

The background image shows an operating theatre with a blue color scheme. In the center is a surgical table. Several monitors are visible, displaying various data and video feeds. One monitor on the left shows a close-up of a surgical site. Another monitor in the center displays a software interface. A stack of medical equipment is on the right. The overall atmosphere is clinical and high-tech.

Infection Control System in the Operating Theatre

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Objectives



- ❧ Share some management perspectives about infection control in OT
- ❧ Share some recommended guiding principles in OT design from infection control perspective
- ❧ Share some evidences based practices
- ❧ Share some examples and current practices in HA
- ❧ Share some practices and initiative from oversea

Operating Theatre- HA Definition



Operating Theatre (OT), is a designated area where operations are being performed under GA/RA/LA, and which can meet the following 3 physical requirements:

1. installed with ventilation system of positive pressure ventilation with a minimum of 15 fresh air changes per hour (with the exception of specially designed negative pressure OT), and
2. an air filter system e.g. HEPA filter to ensure supply of clean air; and
3. with space/ rooms for preparation/recovery of patients.

The Australian Council on Health Care Standards



1.1 Safety Standard

The organization provides safe care and services

❧ Criterion 1.1.5

❧ Continue Infection control system supports safe practices and ensures a safe environment for consumers/patients and healthcare workers

Organizational Infection Control – how?

- ☞ “Effective infection prevention and management requires the organizational wide implementation of **systems, processes and controls**, and regular **monitoring** and **auditing** to ensure compliances and allow remedial actions to be taken where necessary”

Infection Causing Agent



Focus in OT

- ∞ Environment
- ∞ Health care workers
- ∞ Equipment & instrument
- ∞ Patient

Control in OT – What?



Engineering control

- ❧ Air supply
 - ❧ HEPA filter
 - ❧ Temp
 - ❧ Humidity
- ❧ Lamina flow
- ❧ Pressure gradient
- ❧ Air exchange rate

WHO- Global Guidelines for the Prevention of Surgical Site Infection (2016)



- ❧ The panel suggests that “laminar airflow ventilation systems should not be used to reduce the risk of SSI for patients undergoing total arthroplasty surgery.”
- ❧ *(Conditional recommendation, low to very low quality of evidence)*
- ❧ “Very low quality evidence shows that in both total hip (THA) and knee (TKA) arthroplasty, laminar airflow ventilation has no benefit when compared to conventional ventilation in reducing the SSI rate.”

Control in OT – What?



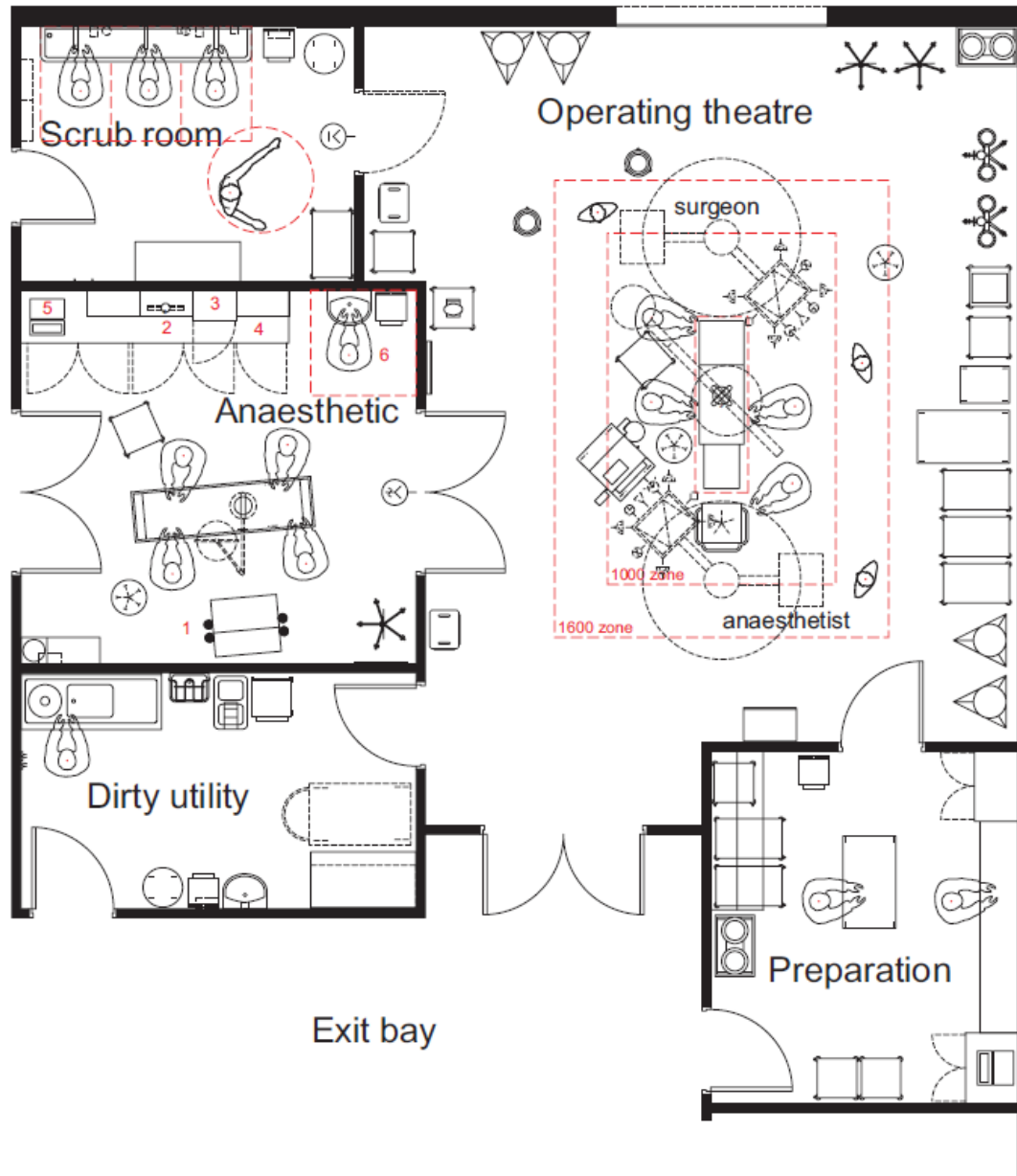
Design

☞ Zoning

☞ Isolation

☞ Anti-room

☞ Synchronized door



Source from HBN 26 Facilities for surgical procedures: Volume 1

Control in OT – What?



- ❧ Administrative control
- ❧ Infection Prevention and Control Practice in the Operating Department
 - ❧ Environmental decontamination
 - ❧ Restrict entry
 - ❧ Attire
 - ❧ Traffic & movement

Administrative control



- ❧ Infection Prevention and Control Practice in the Operating Department
 - ❧ PPE
 - ❧ Vaccination
 - ❧ Waste management

Administrative control



∞ Instrument

- ∞ Disinfection & sterilization
- ∞ Storing (expiry date & shelve life)
- ∞ Traceability
- ∞ CJD
- ∞ Single use devices

∞ Endoscope

- ∞ Disinfection & sterilization
- ∞ Storing
- ∞ Traceability

Current Control on SUD by HA



SUD Items		Spaulding Classification		
		Non-critical	Semi-critical	Critical
FDA Class	Class I	Registered	Reprocess & Re-use Registered Items Only	Reprocess & Re-use Registered Items Only
	Class II	Registered	Reprocess & Re-use Registered Items Only	Reprocess & Re-use Registered Items Only
	Class III	No Such Item	No Reuse	No Reuse

Behavioral Control



- ❧ Aseptic technique
 - ❧ Sterile field
 - ❧ Use of barrier
 - ❧ Handling of instruments
- ❧ Hand antisepsis
- ❧ Hand hygiene

Surgical hand preparation



- ❧ The WHO panel recommends that “surgical hand preparation be performed either by scrubbing with a suitable antimicrobial soap and water or using a suitable ABHR before donning sterile gloves.”
- ❧ *(Strong recommendation, moderate quality of evidence)*

Gloving



Table 4.20.1. Recommendations on gloving according to available guidelines

Guidelines (year issued)	Recommendations on the use of gloves
WHO guidelines for safe surgery (2009) (2)	The operating team should cover their hair and wear sterile gowns and sterile gloves during the operation.
SHEA/IDSA practice recommendation (2014) (3)	All members of the operative team should double-glove and change gloves when perforation is observed.

WHO: World Health Organization; SHEA: Society for Healthcare Epidemiology of America; IDSA: Infectious Diseases Society of America.

Gowning & gloving



- ❧ The WHO panel “decided not to formulate a recommendation due to the lack of evidence to assess whether double-gloving or changing of gloves during the operation or using specific types of gloves is more effective in reducing the risk of SSI.”

Drapes & Gown



1. The panel suggests that “either sterile, disposable, non-woven or sterile, reusable woven drapes and surgical gowns can be used during surgical operations for the purpose of preventing SSI.”

(Conditional recommendation, moderate to very low quality of evidence)

2. The panel suggests “not to use plastic adhesive incise drapes with or without antimicrobial properties for the purpose of preventing SSI.”

(Conditional recommendation, low to very low quality of evidence)

Patient



Antibiotic stewardship

SSI bundle

❧ Skin preparation

❧ Skin antisepsis

❧ Prophylactic antibiotic

❧ Re-dosing

❧ Prevention of hypothermia

Hair removal



- ✧ The panel recommends that “in patients undergoing any surgical procedure, hair should either not be removed or, if absolutely necessary, it should be removed only with a clipper. Shaving is strongly discouraged at all times, whether preoperatively or in the operating room (OR).”
- ✧ *(Strong recommendation, moderate quality of evidence)*

Surgical site preparation

- ❧ The panel recommends “alcohol-based antiseptic solutions based on CHG for surgical site skin preparation in patients undergoing surgical procedures.”
- ❧ *(Strong recommendation, low to moderate quality of evidence)*

Maintaining normal body temperature (normothermia)

Table 4.13.1. Recommendations on body temperature control (normothermia) according to available guidelines

Guidelines (date issued)	Recommendations on body temperature control (normothermia)
SHEA/IDSA (2014) (12)	Maintain normothermia (temperature of 35.5°C or more) during the perioperative period in surgical patients who have an anaesthesia duration of at least 60 minutes.
Royal College of Physicians of Ireland (2012) (13)	Body temperature maintained above 36° C in the perioperative period (excludes cardiac patients).
Health Protection Scotland bundle (2013) (14)	Body temperature maintained above 36° C in the perioperative period (excludes cardiac patients).
UK High impact intervention bundle (2011) (15)	Body temperature maintained above 36° C in the perioperative period.

Maintaining normal body temperature (normothermia)



- ❧ The WHO panel suggests “the use of warming devices in the operating room and during the surgical procedure for patient body warming with the purpose of reducing SSI.”
- ❧ *(Conditional recommendation, moderate quality of evidence)*

Perioperative Oxygenation



- ❧ The panel recommends that “adult patients undergoing general anaesthesia with endotracheal intubation for surgical procedures should receive an 80% fraction of inspired oxygen (FiO₂) intraoperatively and, if feasible, in the immediate postoperative period for 2-6 hours to reduce the risk of SSI.”
- ❧ *(Strong recommendation, moderate quality of evidence)*

Time for SAP



Table 4.4.1. Recommendations on SAP according to available guidelines

Guidelines (date issued)	Recommendations on SAP and the related time of administration
SHEA/IDSA (2014) (8)	Administer only when indicated, within 1 hour before incision with superior efficiency between 0 and 30 minutes prior to incision compared with administration between 30 and 60 minutes.
NICE (2013) (11).	Single dose of antibiotic intravenously on starting anaesthesia. Prophylaxis should be given earlier for operations in which a tourniquet is used, that is, <i>after</i> rather than before tourniquet inflation.

Optimal timing for preoperative surgical antibiotic prophylaxis



- ❧ The panel recommends “the administration of SAP prior to the surgical incision when indicated (depending on the type of operation).”
- ❧ *(Strong recommendation, low quality of evidence)*
- ❧ The panel recommends “the administration of SAP within 120 minutes before incision, while considering the half-life of the antibiotic.”
- ❧ *(Strong recommendation, moderate quality of evidence)*

Mechanical bowel preparation and the use of oral antibiotics



- ❧ 1. The panel suggests that “preoperative oral antibiotics combined with mechanical bowel preparation (MBP) should be used to reduce the risk of SSI in adult patients undergoing elective colorectal surgery.”
- ❧ *(Conditional recommendation, moderate quality evidence)*
- ❧ 2. The panel recommends that “MBP alone (without administration of oral antibiotics) should not be used for the purpose of reducing SSI in adult patients undergoing elective colorectal surgery.”
- ❧ *(Strong recommendation, moderate quality evidence)*

Additional Precaution for Specific Cases


- ☞ Standard precautions
- ☞ Transport of specimen
- ☞ Patient with blood borne viral infections
- ☞ MRSA
- ☞ TB
- ☞ CJD

Others



- ❧ **Antimicrobial-coated sutures**
- ❧ **Glucose control**

WHO Recommendation

The panel suggests “the use of triclosan-coated sutures for the purpose of reducing the risk of SSI, independent of the type of surgery.” 

(Conditional recommendation, moderate quality of evidence)

Table 4.22.1. Recommendations on the use of antimicrobial-coated sutures according to available guidelines

Guidelines (year issued)	Recommendations on the use of antimicrobial-coated sutures
SHEA/IDSA practice recommendation (2014) (33)	Do not routinely use antiseptic-impregnated sutures as a strategy to prevent SSI.
NICE (2013 update) (32)	Antimicrobial-coated sutures may reduce the SSI risk compared to uncoated sutures, although this effect may be specific to particular types of surgery, such as abdominal procedures.

SHEA: Society for Healthcare Epidemiology of America; IDSA: Infectious Diseases Society of America; NICE: National Institute for Health and Care Excellence; SSI: surgical site infection.

Use of protocols for intensive perioperative blood glucose control



- ❧ The WHO panel suggests “the use of protocols for intensive perioperative blood glucose control for both diabetic and non-diabetic adult patients undergoing surgical procedures to reduce the risk of SSI.”
- ❧ *(Conditional recommendation, low quality of evidence)*

Blood Glucose Control



Table 4.14.1. Recommendations on perioperative blood glucose control according to available guidelines

Guidelines (year issued)	Recommendations on perioperative blood glucose control
SHEA/IDSA practice recommendation (2014) (25)	Control blood glucose during the immediate postoperative period for cardiac and non-cardiac surgery patients. a) Maintain postoperative blood glucose at 180 mg/dL or lower. b) Intensive postoperative glucose control (targeting levels less than 110 mg/dL) has not been shown to reduce the risk of SSI and may actually lead to higher rates of adverse outcomes, including stroke and death.

Decolonization



- ❧ 1. The panel recommends that patients undergoing cardiothoracic and orthopaedic surgery with known nasal carriage of *S. aureus* should receive perioperative intranasal applications of mupirocin 2% ointment with or without a combination of CHG body wash.
- ❧ *(Strong recommendation, moderate quality of evidence)*
- ❧ 2. The panel suggests considering to treat also patients with known nasal carriage of *S. aureus* undergoing other types of surgery with perioperative intranasal applications of mupirocin 2% ointment with or without a combination of CHG body wash.
- ❧ *(Conditional recommendation, moderate quality of evidence)*

Decolonization



Table 4.2.1. Recommendations on screening and decolonization of *S. aureus* according to available guidelines and bundles

Guidelines (year issued)	Recommendations on screening and decolonizations of <i>S. aureus</i>
SHEA/IDSA (2014) (34)	Screen for <i>S. aureus</i> (MSSA and MRSA) and decolonize surgical patients for high-risk procedures, including some orthopaedic and cardiothoracic procedures.
NICE (2008) (36)	Do not use nasal decontamination with topical antimicrobial agents aimed at eliminating <i>S. aureus</i> routinely to reduce the risk of SSI.

Bathing



- ❧ It is good clinical practice for patients to bathe or shower prior to surgery. The panel suggests that either a plain or antimicrobial soap may be used for this purpose.
- ❧ *(Conditional recommendation, moderate quality of evidence)*
- ❧ The panel decided not to formulate a recommendation on the use of chlorhexidine gluconate (CHG)-impregnated cloths for the purpose of reducing SSI due to the limited and very low quality evidence.

Monitor



- ❧ Surveillance
- ❧ Hypothermia rate
- ❧ Hand hygiene compliance

Control in OT – How?



❧ **Audit, Surveillance and
Monitoring**

❧ **Training**

Control in OT – How?



❧ “If you can’t measure it, you can’t manage it”

❧ “Without data, it is just an opinion”

❧ *Source: Australasian Clinical Indicator Report 16th Edition 2007 – 2016*

Organizational Infection Control – how?

“---the organization should measures its performance in infection control by strategies such as benchmarking and collection of clinical indicator data.”

Source: *Australasian Clinical Indicator Report 16th Edition 2007 – 2016*

ACHS Clinical Indicator Program



- ❧ Anaesthesia & Perioperative Care
 - ❧ CI 3.3 Inadvertent hypothermia after surgery
- ❧ Infection Control
 - ❧ 1.1- 1.8 Infection surveillance
 - ❧ Hip prosthesis
 - ❧ Knee prosthesis
 - ❧ Chest incision site in CABG
 - ❧ LSCS
 - ❧ CI 3.1 – 3.4 Haemodialysis access –associated bloodstream infection surveillance
 - ❧ CI 4.1 -4.2 VRE

ACHS Clinical Indicator Program



- CI 2.1 – 2.10 Surgical antibiotic prophylaxis (SAP)
 - Timing of SAP Correct SAP & dose
 - Discontinuation of SAP within 24 hours of the procedure

ACHS Clinical Indicator Program

- Staff immunization
 - ❧ CI 5.1 Flu vaccination for permanent staff
 - ❧ CI 5.2 Hepatitis B vaccination for permanent staff

- ❧ Occupational exposures to blood and/or body fluid
 - ❧ CI 6.1 Parenteral
 - ❧ CI 6.2 Non-parenteral

Clinical Indicator & Accreditation

☞ Quoted - - - -

☞ “One of the tools that facilitate the review and development of HCO performance.”

☞ “The data is not a focus for accreditation.”

☞ “ surveyor is able to monitor the HCO’s response to the outlier measure or deteriorating trend”

☞ *Source: Australasian Clinical Indicator Report 16th Edition 2007 – 2016*

Clinical Indicator & Accreditation

- ❧ Quoted
 - ❧ “Was it investigated?”
 - ❧ “What has learnt?”
 - ❧ “What action had been, or would be, taken?”
 - ❧ “What was the outcome of those actions”
 - ❧ “ - - - focus on quality improvement.”
- ❧ *Source: Australasian Clinical Indicator Report 16th Edition 2007 – 2016*

References



- ❧ *EQuIP6 – The ACHS EQuIP6 Hong Kong Guide, Book 1 &2*
- ❧ *Australasian Clinical Indicator Report 16th Edition 2007 – 2016*
- ❧ *WHO Guideline for Safe Surgery (2009)*
- ❧ *WHO Global Guideline for the Prevention of Surgical Site Infection 2016*
- ❧ *NICE CG 65 Inadvertent Peri operative Hypothermia*
- ❧ *Infection Prevention and Control Practice in the Operating Department - The Newcastle upon Tyne NHS Hospitals Foundation Trust (version 3.2 -26 Apr 2016)*