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Operating Theatre Validation, Verification, Rituals & Behaviour. What are the Important Infection Prevention & Control Issues?

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Hosted by Carole Fry
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www.webbertraining.com

24 September, 2026

Declarations

- The views expressed are of a professional but personal nature, if reflective of the views of others
- In recent years, I have received research funding from Pfizer, & received fees for advice given to the Bons Secours Hospital Group (Ireland) & the Scottish Hospital Inquiry
- I am not an engineer, or an expert on technical aspects of ventilation. I am a microbiologist with interests in infection prevention & control issues

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Presentation Objectives

1. To highlight some of the roles of the infection prevention & control (IPC) practitioner in the operating theatre

2. To discuss microbiology aspects of operating theatre validation & verification, especially relating to ventilation

3. To review what rituals, behaviours, & practices are important, & which have an evidence base

4. To emphasise the value of the IPC team as part of a multi-disciplinary approach to enhancing patient safety, & in preventing infection in the operating theatre

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Outline

Background

Operating Theatre (OT) Design, Validation & Verification

OT Rituals & Behaviours

Final Reflections

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Peter Hoffman, RIP



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Background

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How did I get here?

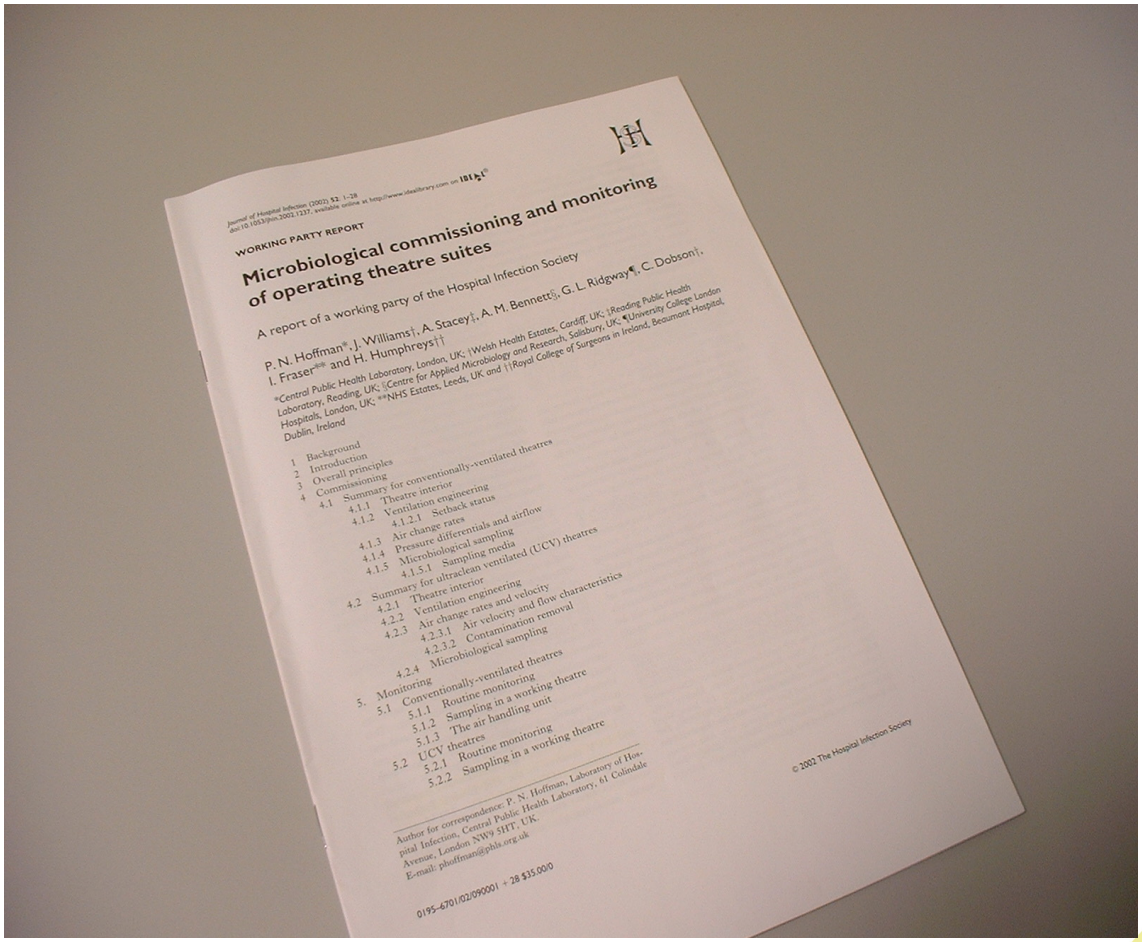
During training in Microbiology, I became interested in infection prevention & control (IPC), including in the operating theatre (OT) or operating room

There were many questions on IPC measures unanswered & when I suggested that these be considered by the HIS about 25 years ago, it was suggested that I take the lead

This resulted in a number of published papers, including guidelines on OT Commissioning (validation), Behaviour (rituals, practises) in the OT, and advice on Minor & Minimally Invasive Surgery (not for discussion here)

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WORKING PARTY REPORT

Microbiological commissioning and monitoring of operating theatre suites

A report of a working party of the Hospital Infection Society

P. N. Hoffman*, J. Williams†, A. Stacey‡, A. M. Bennett§, G. L. Ridgway¶, C. Dobson‖, I. Fraser** and H. Humphreys††

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1 Background
2 Introduction
3 Overall principles
4 Commissioning
4.1 Summary for conventionally-ventilated theatres
4.1.1 Theatre interior
4.1.2 Ventilation engineering
4.1.2.1 Setback status
4.1.3 Air change rates
4.1.4 Pressure differentials and airflow
4.1.5 Microbiological sampling
4.1.5.1 Sampling media
4.2 Summary for ultraclean ventilated (UCV) theatres
4.2.1 Theatre interior
4.2.2 Ventilation engineering
4.2.3 Air change rates and velocity
4.2.3.1 Air velocity and flow characteristics
4.2.3.2 Contamination removal
4.2.4 Microbiological sampling
5. Monitoring
5.1 Conventionally-ventilated theatres
5.1.1 Routine monitoring
5.1.2 Sampling in a working theatre
5.1.3 The air handling unit
5.2 UCV theatres
5.2.1 Routine monitoring
5.2.2 Sampling in a working theatre

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Journal of Hospital Infection (2002) **51**: 241–255
doi:jhin.2002.1220, available online at http://www.idealibrary.com on IDEAL®

WORKING PARTY REPORT

Behaviours and rituals in the operating theatre

A Report from the Hospital Infection Society Working Party* on Infection Control in Operating Theatres

K. Woodhead†, E. W. Taylor‡, G. Bannister§, T. Chesworth¶, P. Hoffman|| and H. Humphreys**

Guidelines

Guidelines on the facilities required for minor surgical procedures and minimal access interventions

H. Humphreys[a,b,*], J.E. Coia[c], A. Stacey[d], M. Thomas[e], A.-M. Belli[f], P. Hoffman[g], P. Jenks[h], C.A. Mackintosh[i]

J Hosp Infect 2012;80: 103-109

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Where are we now?

Journal of Hospital Infection 140 (2023) 165.e1–165.e28

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

Guidelines

Rituals and behaviours in the operating theatre – joint guidelines of the Healthcare Infection Society and the European Society of Clinical Microbiology and Infectious Diseases

H. Humphreys[a,b,c,*], A. Bak[b], E. Ridgway[b], A.P.R. Wilson[b,d], M.C. Vos[c,e], K. Woodhead[f,g], C. Haill[b], D. Xuereb[h], J.M. Walker[b,i], J. Bostock[j], G.L. Marsden[b,k], T. Pinkney[l], R. Kumar[j], P.N. Hoffman[b]

Journal of Hospital Infection xxx (xxxx) xxx

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

Guidelines

Microbiological factors in the design, validation and verification of operating theatre ventilation: healthcare infection society consensus guidance for infection prevention and control professionals, and members of ventilation safety groups

Hilary Humphreys[a,b,*], Andrew M. Thomas[a,c,d], Karren Staniforth[a,e], Craig A. Mackintosh[a], Graham P. Taylor[f], Robert Townsend[g], Aggie Bak[h], Joanna M. Walker[a,i], Kate Woodhead[j], Andrew Poplett[k], Christopher Lynch[a,l], Michael Soroka[m], Catherine Wagland[a,n,o], Giles Bond-Smith[p], Helgi Johannsson[q,r], Lisa Tierney[h], Peter Hoffman[a]

Operating Theatre Design, Validation & Verification

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Reasons for Ventilation in Healthcare

- **Comfort & safety, e.g. to heat, cool or maintain steady temperatures/humidity, e.g. USA, Asia**
- **Operating theatres/rooms (OT/OR)**
- **Preventing spread of microbes (airborne isolation rooms)**
  - **Positive (neutral) pressure, e.g. neutropenia**
  - **Negative (neutral) pressure, chicken pox**
  - **High Risk, e.g. Ebola virus**

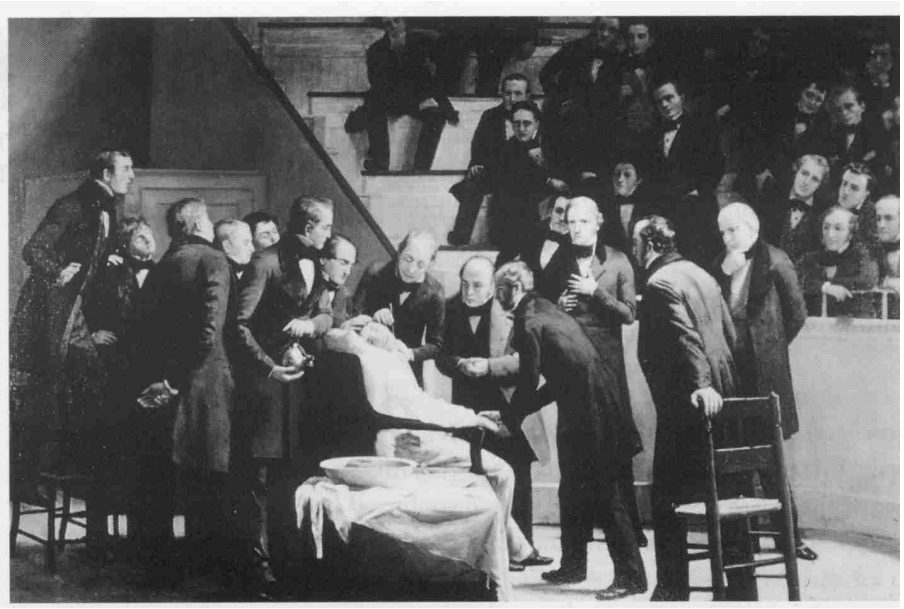
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Purpose & Components of Ventilation in OR

1. Remove anaesthetic gases (early anaesthesia)
2. Provide comfortable environment
3. Minimise risk from airborne micro-organisms by

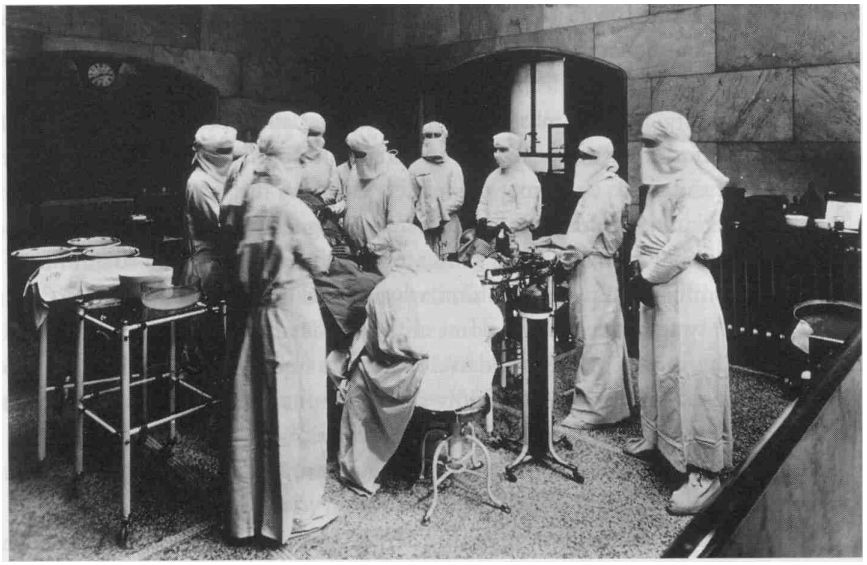
    i. Filtration of supplied air with reduced numbers of particles
    ii. Dilution of contaminated air in the OR, e.g. bacteria shed from theatre staff
    iii. Prevention of entry of contaminated air from areas outside the OR through differential air pressures

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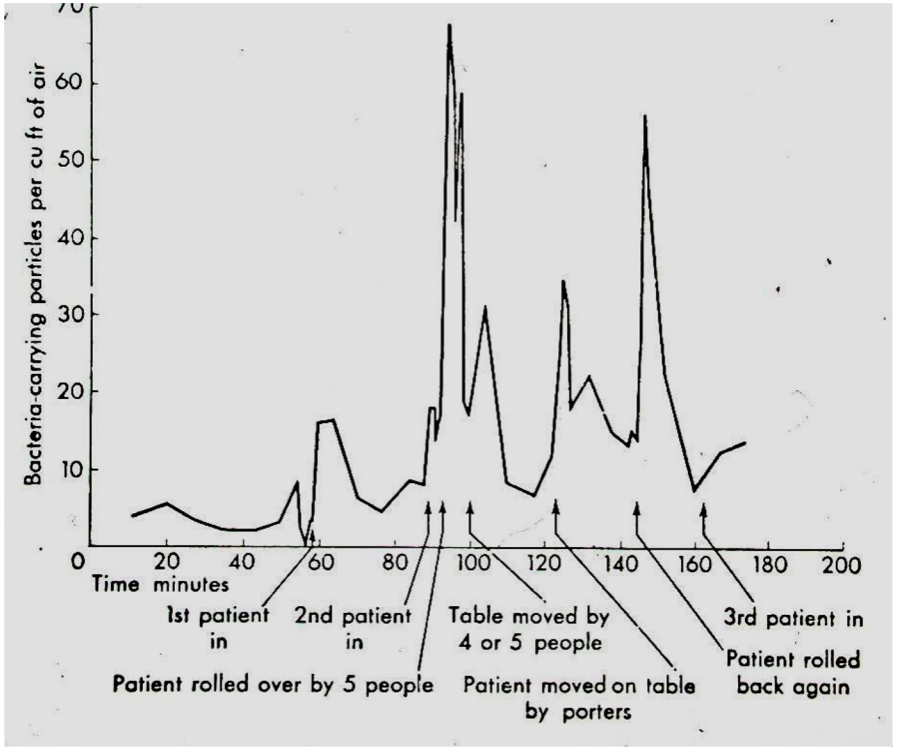


Boston, USA, 1846
(Wellcome)

Middlesex Hospital,
London, 1927
(Wellcome)



Bacterial Counts in Theatres





Craig Mackintosh

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Anecdotal Evidence of Impact of OR Ventilation

J Hosp Infect 2002; 50: 85-90

1. Increase in number of infections with substandard ventilation but temperatures high. Reversed by new ventilation irrespective of month & temperature *Am J Infect Control* 1991; 19: 277-282

2. Highest infections after cardiac surgery with air conditioning & poor practices (7.3%) vs horizontal air flow (2.7%) & better practices or upgraded ventilation & surveillance (0.8%) *Ann Thor Surg* 1986; 42: 321-325

3. Increased air changes per hour (ACH) from 16-25 did not effect HCAI rates & environmental sites had similar bacteria 6-12 months after upgrade

New Eng J Med 1982: 25: 1562-1566

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Why was an update to the guideline needed?

Journal of Hospital Infection (2002) **52**: 1–28
doi:10.1053/jhin.2002.1237, available online at http://www.idealibrary.com on IDEAL®



WORKING PARTY REPORT

Microbiological commissioning and monitoring of operating theatre suites

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P. N. Hoffman*, J. Williams†, A. Stacey‡, A. M. Bennett§, G. L. Ridgway¶, C. Dobson†, I. Fraser** and H. Humphreys††

New Health Technology Memoranda (HTM) 03-01 published for all devolved countries (2021) in the UK & elsewhere

- **Advice changed**
- **Documents are lengthy & technical**
- **IPC professionals do not have time to read an entire document**
- **IPC professionals may be unfamiliar with some concepts & terminology of the HTMs**

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How was the update completed?

Reviewing relevant documents: guidelines, HTMs, Health Building Notes (HBNs), what little scientific evidence there is

Systematic review: particle testing *vs* microbiological sampling (no studies fully met the inclusion criteria). No evidence for other areas

Collaboration: with colleagues from HIS, IPS, BOA, ASGBI, RCoA & AfPP

Panel of professionals: expertise, perspectives & experience of those from medical microbiology, surgery, clinical science, ventilation engineering, estates management, IPC & perioperative nursing

Recommendations & good practice points: very little scientific evidence, all based, more or less on expert consensus

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Definitions

- **Operating Theatre Department (or complex)** – made up of multiple operating suites or facilities
- **Operating Theatre Suite** – entire operating theatre unit, including, but not limited to, operating room, preparation room, anaesthetic room & disposal room
- **Operating Room** – room in which surgical procedures are undertaken
- **Validation** – previously referred to as 'commissioning'. Initial series of tests to prove functionality & performance of theatre suite, usually undertaken when first completed or following a major refurbishment
- **Verification** – Annual assurance that systems & environment remain fit for purpose

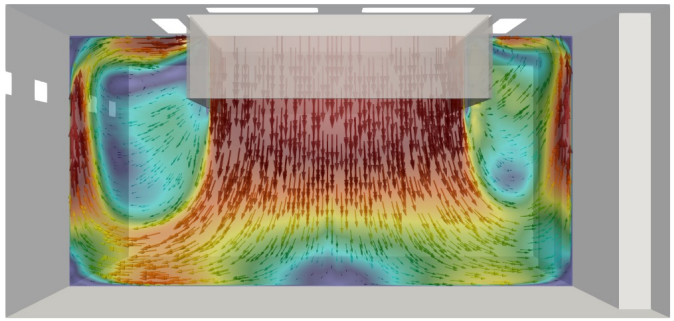
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Types of Theatre Ventilation

Rationale

Conventional ventilation: **aims to dilute contaminants by supplying high volumes of air to OT pushing air out to surrounding areas (i.e. OT is in positive pressure relative to the other areas)**

Ultraclean ventilation (UCV): **filtered air flows from canopy unto the floor & then to periphery. Air flow carries away contaminants from ultraclean area. UCV in the theatre can often be put into 'setback mode' to be used as conventional theatre**



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The Role of IPC Team

Recommendations

1.1: Ensure infection prevention & control (IPC) team & Ventilation Safety Group (VSG) are familiar with & understand relevant HTM 03-01 & HBN 26 documents

1.2: Work with designers, clinical teams, authorising ventilation engineers, etc. to ensure new operating theatres are fit for purpose & possible extensions of use

Good Practice Points (GPP)

GPP 1.1: Ensure experienced (IPC) team representative is core member of VSG

GPP 1.2: Ensure IPC team, as part of VSG, is involved in assessment on whether theatre facilities meet required standard before first use & intended use thereafter

GPP 1.3: Ensure IPC team has sufficient time, training & resources to contribute

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Features of the Facility

Rationale

Three main sources of airborne contamination in operating room:

- **Contamination introduced in supply air**
- **Contamination generated in operating room, mainly from surgical team members**
- **Ingress of contaminated air from adjacent areas outside the operating room**

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Features of the Facility

Recommendations

2.1: Use fine filters to maintain adequate air supply quality in conventional theatres; efficient particulate air (EPA) or high efficient particulate air (HEPA) filters not essential

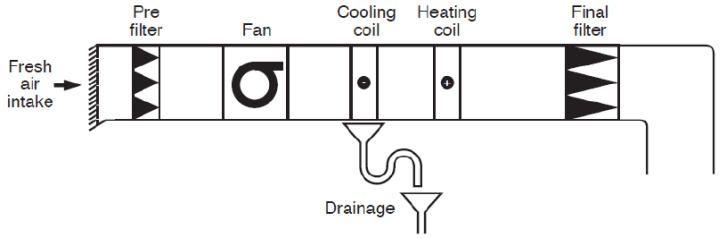
2.2: Ensure OT is at +ve pressure with minimal air ingress into OR from surrounding areas of department

Good Practice Points

None



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Types of Theatre Ventilation

Recommendations

None

Good Practice Points

GPP 3.1: Ensure that air flows from cleanest to less clean areas of theatre suite.

GPP 3.2: If a UCV theatre is used for procedures other than orthopaedic or other large implant procedures, use setback mode to switch to conventional theatre mode to maintain the patient's temperature, & prevent surgical site from drying

GPP 3.3: UCV meets conventional theatre standards if used as such

GPP 3.4: If UCV is at setback, record this

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Design Considerations

Recommendations

4.1: As recommended in HTM 03-01, theatre ventilation must be designed to allow for ≥ 22 air changes per hour to allow for deterioration over time

4.2: Ensure self-closing doors between each functional area

4.3: Opening of doors between the preparation room & elsewhere be via sensors

4.4: Avoid shared preparation rooms

4.5: Ensure air flows from preparation room (if used for laying up instruments pre-operatively) to OT, & then to rest of OT suite, i.e. from cleanest to elsewhere

4.6: If in the OT, scrub sinks should be ≥ 2m from operating area to avoid transfer of splashes

4.7: Hybrid theatres and interventional radiology facilities have the same specifications, e.g. ventilation, as conventional OTs

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Design Considerations

Good Practice Points

GPP 4.1: Follow rituals and behaviours guidelines (later) on when & where to open instrument packs

GPP 4.2: Preparation rooms must have clear signage & local procedures if instrument packs are not to be opened there.

GPP 4.3: Ensure sufficient time for all with necessary expertise to plan new facilities for surgical & other procedures

GPP 4.4: Design OTs so that each suite is supplied by a single air handling unit to facilitate maintenance.



BBC

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Design Considerations: Other Rooms

- **No IPC concerns in relation to anaesthetic rooms, & surgical site infections (SSI) via airborne route**
- **Storage areas should have ≥ 6 air changes per hour & be at positive pressure**
- **No IPC requirement for having separate service & clinical corridors, i.e. two corridors**



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Validation

Rationale

Validation is a series of assessments to ensure facility is fit for purpose & ready to use for surgery. The most important assessments for IPC are:

1. **Air handing unit constructed as specified; final filter located after fan**
2. **Final filter is of a grade to prevent passage of fungal spores & bacteria-carrying particles; no need for EPA/HEPA grade in conventional ORs**
3. **Filters are well fitted without gaps such that no air can bypass filtration**
4. **There is clear indication on surgeons' panel indicating ventilation is working normally**
5. **Over-rides of any setback/standby mode MUST NOT rely on staff to switch system on**
6. **Air flows robustly & in the correct direction**
7. **Air sampling can commence only after all physical parameters met**

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Validation

Recommendations

5.1: Ensure that IPC team receives confirmation that all technical aspects (e.g. filters, air pressures) are in line with official specifications. Details provided, if not the case

5.2: Ensure any air sampling takes place as a final step in validation of a new theatre & only after all other checks have shown compliance (not mandatory)

5.3: Ensure sufficient time allocated for air sampling, for acting on results, & this is communicated in advance to all stakeholders

Good Practice Points

GPP 5.1: Follow a correct sampling technique as provided

GPP 5.2: Follow standards for interpretation of air sampling results

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Are particle counts equivalent to microbiological sampling to asses air supply cleanliness in operating theatres? No.

Table I
Summary of studies which provide some information when comparing particle and microbiological testing in operating theatres (OTs)

Citation	When testing occurred	Type/number of theatres	Results and conclusions
Jowitt and Morris, 2005 [4]	During validation	Conventional ($N = 22$)	All OTs were validated (compliant) by particle tests. Microbiological sampling results were: <1 cfu/m^3 in 17 OTs 1 cfu/m^3 in three OTs 2 or 3 cfu/m^3 in two OTs Microbiological sampling was not considered necessary
Landrin et al., 2005 [5]	Not in use	Conventional ($N = 4$), multiple tests over four months. 96 sets of results for comparison	No correlation — Spearman's $\rho = 0.06$, P=0.6 ROC curve: no particle count value predicted when the bacterial air count was $\geq$5 cfu/m^3 (AUC = 0.4868)
Tan et al., 2021 [6]	Not in use	Laminar flow OT[a] ($N = 4$), multiple tests over four months. 96 sets for comparison	No overall correlation. For particles of the size: 0.5 μm: $\rho = 0.003$ 5 μm: $\rho = 0.07$ 10 μm: $\rho = 0.15$
Fox and Whyte, 1995 [7]	Not in use	Conventional ($N = 3$)	All three OTs had high air particle counts, microbiologically, they were within acceptable limits (no data provided)
Stalfelt et al., 2023 [8]	Studies undertaken during surgical procedures	UCV ($N = 5$) Conventional ($N = 5$) Not specified ($N = 2$) Systematic review of 11 studies	8/11 (73%) studies reported a significant correlation, but it varied from very weak (0.32 [R_P]), to strong (0.76 [R_P]) When stratified into UCV and conventional theatres, the results were inconsistent

AUC, area under the curve; ROC, receiver operating characteristics; UCV, ultraclean ventilated operating theatres.
[a] The OTs were described as laminar flow but would not fulfil the criteria for UCV in the UK.

CORRECTED PROOF

J Hosp Infect 2025; 160: 128-130

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Verification

Rationale

- **Verification is a periodical assessment to ensure facility meets minimum standards, e.g. annually**
- **No microbiological testing required if all standards are met**
- **If ventilation is sub-optimal, risk assessment must be undertaken, & surgical teams informed. Balance the risk of SSI & consequences from delayed surgery**
- **IPC professionals should be invited to contribute to that balanced risk assessment**

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Verification

Recommendations

6.1: Do not perform routine microbiological air sampling to support annual verification of OTs

6.2: Do not perform microbiological air sampling to validate cleaning after building work

6.3: Ensure the IPC team is part of multi-disciplinary team risk, e.g., ventilation safety group (VSG) in UK, assessing inadequacies in OT ventilation

6.4: Ensure local policy states that decision to release an operating facility for use, after it has successfully met annual verification standards, is made by a multi-disciplinary subgroup of the VSG

6.5: Ensure VSG has time to respond & is not pressurised by a too soon scheduled start date

6.6: Ensure IPC team is a part of VSG when risk assessing inadequacies in OT during verification

Good Practice Points

GPP 6.1: Consider air sampling as part of outbreak investigations

GPP 6.2: Ensure IPC team participates in evaluating OT standards are met

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Future Proofing & Contingency

Rationale

- **Over time, clinical needs will be subject to change. Plan for the present & the future**

- **If introducing new techniques or changing activity in OR, IPC team must be informed to assess with surgeons & others the suitability of the area for proposed activity & any modifications/upgrades needed**

- **Clear pathways for communicating changes agreed by VSG**

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Future Proofing & Contingency

Recommendations

7.1: Ensure changes in surgical procedures, or new techniques or activities in OR, are discussed in advance with IPC team & VSG, as there may be an impact on SSI rates

Good Practice Points

None

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Overarching Recommendations

OR 1: IPC member is on the VSG which has adequate representation

OR 2: When urgent IPC action is required, VSG with senior management, can make speedy & considered decisions

OR 3: IPC representation has competence & training to ask meaningful questions

OR 4: Ensure IPC representative has competence & training on microbiology sampling and interpretation

OR 5: VSG (or equivalent) must provide oversight of maintenance, validation & verification to ensure deviations are risk-assessed

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Operating Theatre Rituals & Behaviours

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Rituals & Behaviours



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Why was an update to the guideline needed?

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Last report was published in 2002. Since then:

New technologies emerged - some practices became redundant

New evidence suggests that some practices may be unnecessary

NICE accreditation: guideline process more robust & transparent with involvement of ESGNI (ESCMID)

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Terminology

Rituals Actions & or behaviours regularly & usually followed

Behaviours The way in which we conduct ourselves; how we respond

Document does not cover well established practices with solid evidence base, e.g. avoiding hypothermia, surgical antibiotic prophylaxis

Operating Theatre (OT) = complex, including anaesthetic room, corridor etc.

Operating Room = where surgery takes place

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Methodology

Scoping 15 PICO questions (updates & some new)

Panel include microbiologists/infectious diseases, surgeons, operating theatre & IPC nurses, systematic reviewers, & two lay members

Systematic reviews included 91 studies

We appraised quality & quantity of evidence using GRADE system

Recommendations & Good Practice Points based on level of evidence, clinical experience, practicality & impact on patients

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Recommendations Reflect the Quality of Evidence

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1. 'provide' or 'offer' when evidence was strong; 'do not offer' when strong evidence against the particular practice
    - Some recommendations may have weak evidence but represent what happens & what experts agree should happen (e.g. thorough cleaning)
2. 'consider' used when evidence moderate/weak but the intervention may be beneficial sometimes; "conditional recommendation".

'Good Practice Points'

When evidence is very weak or no evidence with no recommendation possible; based on expert opinion & clinical experience

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Q1 a) Does operating theatre cleanliness/disinfection have any effect on surgical site infection (SSI)?

b) How important is operating theatre cleanliness outside the sterile field?

Q2 If blood splashes and other forms of contamination with body fluids occur, can they be a source of infection?

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Q3 Does bringing in beds & associated linen from wards & other clinical areas into the operating theatre result in increased bacterial counts or increased infection post-operatively?

Q4 a) Does the order in which patients are operated on, i.e. contaminated/infected patients at the end of a list, reduce post-operative infections?

b) Should these patients recover separately from other patients before going to a ward?

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Q5. What is the clinical effectiveness of pre-operative showering/bathing before elective surgical procedures using 1) Non-disinfectant bath/shower 2) Disinfectant bath/shower?

Q6 What is the most effective preoperative skin antiseptic? Existing NICE Guidelines

Q7 a) Should surgical instruments be laid up (unpacked and exposed) as close as possible to use?

b) Should surgical instruments used in ultraclean ventilated theatre procedures be laid up under the canopy or in a prep room?

Q8 What is the most effective surgical scrub procedure for scrub staff? Existing NICE Guidelines

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Q9 Does the movement of theatre staff in and out of the operating room impact on air counts of bacteria & infection rates?

Q10 Should the surgical team remove jewellery before entering the operating theatre facilities?

Q11 a) Should staff cover their hair?

Q12 What is the impact of wearing operating room theatre outside the operating theatre complex?

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Q13 Should patients remove jewellery, false nails, nail polish before being brought into the operating theatre?

Q14 Should patients cover their hair before entering the operating theatre facilities?

Q15 a) What should parents/carers/accompanying person wear when accompanying the patient to the operating theatre?

b) Do patients or other individuals dressed in ordinary (street) clothes in the operating theatre result in increased bacterial counts or increased infection post-operatively?

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Q3 Does bringing in beds & associated linen from wards & other clinical areas into the operating theatre result in increased bacterial counts or increased infection post-operatively?

Evidence

- No studies
- One prospective cohort & one uncontrolled before & after (UBA) study found no difference in OT contamination whether one trolley or two trolley system **Judged weak evidence (against).**

Our rationale

- No need for a two-trolley system
- When patients brought on a bed, clean bedding used

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Q3 Does bringing in beds & associated linen from wards & other clinical areas into the operating theatre result in increased bacterial counts or increased infection post-operatively?

Recommendations

- No recommendation

Good practice points

- Allow clean beds with clean linen to be brought into operating theatre complex directly from clinical areas.

Q4 a) Does the order in which patients are operated on, i.e. contaminated/infected patients at the end of a list, reduce post-operative infections?

Evidence

- Meta-analysis of two retrospective cohort studies found no difference in SSI for patients after infected patients. **Considered very weak evidence (against)**
- One case series reported 1/35 patients acquiring infection from a preceding case. **Considered very weak evidence (against)**

Our rationale

- If theatre adequately cleaned & disinfected between patients, infection status does not impact on order of list

Q 4 b) Should these patients recover separately from other patients before going to a ward?

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Evidence

- No studies

Our Rationale

if patient on contact precautions in ward, maintain in theatre/recovery in separate area

Recommendations

No need to place contaminated/infected patients at end of operating list if operating room sufficiently cleaned & disinfected between patients, & the theatre ventilation continuously running

Good practice point

Allow patients on isolation/contact precautions to recover in the operating room or in a designated section of the recovery area

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Q5. What is the clinical effectiveness of pre-operative showering/bathing before elective surgical procedures using 1) Non-disinfectant bath/shower 2)Disinfectant bath/shower?

Evidence

- No studies
- One excluded study had patient showering in a bundle had no effect on SSI rates. **Judged very weak evidence (against)**

Our rationale

- Showering/bathing probably has little effect on SSI
- Should be encouraged for personal hygiene reasons
- Some patients shave operative site during pre-operative shower, evidence (not assessed here) shows that this practice should be discouraged
- Patients with e.g. MRSA likely to undergo decolonisation/ suppression therapy but specific & regimented (often includes other suppression therapies). Is therefore different to preoperative shower

Q5. What is the clinical effectiveness of pre-operative showering/bathing before elective surgical procedures using 1) Non-disinfectant bath/shower 2) Disinfectant bath/shower?

Recommendations

- No recommendation

Good practice points

- Encourage patients to shower/bathe before surgery for personal hygiene reasons. Consider using alternatives (e.g. wipes) immediately before operation if patients are unable to shower or bathe before operation.
- Don't delay operations for patients unable to shower/bathe before the surgery.
- Instruct patients not to shave surgical area before surgery.

Q7 a) Should surgical instruments be laid up (unpacked & exposed) as close as possible to use? b) Should surgical instruments used in ultraclean ventilated theatre procedures be laid up under the canopy or in a prep room?

Evidence

- 1 low-quality n-RCT found less contamination on instruments which were covered. **Considered weak evidence (for)**
- 3 prospective cohort & 1 UBA study found no effect on SSI when instruments under the ultraclean ventilation (UCV) canopy. **Considered weak evidence (against)**
- 3 prospective cohort, 1x non-randomise controlled trial (n-RCT) & 1 simulation study found less contamination on instruments placed under the UCV canopy. **Considered weak evidence (for)**

Q7 a) Should surgical instruments be laid up (unpacked & exposed) as close as possible to use? b) Should surgical instruments used in ultraclean ventilated theatre procedures be laid up under the canopy or in a prep room?

Our rationale

- Despite weak evidence, opening instruments should take place immediately before use to remain sterile for as long as possible
- Similar for any materials which go into the wound (e.g. prostheses)
- When possible, open under UCV conditions
- In line with other professional bodies e.g. British Orthopaedic Association

Q7 a) Should surgical instruments be laid up (unpacked and exposed) as close as possible to use? b) Should surgical instruments used in ultraclean ventilated theatre procedures be laid up under the canopy or in a prep room?

Recommendations

- For all surgical/operative procedures, lay up instruments & prosthetic materials as close to when needed.

Good practice points

- For UCV operating theatres, lay up instruments/prosthetic materials under canopy in preference to preparation room, unless local UCV there also.

Q11 a) Should staff cover their hair?

Evidence

- No studies
- 2 simulation studies showed that head coverings reduced air contamination in OT, 1 simulation study concluded there was no difference. **Judged very weak evidence (for)**
- 1 retrospective cohort & 3 UBA studies showed no difference in SSI if surgical cap or bouffant style/squire hood type of head coverings. **Judged very weak evidence (against)**

Q11 b) Should staff use facemasks?

Evidence

- Meta-analysis of 2 RCT, 1 n-RCT, 2 prospective cohort, 2 UBA & 1 case control study showed no benefit of masks for SSI reduction. **Considered moderate evidence (against).**
- 1 study reported outbreak of MSSA in patients operated by carrier surgeon who consistently worse mask under nose
- 1 RCT, 1 prospective cohort & 5 simulation studies demonstrated higher theatre air contamination when masks not worn. 2 simulation studies reported masks made no difference. **Considered weak evidence (for).**

Q11 a) Should staff cover their hair? b) Should staff use facemasks?

Our rationale

- Head coverings are not likely to reduce SSI
- Face masks are not likely to reduce SSI
- Face masks may be needed for other reasons (e.g. recent pandemic)
- Head coverings & face masks are a part of OT staff uniform & may be worn to maintain discipline & to distinguish OT from non-OT staff

Q11 a) Should staff cover their hair? b) Should staff use facemasks?

Recommendations

- No recommendation

Good practice points

- Ensure all staff working in operating room wear a head covering & a face mask in accordance with local policies.

Q12 What is the impact of wearing operating room theatre outside the operating theatre complex?

Evidence

- No studies
- 1 n-RCT reported no benefit when attire covered on leaving the theatre, 1 crossover trial found less contamination when covered. **Judged weak evidence (inconsistent)**
- 1 cross-over trial reported less contamination when staff changed on leaving & returned to don new attire but not when they changed into attire used before they left the theatre **Judged weak evidence (for)**
- 2 cross-over trials reported no difference when OT attire worn exclusively within the theatre complex vs when it was not. **Judged moderate evidence (against)**

Q12 What is the impact of wearing operating room theatre outside the operating theatre complex?

Our rationale

- Wearing OT attire outside complex probably does not increase SSI
- Staff need to be careful when visiting clinical areas (e.g. ICU) where antibiotic-resistant bacteria or highly pathogenic microorganisms (e.g. Group A streptococci) prevalent
- Not possible to monitor staff movement outside the theatre
- Covering attire or changing on return may mitigate any risks
- No evidence for footwear but agreed that this should be treated the same

Studies assessing bacterial contamination of operating theatre attire (OTA) when worn inside or outside the operating theatre (OT) or delivery/labour unit

Region [reference]	Methodology	Main findings	Conclusions
California, USA [4]	Rodac plates to assess nurses' OTA contamination with and without cover gowns or with fresh OTA when re-entering the OT	Counts were lower if cover gowns were used or if OTA was replaced when re-entering the OT. Colony counts increased over lunch periods	Cover gowns over OTA may reduce colony counts
New York, USA [5]	Tagged fabric on OTA cultured from midwives, obstetricians and others who did and did not leave the unit	Less growth on those who moved outside the unit but no statistical difference between the groups	No evidence to suggest that cover gowns will help maintain low counts on OTA
Bristol, UK [6]	OTA of 20 doctors sampled four times per day when inside and outside an orthopaedic OT	OTA worn outside the OT had higher bacterial counts 2 h after donning, but not after 4, 6 and 8 h	Contamination levels may be influenced more by activity than location
Singapore [7]	Sampling fabric squares from 16 anaesthetists in the OT alone, in both the OT and the surgical ward, and in the OT and a departmental office	Non-significant increase in counts compared with those remaining exclusively in the OT	Anaesthetists wearing OTA outside the OT did not have increased bacterial counts
Dundee, UK [8]	Rodac plates to assess the OTA of 12 staff on 19 occasions. Five changed OTA when outside the OT and a white coat was worn over OTA on five occasions	Small numbers of skin flora from 74/75 samples. *Staphylococcus aureus* recovered from five samples	Small numbers of staff with variable practices preclude definitive conclusions on the impact of wearing OTA outside the OT

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Q12 What is the impact of wearing operating room theatre outside the operating theatre complex?

Recommendations

- No recommendation

Good Practice Points

- Change or cover operating theatre attire (e.g. single-use disposable gown) & change footwear if leaving the operating theatre complex with the intention of returning.

Q15 a) What should parents/carers/accompanying person wear when accompanying the patient to the operating theatre? b) Do patients or other individuals dressed in ordinary (street) clothes in the operating theatre result in increased bacterial counts or increased infection post-operatively?

Evidence

- No studies

Our rationale

- Wearing scrubs, masks, head coverings/PPE not needed in anaesthetic room
- Probably not required in operating room, but maintains theatre discipline; local policy may state that these should be worn by all visitors

Q15 a) What should parents/carers/accompanying person wear when accompanying the patient to the operating theatre? b) Do patients or other individuals dressed in ordinary (street) clothes in the operating theatre result in increased bacterial counts or increased infection post-operatively?

Recommendations

- No recommendation

Good practice points

- Ask parents and carers to wear scrubs or equivalent (e.g. single-use coverall), with head coverings/face masks, in operating room as per local policy
- Ensure that visitors (e.g. technicians or company representatives) comply with local departmental policy on theatre attire

Final Reflections

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OT Validation & Verification

- **The IPC team will not be validating on their own & should avail of the necessary expertise, local & beyond**
- **Appropriate governance systems are essential to support the IPC team**
- **Unlike previously, the necessity to check air bacterial counts, is less dogmatic. Particle counting is not considered equivalent**
- **If sampling, do it correctly & allow for enough time to interpret results & even repeat**



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Rituals & Behaviours

- Evidence suggestive that instruments/prostheses should be opened as late as possible before the operative procedure & minimise door openings
- Beds can be brought in to the operating theatre & patients on contact precautions do not need to be last on the list
- While the evidence is conflicting, still probably important for staff to wear head gear & masks in the operating room
- Good Practice Points allow for common sense based on biological plausibility to be followed, e.g. no need to remove all patient jewellery

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Thank You





HIS official journals

Journal of Hospital Infection

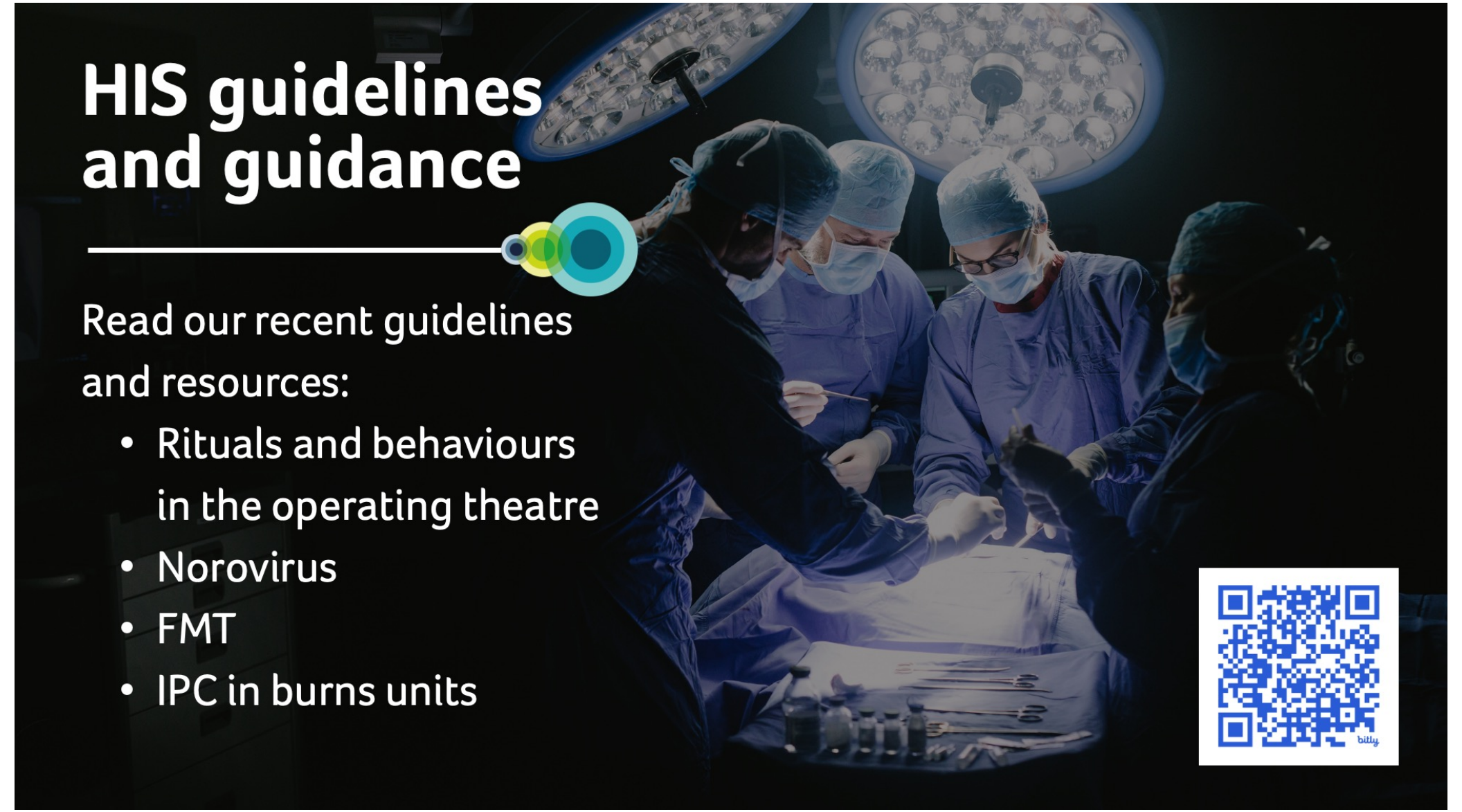
Infection Prevention in Practice







HIS guidelines and guidance



Read our recent guidelines and resources:

- Rituals and behaviours in the operating theatre
- Norovirus
- FMT
- IPC in burns units

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MON
28

September 28 @ 10:00 am BST

Cottrell Lecture … Walking the Tightrope: Balancing Safety, Science and Common Sense



Presented by the Infection Prevention Society (IPS)
Pat Cattini, Independent IPC Consultant, UK

Free

MON
28

September 28 @ 3:40 pm BST

Tina Bradley Lecture … Sampling — The Medium is the Message



Presented by the Infection Prevention Society (IPS)
Martyn Wilkinson, Journal of Hospital Infection, Editor-in-Chief, UK

Free

TUE
29

September 29 @ 9:45 am BST

Ayliffe Lecture … The Art and Science of Infection Prevention and Control



Presented by the Infection Prevention Society (IPS)
Prof. **Jennie Wilson**, University of West London, UK

Free

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