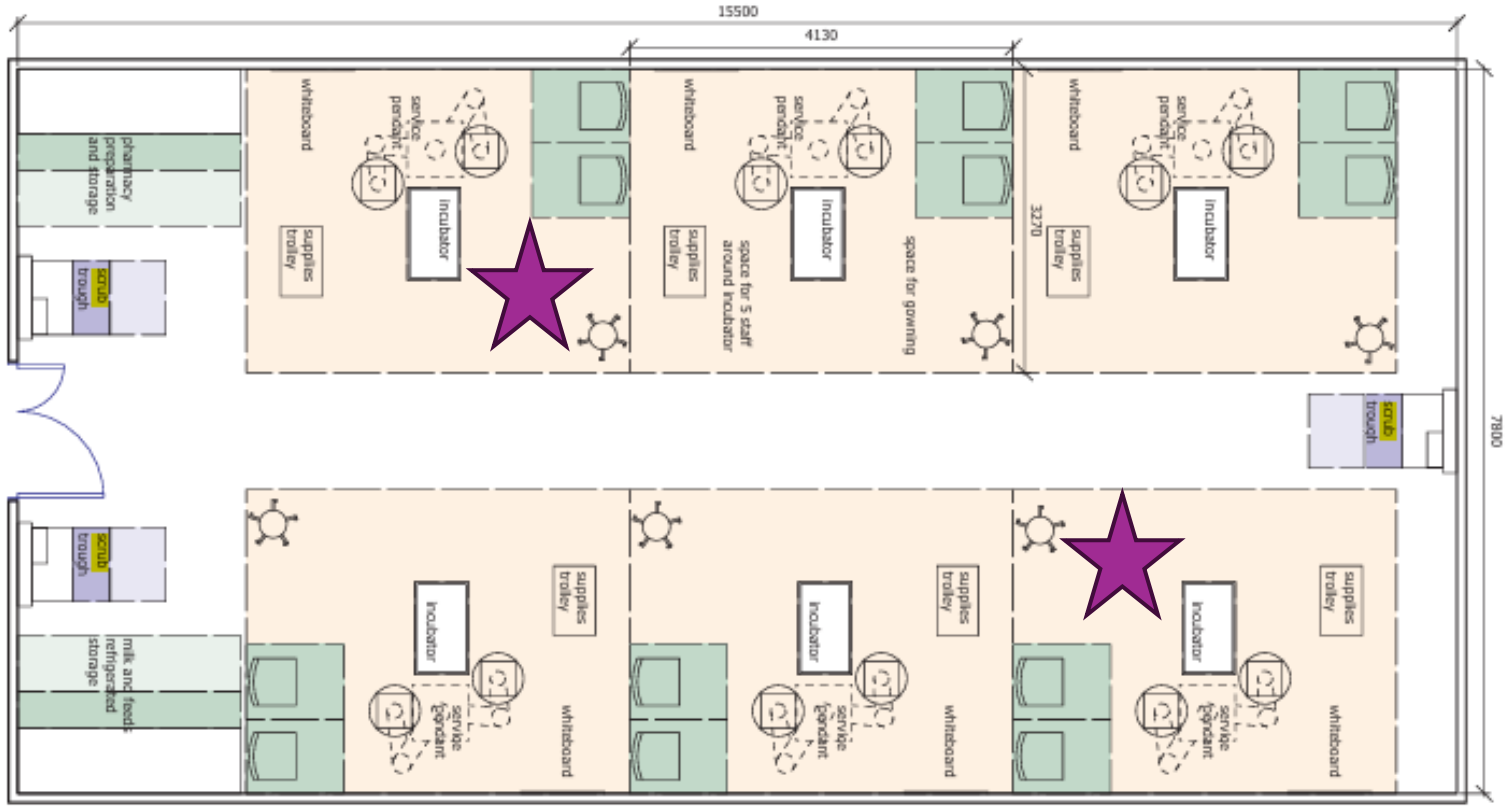
https://evolutamente.it/en/Low-maternal-iron-levels-in-the-early-stage-of-fetal-growth-can-heavily-affect-the-baby%27s-future-health/

Infection control in the built environment



- For healthcare associated infection (HCAIs) to be reduced, IPC measures must be ‘designed in’ at the planning stage
- The route of spread of infection is a basic concept in preventing cross-infection, and spacing has direct implications for the prevention of infection.

Infection control in the built environment



- MRSA outbreaks
- Common on neonatal units
- Uneven distributions of cases across neonatal unit rooms and cots, suggesting transmission linked to local environmental contamination
- Increased odd of colonisation if <32 weeks gestation and needing respiratory support
- Staff screening can be emotive and challenging

https://pmc.ncbi.nlm.nih.gov/articles/PMC13098614/

Reasons to be hopeful

UKHSA has built a modular ward on our site at Porton Down – a bespoke research facility just for study purposes

Creating the most life-like hospital ward possible ensures that we can better understand how microorganisms can live and spread in this environment.



LETTER TO THE EDITOR · Volume 144, P150, February 2024

Download Full Issue

The healthcare built environment – an under-recognized and preventable source of transmission of organisms and antimicrobial resistance to patients

M. Meda [a] · M. Weinbren [b]



5 years old, chronic lung disease, recurrent chest infections

- Regular admissions to hospital for treatment of chest infections
- Last admission, needed intubating and ventilating on critical care
- *Pseudomonas aeruginosa* isolated from endotracheal secretions

When we get Pseudomonas infections, where would we worry this has come from??

Update 2 – Water safe care

- Water seems innocuous but not in the complex healthcare environment





20 August 2025

Hospital pays ou linked deaths

A hospital trust has paid a "six-figure settlement package" in the case of nine patients following an outbreak of a bacterial infection linked to its water supply.

Three patients died and two of these cases were as a result of complications connected to the outbreak at Royal Papworth Hospital in Cambridge

Document

.pdf

NHS Estates Technical Bulletin (NETB) No.2024/3

PDF 2 MB

Summary

Designing safe spaces for patients at high risk of infection from nontuberculous mycobacteria and other waterborne pathogens

The risks from water are under recognised

- Drains are a rich source of bacteria
- Bacteria in hospital are more antibiotic resistant
- Certain patients are high risk
- Splash zones
- Where are the aseptic procedures taking place and where is equipment placed?



Reasons to be hopeful

Transmission Based Precautions (TBPs) guidance has changed

National Infection Prevention and Control Manual

Chapter 4 - Infection Control in the Built Environment and Decontamination



Poster - Safe use of Clinical Hand wash basins

The animation is supported by a poster developed by ARHAI Scotland for use beside clinical wash hand basins to locally promote good practice for health and care staff as well as the general public who may visit those settings.

For further information around water safety, please visit Chapter 4 - Infection Control in the Built Environment and Decontamination

Now 45 yr old, admitted for gall bladder surgery – blood loss – ITU stay required

Central line catheter tip – heavy growth Candida sp.

Need to ensure not a Candidaemia – blood cultures

Optimal anti-fungal treatment

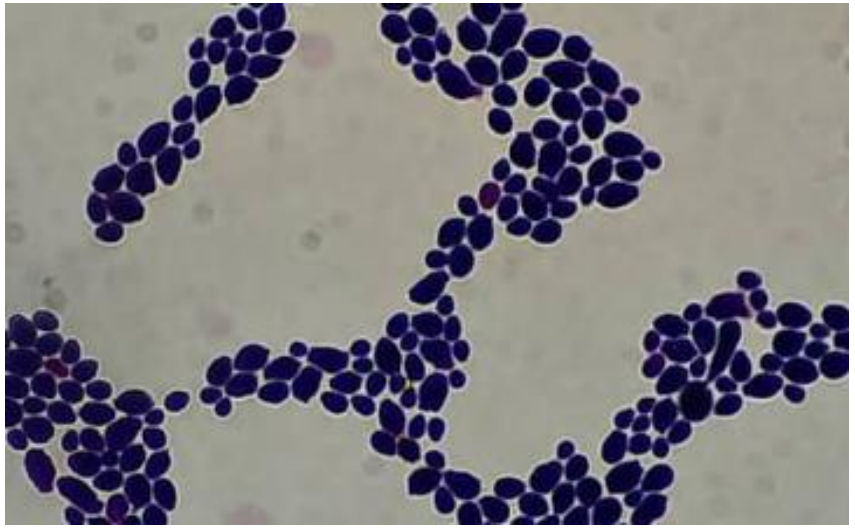
Usually fluconazole but…….

Update 3 – *Candida auris*

- ***Candida auris* (*C. auris*)** is an emerging multidrug-resistant yeast that can cause healthcare-associated outbreaks and invasive infections in vulnerable patients.
- First identified globally in 2009; now reported worldwide.
- Causes colonisation, bloodstream infection, wound infection and device-associated infection.
- **Frequently resistant to fluconazole** and may exhibit resistance to multiple antifungal classes.
- Can persist on healthcare surfaces and equipment.
- Outbreaks have occurred in several NHS hospitals, particularly critical care settings

Risk factors for acquisition and infection

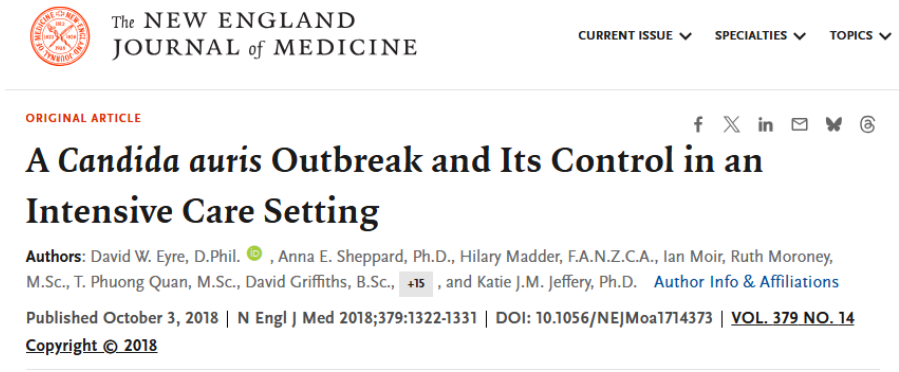
- Recent hospitalisation outside the UK
- Transfer from healthcare facilities with known *C. auris* cases
- **Admission to ICU, HDU or other high-dependency settings**
- **Presence of central venous catheters, urinary catheters or other invasive devices**
- **Broad-spectrum antimicrobial exposure**
- **Prolonged hospital stay**
- Severe immunosuppression or **multiple comorbidities**





How bad can it get?

- Oxford University Hospitals NHS Foundation Trust identified 4 patients who were colonized and 5 patients who were infected with *C. auris* between February 2, 2015, and October 16, 2016
- 16 beds, 13 in an open-plan configuration plus three side rooms with 1 bed each
- Patient and environmental screening was undertaken as part of routine infection control in the hospital
- A total of 70 patients were identified as being colonized or infected with C. auris between February 2, 2015, and August 31, 2017
- The risk of colonization or infection was also associated with any skin-surface axillary temperature monitoring with the use of reusable probes
- Systemic fluconazole treatment was also associated with an increased risk



Infection control interventions

- Isolate colonised or infected patients in a single room whenever possible.
- Use contact infection control precautions and appropriate PPE
- Strict hand hygiene using alcohol-based hand rub or soap and water when indicated
- Use dedicated or single-patient equipment
- Enhanced environmental cleaning with disinfectants effective against *C. auris*
- Prompt communication during transfers between wards and organisations

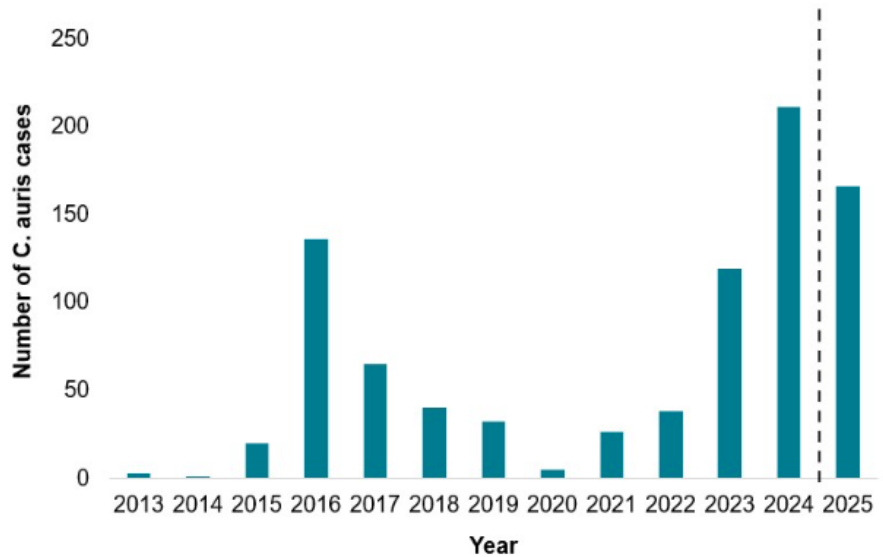
Guidance

Candidozyma auris: guidance for acute healthcare settings

Candidozyma auris (C.auris): laboratory investigation, management and infection prevention and control of cases.

From: UK Health Security Agency
Published: 27 June 2016
Last updated: 21 August 2025

Figure 1. Annual cases of C. auris by year, England 2013 to 2025



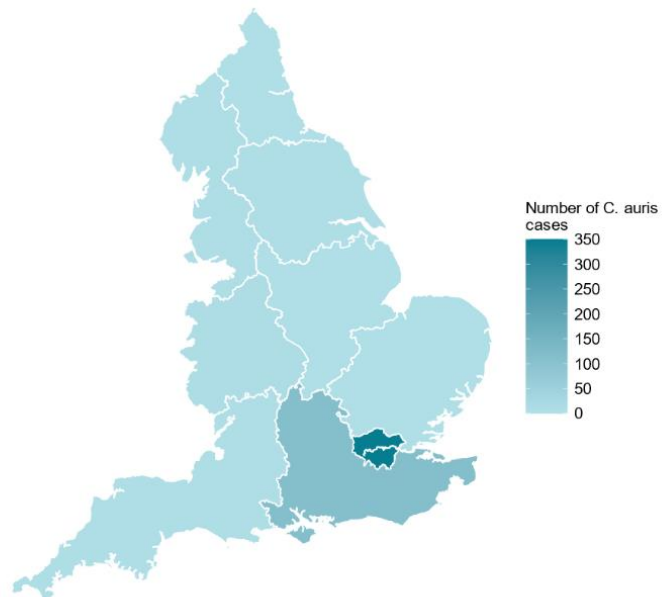
Contact screening

Screen contacts of patients with C. auris.

Screen all patients on units or wards with ongoing transmission of cases.

Consider the need to conduct periodic patient screens as part of active surveillance on units or wards where C. auris patients are being managed.

Figure 3: Map of C. auris cases by region, England 2023 to 2025



70 years old, urinary tract infection, catheter inserted using ANTT

- 3 weeks after insertion, symptoms of UTI
- GP gave nitrofurantoin empirically and sent urine sample for MC&S
- No improvement of symptoms
- Urine culture:

E. coli >10^5 CFU/ml

Carbapenemase producing Enterobacterales

R amoxicillin, co-amoxiclav, pivmecillinam, trimethoprim, nitrofurantoin, ciprofloxacin, gentamicin, cefuroxime, tazocin and meropenem

S fosfomycin and …… ??

Update 4: Carbapenemase-producing Enterobacterales



Carbapenemase-producing Enterobacterales (CPE) are bacteria that produce enzymes capable of breaking down carbapenem antibiotics.



Common organisms include *Escherichia coli* and *Klebsiella pneumoniae*.

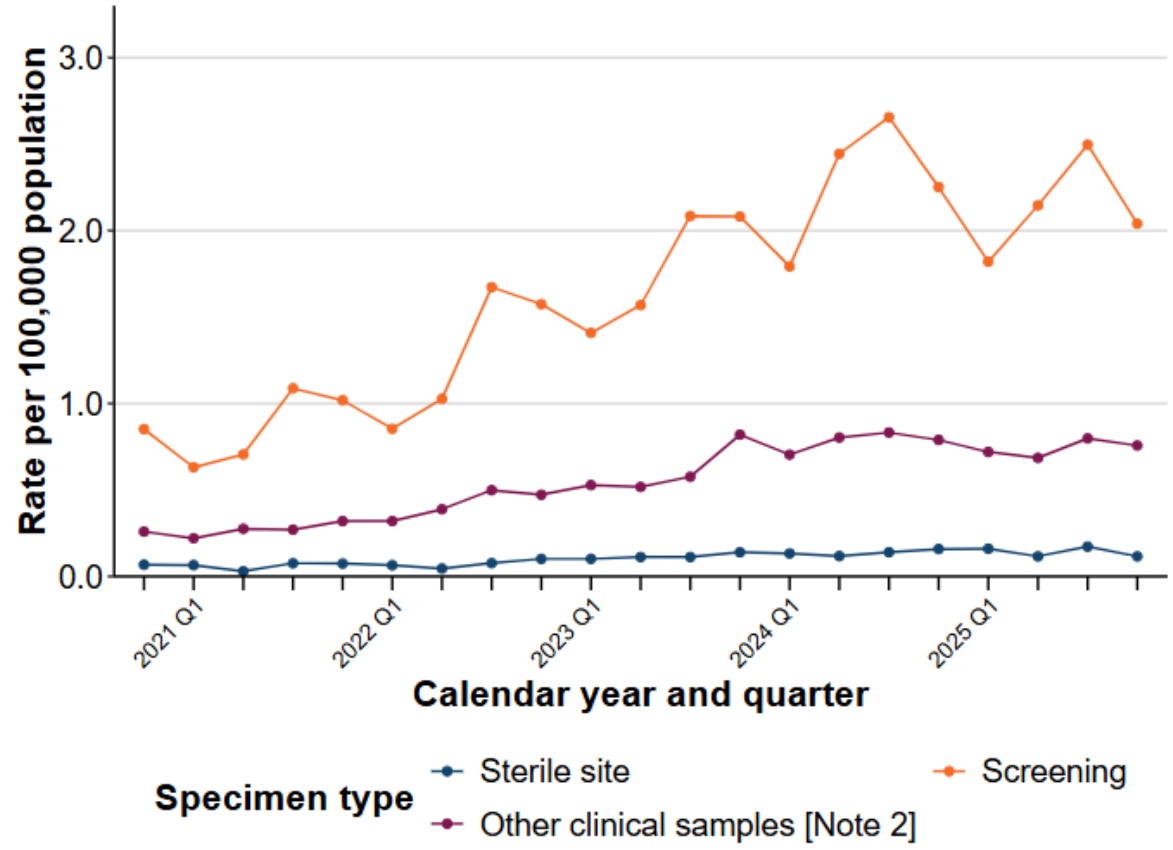


CPE infections are important because treatment options may be limited by antibiotic resistance



And they can spread easily in healthcare environments

Rate of CPE are increasing year on year



Note 2. Samples that did not fall into either 'sterile site' or 'screening' samples, for example, urine and lower genital tract specimens.

Risk factors for CPE acquisition

2.3 Key risk factors for CPE colonisation or infection

2.3.1 Admission screening to acute care providers

Acute trusts will need to make their own risk assessment based on regional prevalence, patient mix, and linkages with other care providers.

The following patients should be strongly considered for screening on admission if they are likely to stay in hospital overnight (22, 24), if:

- in the last 12 months, they have
  - been previously identified as CPE positive (13, 25, 26)[4]
  - been an inpatient in any hospital, in the UK or abroad (25, 27 to 30)
  - had multiple hospital treatments for example are dialysis dependent (25, 29, 31)
  - had known epidemiological link to a known carrier of CPE (25, 32)
  - they are admitted into augmented care or high-risk units (29, 33 to 35) (see Box 2)

Framework of actions to contain carbapenemase-producing Enterobacterales

September 2022

What are we telling patients?

- Explain CPE in simple language: a person can carry the bacteria without being ill
- Encourage handwashing after toileting and before eating
- Explain the reason for any additional infection-control precautions without causing unnecessary fear or stigma
- Whilst clinical care may need extra IPC planning, CPE colonisation or infection should not be detrimental to clinical care
- Advise the patient to tell future healthcare providers about their CPE history

How should we be preventing spread?

Hand hygiene: Clean hands before and after patient contact and after glove removal. Follow the local hand-hygiene protocol; use soap and water when hands are visibly soiled

Personal protective equipment (PPE): Wear gloves and an apron or gown according to the anticipated exposure and local contact-precaution policy

Patient placement: Inform the nurse in charge and IPC team. Use a single room or cohorting when indicated

Equipment: Use dedicated patient-care equipment where possible; clean and disinfect shared equipment between patients.

Environment: Ensure regular cleaning of high-touch surfaces, including bed rails, call bells, toilet areas and commodes.

Waste and linen: Handle contaminated materials safely and follow local disposal and laundry procedures.

NHS England

Search

Greener NHS | National ambition | Net Zero | Take action | System progress



Greener NHS

Climate change poses a major threat to our health as well as our planet. The environment is changing, that change is accelerating, and this has direct and immediate consequences for our patients, the public and the NHS.

The Greener NHS team works with staff, organisations and suppliers to support the NHS's world leading ambition to become a net zero national health service.

Update 5 - Sustainable Infection Prevention & Control – Why It Matters

- Climate change is a major threat to health
- Greener NHS has committed the NHS to achieving net zero emissions while maintaining high-quality patient care
- Healthcare contributes substantially to carbon emissions
- IPC professionals can influence procurement, PPE use, waste management and antimicrobial prescribing
- Many sustainability initiatives improve both patient safety and environmental outcomes – a couple of examples…

a) The "Gloves Off" Campaign

Gloves are needed when:

✅ Risk of exposure to blood or body fluids
✅ Contact with mucous membranes
✅ Use of hazardous chemicals or medications

Gloves are usually NOT needed for:

❌ Observations
❌ Routine patient conversations
❌ Transporting patients
❌ Touching intact skin
❌ Most routine examinations following hand hygiene

Impact

- At Manchester University NHS Foundation Trust, the Gloves Off campaign reduced non-sterile glove use by 14.6%, saving over 11 million gloves, approximately 40 tonnes of plastic waste and 286 tonnes CO_2e

b) Greener Microbiology and Diagnostic Laboratories

Why focus on laboratories?

NHS laboratories process over a billion tests annually and consume large quantities of:

- Single-use plastics
- Energy
- Water
- Chemicals

Practical actions

- Improve waste segregation
- Reduce unnecessary clinical waste disposal
- Power down equipment when safe
- Purchase more sustainable consumables
- Minimise reagent and stock wastage

Role of IPC and microbiology teams

- Review unnecessary screening and testing
- Reduce repeat specimens that do not influence management
- Promote sustainable procurement

Key message: Every laboratory test has an environmental cost, so appropriate testing is a sustainability intervention

c) Antibiotic IV to oral switch



Medicines account for approximately 20% of the NHS carbon footprint, with antimicrobials forming a substantial portion of this due to their manufacturing complexity, supply chains, and high utilisation



A course of intravenous antimicrobials is significantly more carbon-intensive than an equivalent course of oral therapy due to the cumulative resource involved



Greater carbon intensity in the manufacture and packaging of IV formulations



Use of single-use plastics for cannulation, infusion sets, and syringes . Increased risk of IV access complications such as phlebitis and bloodstream infections due to peripheral or central venous access devices, requiring additional medical intervention and potential patient harm

Summary of what we've covered

- Update 1 – The built environment
- Update 2 – Water safe care
- Update 3 – *Candida auris*
- Update 4 – Multi-drug resistant Gram negative pathogens
- Update 5 – Sustainable Infection Prevention & Control

Questions welcome!