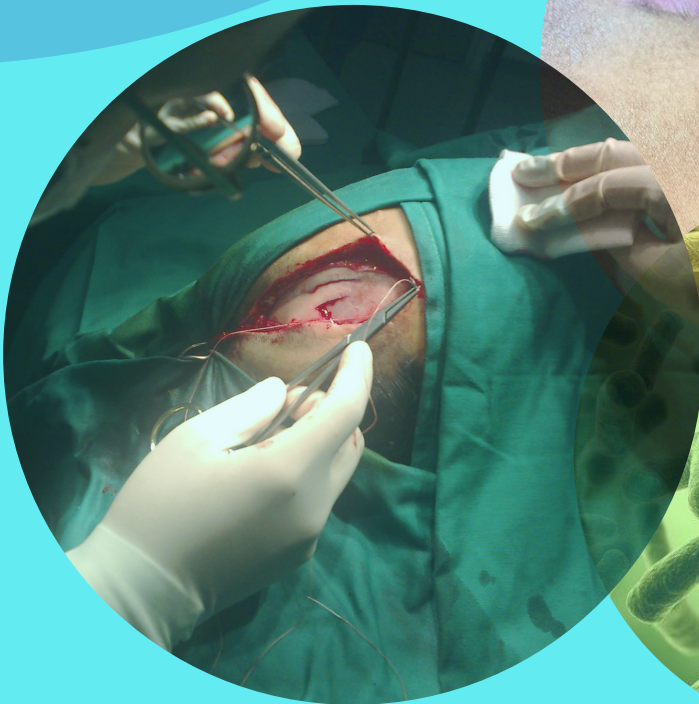


# SURGICAL SITE INFECTION

## PREVENTION & SURVEILLANCE GUIDELINE

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2023



MEDICAL CARE QUALITY SECTION  
MEDICAL DEVELOPMENT DIVISION  
MINISTRY OF HEALTH MALAYSIA

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# **Surgical Site Infection Guideline**

## **2023**

This document was developed by the Clinical Audit Unit, Medical Care Quality Section of Medical Development Division, Ministry of Health, Malaysia and the National Technical Working Group of Surgical Site Infection.

Completed in December 2022

Published by Ministry of Health Malaysia in August 2023

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Federal Government Administrative Centre  
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A catalogue record of this document is available from the National Library of Malaysia

ISBN: 978-967-2469-62-9

A copy of this document is also available at MOH Portal:

<https://hq.moh.gov.my/medicaldev/ckpp/unit-audit-klinikal/>

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## PREAMBLE

It is with utmost pleasure that I pen this Foreword for Malaysia's 1st Surgical Site Infection (SSI) Prevention and Surveillance Guideline which has been formulated by a strong multidisciplinary team comprising of Surgeons from various Surgical Specialties, Anaesthetists and Infectious Diseases Physicians from various Ministries. I would like to thank and congratulate everyone involved in producing this Guideline especially the Clinical Audit Unit of Ministry of Health, Malaysia along with the members of the Technical Working Group (TWG). They have been charged with many tasks which includes initiating and establishing a Malaysian policy to meet global standards but ensure that they are still feasible for adaptation within our healthcare facilities.

A country's growth is measured based on its healthcare delivery system. As we thrust Malaysia from a low- to upper-middle-income country, our healthcare delivery should be modernised constantly. This guideline is now on par with The United Nations Sustainable Development Goals (SDG) 2030, G4 Alliance recommendations and the Medical Programme Strategic Plan 2021-2025.

With the birth of this Guideline, this becomes a reference for healthcare professionals to ensure protocols and procedures are adhered to. When appropriately adapted and in place, we can aim to prevent and reduce the risk. It is my devout hope that everyone works hand in hand to comply with the standard practices, to reduce any variations in practice. This requires a high level of commitment from the healthcare workers (HCWs) which is astutely integral in providing the best quality of care. As Henri Frederic Amiel, a Swiss poet aptly said, "In health there is freedom. Health is the first of all liberties". I sincerely hope, we provide the freedom of health to all our patients.



**DATUK DR. MUHAMMAD RADZI BIN ABU HASSAN**  
DIRECTOR GENERAL OF HEALTH  
MINISTRY OF HEALTH MALAYSIA  
AUGUST 2023

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## FOREWORD

The Medical Development Division (MDD) under the Medical Programme of the MOH, plays a critical role in ensuring the effective planning and implementation of healthcare policies and programs cinching the smooth sailing of all the hospitals. With the country's growing population, there is an increasing need to ensure all healthcare workers are up to date in their knowledge and skills to accommodate the growing demand for quality healthcare services. One such activity is the development of the Surgical Site Infection Prevention Guideline and Surveillance.

Surgical site infection (SSI) can be a serious complication for patients undergoing surgical procedures. Till date, in Malaysia, there are no specific guidelines in place to prevent and manage SSI in healthcare facilities. In this guideline, we focus on the prevention of SSIs before, during and after the surgery. A Surveillance is also in placed to identify patients who may be at risk to develop an SSI and these cases will be discussed by the National Surgical Site Infection Committee which was recently formed during the development of this guideline. This guideline aims to educate all healthcare professionals in preventing and managing SSI as well as to educate the patients on their role in preventing SSI.

Overall, the committee has established a comprehensive framework for preventing and managing SSI in healthcare facilities. By adhering to these guidelines and implementing effective infection control strategies, patients can receive optimal care and minimize the risk of infections during surgical procedures. SSI is a preventable complication, and healthcare professionals have a responsibility to mitigate this risk. By taking a proactive approach and adhering to established infection control protocols, we can significantly reduce the incidence of surgical site infections, resulting in safer, effective and efficient patient care.

A simple but effective quote that perfectly encapsulates this notion is, "an ounce of prevention is worth a pound of cure." With that, I hope this book will guide us, the HCWs, in preventing and reduce the burden of SSI.



**DATO' DR ASMAYANI BINTI KHALIB**  
DEPUTY DIRECTOR GENERAL OF HEALTH (MEDICAL)  
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AUGUST 2023

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## PREFACE

Surgical site infection (SSI) is an infection occurring after surgery which is undesirable and has serious outcomes. Preventing SSI has become increasingly important in ensuring that patients receive the best care possible. According to the World Health Organisation (WHO), SSI is a leading Healthcare Associated Infection (HCAI); thus, we seized the opportunity to produce this guideline which has unravelled the complexities involved in SSI prevention.

As healthcare providers, we must stay abreast of the latest developments and management in preventing SSI. By the implementation of this Guideline, we have ventured into making this challenging task of SSI prevention simpler and more straightforward to facilitate our fellow comrades in providing the best care for our patients.



The Technical Working Group (TWG) was formed in 2020, however we had to pause in 2021 due to the global pandemic of COVID-19. However, we resumed in 2022 and had convened several times since then to complete this Guideline. Despite facing many hurdles and hiccups, we came to a consensus and produced this Surgical Site Infection Prevention and Surveillance Guideline. This book is aimed to equip every healthcare worker with the knowledge of SSI Prevention.

In conclusion, managing SSI is key to providing the best healthcare for our patients. I extend my sincere gratitude to the members of the National TWG and the Clinical Audit Unit, Ministry of Health for their time and effort in materialising this Guideline. I hope we benefit from this Guideline and able to implement it to our patient's benefit.

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## List of Abbreviations

AAA	Abdominal Aortic Aneurysm
ABHR	Alcohol-based Handrub
AC	Axillary Clearance
ACH	Air Changes per Hour
AMO	Assistant Medical Officer
AMR	Antimicrobial Resistance
APSIC	Asia Pacific Society of Infection Control
ASC	Active Surveillance Culture
ASHP	American Society of Health-System Pharmacists
AST	Active Surveillance Testing
AVF	Arteriovenous Fistula
AVR	Aortic Valve Replacement
BMI	Body Mass Index
BSO	Bilateral Salpingo-Oophorectomy
CABG	Coronary Artery Bypass Grafting
CAU	Clinical Audit Unit
CBGB	Coronary Artery Bypass Grafting Surgery with Both Chest and Donor Site Incisions
CDC	Centres for Disease Control and Prevention
cfu/m <sup>3</sup>	colony forming units per cubic meter
CHG	Chlorhexidine Gluconate
CP	Contact Precautions
CPRC	Crisis Preparedness Response Centre
CT	Computed Tomography
DIP	Deep Incisional Primary
DIS	Deep Incisional Secondary
ECDC	European Centre for Disease Prevention and Control
ERAS	Enhanced Recovery After Surgery
FDA	U.S. Food & Drug Administration
GDFT	Goal-Directed Fluid Therapy
HAI	Health Care-Associated Infection
HbA1C	Glycated Haemoglobin
HCW	Healthcare Worker
HIACC	Hospital Infection & Antibiotic Control Committee
INR	International Normalized Ratio
JCI	Joint Commission International
JKKIAK	<i>Jawatankuasa Kawalan Infeksi dan Antibiotik Kebangsaan</i>
JKN	<i>Jabatan Kesihatan Negeri</i>

---

LSCS	Lower Segment Caesarean Section
MBP	Mechanical Bowel Preparation
mmol/L	millimoles per litre
MOABP	Mechanical + Oral Antibiotics Bowel Preparation
MOBILE	Mechanical and Oral Antibiotic Bowel Preparation versus No Bowel Preparation for Elective Colectomy
MOH	Ministry of Health, Malaysia
MPIS	Medical Programme Information System
MRSA	Methicillin-Resistant <i>Staphylococcus aureus</i>
m/s	metre per second
MSSA	Methicillin-Susceptible <i>Staphylococcus aureus</i>
NAG	National Antibiotic Guideline
NBP	No Bowel Preparation
NCEPOD	National Confidential Enquiry into Patient Outcome and Death
NHSN	National Healthcare Safety Network
NICE	National Institute for Health and Care Excellence
NPWT	Negative Pressure Wound Therapy
OMF	Oro-Maxillofacial
PIC	Person-in-Charge
POCT	Point-of-Care Testing
POMR	Perioperative Mortality Review
PPS	Point-Prevalence Survey
PVP-I	Polyvinylpyrrolidone Iodophors/ Povidone Iodine
RCSEng	Royal College of Surgeons of England
SAP	Surgical Antibiotic Prophylaxis
SDG	The United Nations Sustainable Development Goals
SIACC	State Infection & Antibiotic Control Committee
SIP	Superficial Incisional Primary
SIS	Superficial Incisional Secondary
SP	Standard Precautions
SSI	Surgical Site Infection
<i>S. aureus</i>	<i>Staphylococcus aureus</i>
TAH	Total Abdominal Hysterectomy
TWG	Technical Working Group
UNHCR	United Nations High Commissioner for Refugees
USA	United States of America
VAS	Vascular Access Surgery
WHO	World Health Organisation
°C	Degree Celsius



# PART 1 - INTRODUCTION



## BACKGROUND

Surgical site infection (SSI) is one of the most common types of healthcare-associated Infection (HAI). SSI can range from trivial erythema to a life-threatening condition which may require intensive care or re-operations.

SSI is the most surveyed HAI in low-to-middle income countries and the pooled incidence of SSI is 11.8 per 100 surgeries<sup>1,2</sup>. Although it is lower in high-income countries, it is still the second most frequent HAI in the United States of America (USA) and Europe<sup>1</sup>. SSI is also associated with 3% mortality rate<sup>3</sup>. However, prevalence studies often underestimate SSI due to poor recognition and underreporting.

SSI costs an estimated USD\$3.3 billion and almost 1 million additional inpatient-days annually<sup>3</sup>. The main additional costs are re-operations, nursing, and wound care as well as drug treatments. The indirect costs are due to loss of productivity, patient dissatisfaction and litigation, and reduced quality of life for the patient. The United Nations Sustainable Development Goals 2030, Goal 3: Good Health and Well-being: Ensure healthy lives and promote well-being for all at all ages, uses SSI rate as a proxy indicator<sup>4</sup>.

In 2021, the total number of surgeries performed in Malaysia was 891,558 (HIMS)<sup>5</sup>. Therefore, if our numbers were to be extrapolated based on the statistic above, the total number of SSI could be as high as 105,203 cases and the number of deaths associated with SSI could be as high as 3,156. According to the study by Tan LT et. Al. (2019)<sup>6</sup>, patients with SSI requires additional hospitalization of 7-10 days. As the cost of additional inpatient stay is RM 100/ day (Malaysian Fee Schedule 2012)<sup>7</sup>, which would entail in an expenditure of at least RM 18 million, excluding the costs of treatment.

The cause of SSI can be multifactorial which include modifiable and non-modifiable patient, surgical and environmental factors. Therefore, it is essential that healthcare professionals work towards minimizing the risk of SSI. This is the impetus for preparing this document in accordance with the recommendations by WHO, CDC and APSIC. This guideline would also serve as a foundation for an SSI Surveillance Program in Malaysia.

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## OBJECTIVES

### General

To provide a reference for healthcare workers in Malaysia for the prevention, diagnosis, surveillance and management of SSI.

### Specific

1. To improve awareness of current measures in SSI prevention
2. To decrease variations in clinical practice
3. To improve the effectiveness of the quality of care
4. To minimize costly preventable complications
5. To serve as an instrument for training

---

## DEFINITION OF TERMS

### **Surgery**

Defined as procedure performed for the purpose of structurally altering the human body by incision or destruction of tissues and is part of the practice of medicine for the diagnostic or therapeutic treatment of conditions or diseases.

### **Surgical site**

Defined as the site on the human body where the surgery was performed.

### **Surgical wound<sup>1</sup>**

Defined as a wound created when an incision is made with a scalpel or other sharp cutting device and then closed in the operating room by suture, staple, adhesive tape, or glue and resulting in close approximation to the skin edges.

### **Surgical site infection (SSI)<sup>1,8</sup>**

Defined as an infection related to an operative procedure that occurs at or near the surgical incision within 30 days of the procedure or within 1 year if prosthetic material is implanted at surgery.

Also defined as an infection that occurs within 30 days after the operation and involves the skin and subcutaneous tissue of the incision (superficial incisional) and/or the deep soft tissue (for example, fascia, muscle) of the incision (deep incisional) and/or any part of the anatomy (for example, organs and spaces) other than the incision that was opened or manipulated during an operation (organ/space).

### **Healthcare worker (HCW)**

Defined as any person who is temporarily or permanently employed by or at, or who serves as a volunteer in, or has an employment contract with, a health care facility.

### **Medical Implant<sup>9</sup>**

Devices or tissues that are placed inside or on the surface of the body. Many implants are prosthetic intended to replace missing body part. Other implants deliver medication, monitor body functions or provide support to organ and tissues<sup>1</sup>.

## Surgical Site Infection (SSI) Criteria<sup>3</sup>

Criterion	Surgical Site Infection (SSI)
	<p><b>Superficial incisional SSI</b></p> <p>Must meet the following criteria:            Date of event occurs within 30 days following the operative procedure (where day 1 = the procedure date)</p> <p><b>AND</b></p> <p>involves only skin and subcutaneous tissue of the incision</p> <p><b>AND</b></p> <p>Patient has at least one of the following:</p> <ol style="list-style-type: none"> <li>a. Purulent drainage from the superficial incision</li> <li>b. Organisms identified from an aseptically-obtained specimen from the superficial incision or subcutaneous tissues by a culture or non-culture based on microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, not Active Surveillance Culture/Testing [ASC/AST].</li> <li>c. A superficial incision that is deliberately opened by surgeon, physician or physician designee and culture or non-culture-based testing of the superficial incision or subcutaneous tissue is not performed</li> </ol> <p><b>AND</b></p> <p>Patient has at least one of the following signs or symptoms: localized pain and tenderness; localized swelling; erythema; or heat.</p> <ol style="list-style-type: none"> <li>d. Diagnosis of a superficial incision SSI by a physician* or physician designee.</li> </ol> <p>* The term physician for the purpose of application of the SSI criteria may be interpreted to mean a surgeon, infectious disease physician, emergency physician, other physician on the case, or physician's designee (nurse practitioner or physician's assistant).</p>
<p><b>Comment</b></p>	<p>There are two specific types of superficial incision SSIs:</p> <ol style="list-style-type: none"> <li>1. Superficial Incisional Primary (SIP) – a superficial incisional SSI that is identified in the primary incision in a patient that has had an operation with one or more incisions (for example, c-section incision or chest incision for CBGB).</li> <li>2. Superficial Incisional Secondary (SIS) – a superficial incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (for example, donor site incision for CBGB)</li> </ol>

---

**Reporting  
Instructions for  
Superficial  
incisional SSI**

The following do not qualify as criteria for meeting the definition of superficial incisional SSI:

- Diagnosis/ treatment of cellulitis (redness/ warmth/ swelling), by itself, does not meet superficial incisional SSI criterion 'd'.
- A stitch abscess alone (minimal inflammation and discharge confined to the points of suture penetration).
- A localized stab wound or pin site infection; depending on the depth, these infections might be considered either a skin (SKIN) or soft tissue (ST) infection.

**Note:** For an operative procedure, a laparoscopic trocar site is considered a surgical incision and not a stab wound. If a surgeon uses a laparoscopic trocar site to place a drain at the end of a procedure this is considered a surgical incision.

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**Deep incisional SSI**

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Must meet the following criteria:

Date of event occurs within 30 following the operative procedure (where day 1 = the procedure date)

**AND**

Involves deep soft tissues of the incision (for example, fascial and muscle layers)

**AND**

Patient has at least one of the following:

- a. Purulent drainage from the deep incision.
- b. A deep incision that is deliberately opened or aspirated by a surgeon, Physician\* or physician designee or spontaneously dehisces

**AND**

Organisms identified from deep soft tissue of the incision by a culture or non-culture based on microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, not Active Surveillance Culture/ Testing [ASC/ AST] or culture or non-culture based microbiologic testing method is not performed. A culture or non-culture-based test from deep soft tissues of the incision that has a negative finding does not meet this criterion.

**AND**

Patient has at least one of the following signs and symptoms: (>38°C); localized pain or tenderness.

- c. an abscess or other evidence of infection involving the deep incision detected on gross anatomical exam histopathologic exam, or imaging test.

---

\* The term physician for the purpose of application of the SSI criteria may be interpreted to mean a surgeon, infectious disease physician, emergency physician, other physician on the case, or physician's designee (nurse practitioner or physician's assistant).

**Comment**

There are two specific types of deep incisional SSIs:

1. Deep Incisional primary (DIP)- a deep incisional SSI that is identified in a primary incision in a patient that has had an operation with one or more incisions (for example, C- section incision or chest incision for CBGB)
2. Deep Incisional Secondary (DIS) – a deep incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (for example, donor site incision for CBGB)

---

**Organ/ Space SSI**

Must meet the following criteria:

Date of event occurs within 30 following the operative procedure (where day 1 = the procedure date)

**AND**

involves any part of the body deeper than the fascial/ muscle layers that is opened or manipulated during the operative procedure

**AND**

patient has at least one of the following:

- a. purulent drainage from a drain placed into the organ/ space (for example, closed suction drainage system, open drain, T-tube drain, CT-guided drainage).
  - b. organism(s) identified from fluid or tissue in the organ/space by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, not Active Surveillance Culture/ Testing [ASC/ AST])
  - c. an abscess or other evidence of infection involving the organ/ space detected on gross anatomical exam or histopathologic exam, or imaging test evidence definitive or equivocal for infection.
-

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## DEFINITION OF OPERATIVE PERIOD

### PERIOPERATIVE PERIOD<sup>10</sup>

It is a period that includes pre-, intra- and post-operative.

#### a) PRE-OPERATIVE PERIOD\*

From the time when patient agrees for operation to arrival of patient at Operating Room.

#### b) INTRAOPERATIVE PERIOD\*

From arrival of patient at Operating Room until the arrival of patient at the Recovery Area.

#### c) POST-OPERATIVE PERIOD\*

From arrival of patient at the Recovery Area until completion of surgical care.

\*These definitions of terms were based on the consensus of the TWG for the purpose of standardization of practice within Malaysian healthcare facilities.

## DEFINITIONS OF TYPE OF SURGERY<sup>11</sup>

### ELECTIVE SURGERY

Elective surgery is planned surgery that can be booked in advance of routine admission to hospital as a result of a specialist clinical assessment. It occurs within a planned time that suits patient, hospital and staff. It is performed in an elective surgical list for conditions not classified as emergency surgery.<sup>11,12,13</sup>

## CLASSIFICATION OF WOUND<sup>1</sup>

<b>Class I Clean</b>	An uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tract is not entered. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. Operative incisional wounds that follow non-penetrating (blunt) trauma should be included in this category if they meet the criteria.
<b>Class II Clean-contaminated</b>	An operative wound in which the respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions without unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina and oropharynx are included in this category, provided no evidence of infection or major break in technique is encountered.
<b>Class III Contaminated</b>	Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique (e.g. open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions in which acute, non-purulent inflammation is encountered are included in this category.
<b>Class IV Dirty-infected</b>	Old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation.



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## **PART 2**

# **SSI PREVENTION STRATEGIES**

**SSI  
PREVENTION  
STRATEGIES**

**PRE-OPERATIVE**

**INTRA-OPERATIVE**

**POST-OPERATIVE**

A person wearing a surgical cap and mask is standing in a tiled room, likely a scrub room or pre-operative area. The person is facing away from the camera, looking towards a sink and a poster on the wall. The room has white tiled walls and a sink with a faucet. A poster is visible on the wall to the left. The overall scene is dimly lit, with a blue tint. A large blue rounded rectangle is overlaid on the image, containing the text "PRE - OPERATIVE".

# PRE - OPERATIVE

## PATIENT RISK FACTORS

<b>A1</b>	Age
<b>A2</b>	General Skin Condition
<b>A3</b>	Glycemic Control
<b>A4</b>	Nutritional Status
<b>A5</b>	Smoking
<b>A6</b>	Obesity
<b>A7</b>	Medications
<b>A8</b>	Immunocompromised State
<b>A9</b>	Staphylococcus Aureus (MSSA and MRSA) Colonisation

## HOSPITALISATION FACTORS

<b>B1</b>	Types of Surgery
<b>B2</b>	Duration of Pre-operative Admission
<b>B3</b>	Pre-operative Bathing or Wiping
<b>B4</b>	Mechanical Bowel Preparation

## A. PATIENT RISK FACTORS

### FACTOR A1 – Age

#### RECOMMENDATIONS

The TWG recognizes increasing age has an increased risk of SSI.

We recommend that surgeons should exercise caution when dealing with older surgical patients by optimizing the patients' condition pre-operatively.

#### RATIONALE

Increasing age has an increased risk of developing SSI due to deteriorating immunological responses and presence of possible comorbidities.<sup>1</sup>

#### REMARKS / CAVEAT

Older person refers to a person who is over 60 years of age.<sup>2,3</sup>

#### REFERENCE

- 1) Joint Commission International. (2018). Evidence-Based Principles and Practices for Preventing Surgical Site Infections. [https://store.jointcommissioninternational.org/assets/3/7/JCI\\_SSI\\_Toolkit.pdf](https://store.jointcommissioninternational.org/assets/3/7/JCI_SSI_Toolkit.pdf)
- 2) UNHCR | Emergency Handbook. UNHCR. <https://emergency.unhcr.org/>
- 3) World Health Organization: WHO. (2022, October 1). Ageing and health. <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>

### FACTOR A2 – General Skin Condition

#### RECOMMENDATIONS

The TWG identifies that a previous insult to the surgical site increases the risk of SSI.

We recommend when a skin condition is reversible and treatable, the elective surgery should be postponed until the skin condition is favourable for surgery.

#### RATIONALE

The presence of previous surgical scar, recent radiotherapy and history of skin or soft tissue infection to the surgical site increases the risk of SSI.<sup>1</sup>

#### REMARKS / CAVEAT

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#### REFERENCE

- 1) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>

## FACTOR A3 – Glycaemic Control

### RECOMMENDATIONS

The TWG recommends having good glycaemic control for both diabetic and non-diabetic adult patients undergoing surgical procedures to reduce the risk of SSI.<sup>1,2</sup>

We recommend a target glycaemic control for Diabetic & Non-Diabetic patients (with risk factors of Diabetes Mellitus) is 8-10mmol/L<sup>1,3,4</sup> and insulin infusion should be considered if blood glucose level is > 10mmol/L.<sup>2</sup>

The TWG also recommends that post-operative glucose control be maintained from 18 hours post-operatively and “until enteral nutrition” commences to a maximum of 14 days.<sup>4</sup>

We advise maintaining preoperative HbA1C levels to be less than 8% in diabetic patients.<sup>2</sup>

### RATIONALE

Poor perioperative blood sugar control increases the risk of SSI.<sup>1</sup>

Use of available protocols for perioperative blood glucose control for both diabetic and non-diabetic adult patients undergoing surgical procedures to reduce the risk of SSI.<sup>2</sup>

### REMARKS / CAVEAT

Glycaemic control in paediatric and adolescent age groups should be considered separately.

A simple, conventional protocol should be sufficient to reduce the risk of hypoglycaemia for patients who are admitted to a general ward where frequent glucose monitoring may not be done.

Recommendations were adapted from the Global Guidelines for The Prevention of Surgical Site Infection, World Health Organisation (WHO) 2018 & Centres for Disease Control and Prevention (CDC) Guideline for the Prevention of Surgical Site Infection, 2017 although the quality of evidence is low in the range of optimal perioperative glucose levels.

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## REFERENCE

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- 2) World Health Organization. (2018). Global guidelines for the prevention of surgical site infection.
- 3) Berríos-Torres, S. I. et. al. (2017). Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. JAMA Surgery, 152(8), 784. [doi.org/10.1001/jamasurg.2017.0904](https://doi.org/10.1001/jamasurg.2017.0904)
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## FACTOR A4 - Nutritional Status

### RECOMMENDATIONS

The TWG recommends optimization of the patient's nutritional status.<sup>1</sup>

Patients with malnutrition or at risk of malnutrition following pre-operative nutritional assessment should receive nutritional support and have their nutrition optimised prior to a planned surgery.<sup>2</sup>

### RATIONALE

The nutritional status of a patient has an impact on the immune system and hence, plays a role in the postoperative outcome susceptibility to infection leading to SSI.<sup>3,4</sup>

It is also reported that malnutrition can delay the healing process and is a threat to the surgical outcome.<sup>5</sup>

### REMARKS / CAVEAT

Malnutrition is defined as deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients.<sup>6</sup>

### REFERENCE

- 1) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>
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- 6) Malnutrition. (2020) <https://www.who.int/news-room/questions-and-answers/item/malnutrition>

## FACTOR A5 – Smoking

### RECOMMENDATIONS

The TWG strongly advocates cessation of smoking before surgery.<sup>1</sup>

We recommend smoking cessation for 3-4 weeks to reduce wound healing complication<sup>2</sup> and to continue cessation of smoking postoperatively.<sup>3</sup>

### RATIONALE

Active smokers have an increased risk of SSI.<sup>2</sup>

Smoking causes vasoconstriction: hence it delays wound healing. Therefore, it makes the patient susceptible to the colonization of organisms.<sup>3</sup> It also impairs the revascularization of the wound and delays wound healing.<sup>4</sup>

Smoking distorts a patient's immune system and can delay healing, increasing the risk of infection at the wound site. Smoking just one cigarette decreases the body's ability to deliver necessary nutrients for healing after surgery.<sup>5</sup>

### REMARKS / CAVEAT

To reduce respiratory complications, cessation of smoking should be 6-8 weeks.<sup>3</sup>

Smoking-cessation programs education to patients should be continued.

### REFERENCE

- 1) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>
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- 5) World Health Organization. (2018). Global guidelines for the prevention of surgical site infection

## FACTOR A6 - Obesity

### RECOMMENDATIONS

The TWG recognizes obesity as a risk factor for developing SSI.

We recommend the HCWs to be vigilant when attending to an obese patient when planning for surgery. It is advisable and if possible, the patient should undergo a weight reduction programme prior to surgery.<sup>1</sup>

### RATIONALE

Studies have shown that areas with prominent fatty tissue have a higher rate of infection due to decreased blood supply which may impair healing.<sup>2</sup>

### REMARKS / CAVEAT

Obesity is defined as a BMI of  $\geq 30$ .<sup>3</sup>

Body mass index (BMI) for overweight is defined as 25–29.9.<sup>3</sup> Overweight patients should also be considered for this recommendation.

### REFERENCE

- 1) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>
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- 3) World Health Organization: WHO. (2010, May 6). A healthy lifestyle - WHO recommendations. <https://www.who.int/europe/news-room/fact-sheets/item/a-healthy-lifestyle-who-recommendations>

## FACTOR A7 – Medications

### RECOMMENDATIONS

The TWG suggests identifying the patient's existing medications which may increase the risk of SSI (e.g. steroids, chemotherapy, anticoagulant and antiplatelet).<sup>1</sup>

We recommend withholding anticoagulant and antiplatelet prior to surgery unless clinically indicated to continue.<sup>2</sup>

The TWG proposes to continue immunosuppressive medications for its clinical indication.<sup>1</sup> However, in certain condition (e.g. rheumatoid arthritis), the continuation of medications is based on the CPG and advise of the attending physician<sup>3</sup>.

We suggest that novel oral anticoagulants e.g. rivaroxaban, dabigatran, apixaban and edoxaban to be withheld 24-48 hours pre-operatively (refer Appendix 1).<sup>2</sup>

### RATIONALE

Discontinuation of immunosuppressive medications is not recommended for SSI prevention.<sup>1</sup>

Withholding anticoagulant and antiplatelet reduces the risk of bleeding and hence reduces the risk of SSI.<sup>2</sup>

Surgery can proceed safely if the INR is <1.5 on the day of surgery.<sup>2</sup>

### REMARKS / CAVEAT

-

### REFERENCE

- 1) World Health Organization. (2018). Global guidelines for the prevention of surgical site infection.
- 2) Clinical Excellence Commission (2018), Guidelines on Perioperative Management of Anticoagulant and Antiplatelet Agents
- 3) Ministry of Health Malaysia (2019), CPG on Management of Rheumatoid Arthritis.

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## **FACTOR A8 – Immunocompromised State**

### **RECOMMENDATIONS**

The TWG recognises immunocompromised state has an increased risk of SSI.<sup>1</sup>

We recommend that in these groups of patients, stringent adherence to SSI prevention measures should be practised.<sup>1</sup>

### **RATIONALE**

Immunocompromised patients are susceptible to infection from the disease process as well as the treatment.

### **REMARKS / CAVEAT**

Immunocompromised state includes malignancy, autoimmune diseases, retroviral disease and etc.

### **REFERENCE**

- 1) Coccolini, F., et. al. (2021). Surgical site infection prevention and management in immunocompromised patients: a systematic review of the literature. World Journal of Emergency Surgery, 16(1). doi.org/10.1186/s13017-021-00375-y

## **FACTOR A9 - *Staphylococcus Aureus* (MSSA and MRSA) Colonisation (for indicated elective surgeries)**

### **RECOMMENDATIONS**

The TWG suggests screening for *Staphylococcus aureus* nasal carriage colonization for indicated elective surgeries (e.g. cardiothoracic, transplant, implant).<sup>1</sup>

We recommend to perform decolonisation with 2% mupirocin intranasal ointment regime twice daily + CHG bath or body wash for 5-7 days) if patient is identified as *S. aureus* nasal carriage is detected.<sup>2</sup>

The TWG advises patients with *S. aureus* to repeat swab after 48 hours of completion of decolonization.<sup>3</sup>

The TWG proposes patients with MSSA or MRSA nasal carriage to complete a five-day decolonization protocol with 2% nasal mupirocin twice per day and daily bathing with CHG before surgery in their home.<sup>1,2</sup>

- If MRSA is positive, contact precautions (CPs) were introduced in the operating room and nursing units, and add Vancomycin to routine/recommended SAP.<sup>4,5</sup>
- If MSSA, surgical prophylaxis should be adequate to cover for MSSA (i.e. cefazolin).<sup>4,5</sup>

The TWG advocates these recommendations specially to major, clean surgery (such as cardiothoracic and orthopaedic) involving the insertion of implanted devices.<sup>1</sup>

### **RATIONALE**

*S. aureus* nasal colonization is a risk factor for SSI and associated with poor outcomes.

### **REMARKS**

Indicated Elective Surgeries (e.g. cardiothoracic, prosthetic surgery, transplant and implants).<sup>5</sup>

4% CHG bath requires skin contact time of minimum 5 minutes before rinsing.

Alternative decolonization agents are octanidine and povidone iodine.

Cochlear and intra-ocular implants are not included.

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## REFERENCE

- 1) World Health Organization. (2018). Global guidelines for the prevention of surgical site infection.
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- 5) Portal Rasmi Kementerian Kesihatan Malaysia. (2018) Perioperative Mortality Review (POMR), Prioritisation of Cases for emergency and Elective Surgery. <https://www2.moh.gov.my/index.php/pages/view/2031?mid=708>

## B. HOSPITALISATION FACTORS

### FACTOR B1 – Types of Surgery

#### RECOMMENDATIONS

The TWG recognizes that certain types of surgery are associated with higher risk of SSI.<sup>1</sup>

We recommend to exercise caution when attending to these cases.

#### RATIONALE

Types of surgery considered to have higher risk of SSI are:

- complex surgeries
- higher wound classification e.g. class I being a clean wound and class IV being a dirty infected wound (refer to table in the Introduction section)
- open surgeries
- emergency surgeries

#### REMARKS / CAVEAT

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#### REFERENCE

- 1) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>

### FACTOR B2 – Duration of Pre-operative Admission

#### RECOMMENDATIONS

The TWG proposes that pre-operative admission should not be more than 2 days.<sup>1</sup>

#### RATIONALE

Duration of admissions prior to operation (ideally  $\leq$  2 days) reduces risk of SSI and HAIs.<sup>2</sup>

#### REMARKS

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#### REFERENCE

- 1) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>
- 2) Joint Commission International. (2018). Evidence-Based Principles and Practices for Preventing Surgical Site Infections.



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## **FACTOR B3 - Pre-operative Bathing or Wiping**

### **RECOMMENDATIONS**

The TWG strongly recommends for pre-operative bathing or wiping on the day of or prior to the surgery to reduce SSI.<sup>1,2</sup>

### **RATIONALE**

Patients are advised to bathe (wiping for bedridden patients) prior to surgery (morning and/ or night before surgery) to reduce bacterial colonization of the skin.<sup>1,2</sup>

### **REMARKS / CAVEAT**

Soap and water are adequate for bathing or wiping.<sup>1</sup>

### **REFERENCE**

- 1) World Health Organization. (2018). Global guidelines for the prevention of surgical site infection.
- 2) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>

## FACTOR B4 – Mechanical Bowel Preparation

### RECOMMENDATIONS

The TWG advocates using oral antibiotics along with mechanical bowel preparation (MBP) in colorectal and related surgeries in adults.<sup>1,2,3,4</sup>

Mechanical + Oral Antibiotics Bowel Preparation (MOABP) suggested regime:

→ MBP + oral neomycin 2g + oral metronidazole 2g.<sup>3,4</sup>

### RATIONALE

MBP with oral antibiotics is recommended as it reduces intraluminal bacterial load, thus decreasing risk of SSI.<sup>1,2</sup>

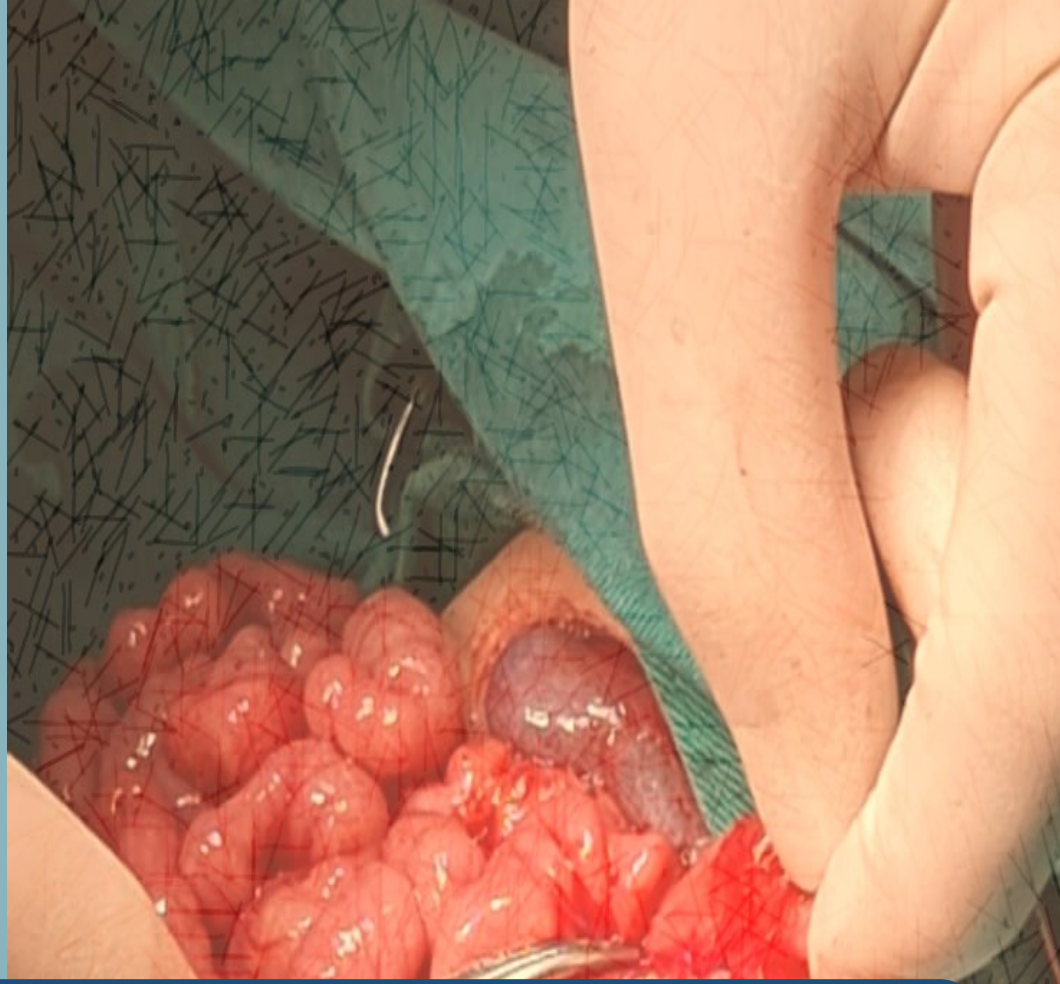
MBP alone does not reduce SSI.<sup>1,2,3</sup>

### REMARKS / CAVEAT

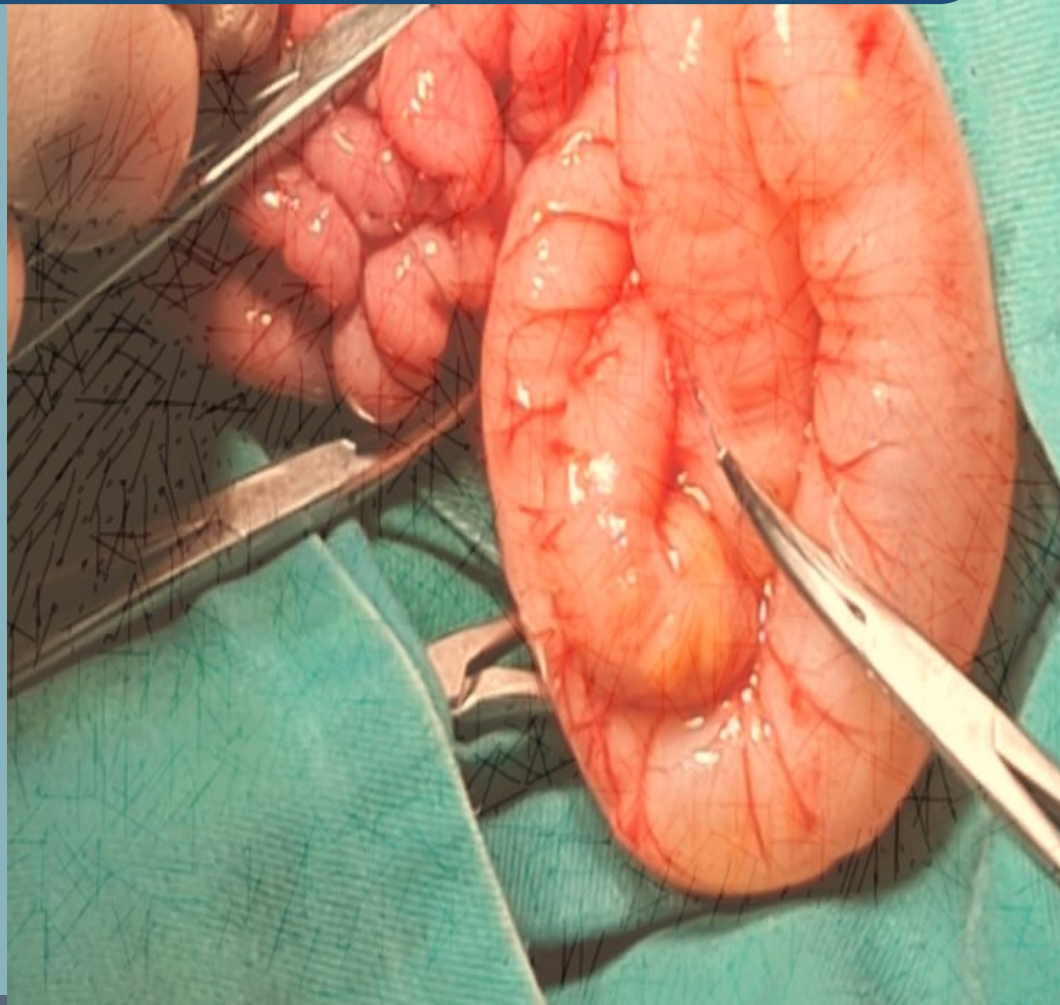
In paediatric patients, the effectiveness of these interventions is yet to be substantiated.

### REFERENCE

- 1) World Health Organization. Global guidelines for the prevention of surgical site infection. (2018).
- 2) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>
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**INTRA – OPERATIVE**



## FACTORS

<b>C1</b>	Surgical Antibiotic Prophylaxis (SAP)
<b>C2</b>	Draping
<b>C3</b>	Skin Preparation Solution
<b>C4</b>	Hair Removal
<b>C5</b>	5.1 Operating Room Setup (Traffic)
	5.2 Operating Room Setup (Temperature, Humidity & Ventilation)
<b>C6</b>	Change of Gloves
<b>C7</b>	Hand Washing or Scrubbing
<b>C8</b>	Irrigation
<b>C9</b>	Homeostasis
<b>C10</b>	Antimicrobial-Impregnated Sutures
<b>C11</b>	Wound Dressing
<b>C12</b>	Prophylactic Negative Pressure Wound Therapy (NPWT)

## FACTOR C1 – Surgical Antibiotic Prophylaxis (SAP)

### RECOMMENDATIONS

The TWG endorses that the choice of antibiotic should follow the National Antibiotic Guidelines 3<sup>rd</sup> edition 2019 - based on the type of surgery.<sup>1</sup>

The TWG agrees that surgical antibiotic prophylaxis is administered in order to provide a concentration of the drug in serum and tissues that is at a bactericidal level when the incision is made.<sup>2,3</sup>

We recommend re-dosing if the duration of surgery exceeds the half-life of the antibiotic and/ or the presence of other factors that may shorten the half-life of the drug (e.g. burns, excessive blood loss >1.5L).<sup>2,3</sup>

Timing of antibiotic given should be within 30-60 minutes before incision. However, for Fluoroquinolones & Vancomycin which require infusion, the antibiotics have to be administered 2 hours before incision.

In procedures requiring tourniquet, the SAP needs to be administered at least 15 minutes prior to inflation of the tourniquet.<sup>6</sup>

### RATIONALE

Single dose of prophylaxis is sufficient to reduce SSI and prolonged use is not proven to reduce SSI instead it increases AMR and cost.<sup>2</sup>

Meta-analyses and Systemic Reviews of 52 Randomised Control Trials showed no evidence for a benefit of postoperative continuation of antibiotic prophylaxis over its discontinuation in reducing the incidence of SSI.<sup>4,5</sup>

### REMARKS

While single dose prophylaxis is usually sufficient, the duration for antibiotics in procedures involving implants should not be more than 24 hours, whilst, for cardiac surgery, it should not be more than 48 hours. This is to minimise adverse effects, prevent AMR and is cost-effective.<sup>4,5</sup>

## REFERENCE

- 1) National Antimicrobial Guideline (NAG) (2019), 3rd Edition. Pharmaceutical Services Programme. <https://www.pharmacy.gov.my/v2/en/documents/national-antimicrobial-guideline-nag-2019-3rd-edition.html>
- 2) World Health Organization. (2018). Global guidelines for the prevention of surgical site infection.
- 3) Joint Commission International. (2018). Evidence-Based Principles and Practices for Preventing Surgical Site Infections. [https://store.jointcommissioninternational.org/assets/3/7/JCI\\_SSI\\_Toolkit.pdf](https://store.jointcommissioninternational.org/assets/3/7/JCI_SSI_Toolkit.pdf)
- 4) SW de Jonge, et. al. (2020) Effect of postoperative continuation of antibiotic prophylaxis on the incidence of surgical site infection: a systematic review and meta-analysis. *Lancet Infect Dis.* 2020 Oct;20(10):1182-1192. doi: 10.1016/S1473-3099(20)30084-0. Epub 2020 May 26. PMID: 32470329.
- 5) Bratzler DW, Dellinger EP, Olsen KM, et al. (2013) Clinical practice guidelines for antimicrobial prophylaxis in surgery. *Am J Health-Syst Pharm.* 2013; 70:195–283
- 6) Nagata K, Yamada K, Shinozaki T, et al. (2022) Effect of Antimicrobial Prophylaxis Duration on Health Care–Associated Infections After Clean Orthopedic Surgery: A Cluster Randomized Trial. *JAMA Netw Open.*2022;5(4): e226095. doi:10.1001/jamanetworkopen.2022.6095

## FACTOR C2 - Draping

### RECOMMENDATIONS

The TWG recommends using either sterile disposable non-woven or sterile reusable woven drapes and surgical gowns during surgical operations.<sup>1,2</sup>

For ophthalmic surgeries, the TWG acclaims proper draping of the eyelid margin using adhesive non-porous drape and the use of speculum to cover all the eyelashes.<sup>3</sup>

### RATIONALE

Ideally, drapes should be impermeable to blood, other bodily fluids as well as any other fluids used during surgery; resistant to tears, punctures, and abrasions. This is to ensure the integrity of the sterile field. They should be consistent with accepted flammability standards. Drapes should also be durable, flexible, and low-linting, while having limited memory.<sup>1,2</sup>

### REMARKS

Safety and financial aspects as well as ecological effects should always be considered when selecting drapes and gowns.

### REFERENCE

- 1) Joint Commission International. (2018). Evidence-Based Principles and Practices for Preventing Surgical Site Infections.  
[https://store.jointcommissioninternational.org/assets/3/7/JCI\\_SSI\\_Toolkit.pdf](https://store.jointcommissioninternational.org/assets/3/7/JCI_SSI_Toolkit.pdf)
- 2) World Health Organization. (2018). Global guidelines for the prevention of surgical site infection.
- 3) Ministry of Health, Malaysia. (2006) Management of Post-operative Infectious Endophthalmitis.

## FACTOR C3 – Skin Preparation Solution

### RECOMMENDATIONS

The TWG recommends the use of Alcohol-based antiseptic solutions for surgical site skin preparation in patients undergoing surgical procedures.<sup>1,2</sup>

The options are<sup>1,2</sup>:

- 1) Chlorhexidine / chlorhexidine gluconate (CHG): 0.5 - 4% CHG in 70 - 74% Alcohol with contact time as recommended by the manufacturer,

**Or**

- 2) Povidone iodophore with alcohol 70% with contact time as recommended by the manufacturer,

**Or**

- 3) Aqueous povidone iodophore with at least 2-minute contact time followed by alcohol 70% and let air dry.

In ophthalmic surgeries, the use of povidone 5% is recommended for the preparation of skin and conjunctival sac.<sup>3</sup>

### RATIONALE

Skin preparation solution is used to reduce skin flora thus minimize risk of SSI. Dual agent containing alcohol and CHG or PVP-I would provide rapid, persistent and cumulative antimicrobial action.

The contact and drying time are essential for bactericidal effect. Additionally, allowing alcohol to air dry reduces the risk of operating room fires.<sup>1,2</sup>

### REMARKS

When selecting a skin antiseptic agent, consider the following qualities:

- Non-irritant,
- Broad-spectrum activity,
- Ability to act rapidly,
- Persistent effect,
- Resistance to being washed away or inactivated by blood and/ or other fluids.

### REFERENCE

- 1) Joint Commission International. (2018). Evidence-Based Principles and Practices for Preventing Surgical Site Infections. [https://store.jointcommissioninternational.org/assets/3/7/JCI\\_SSI\\_Toolkit.pdf](https://store.jointcommissioninternational.org/assets/3/7/JCI_SSI_Toolkit.pdf)
- 2) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>
- 3) Ministry of Health, Malaysia. (2006) Management of Post-operative Infectious Endophthalmitis.



## FACTOR C4 – Hair Removal

### RECOMMENDATIONS

The TWG strongly recommends against removal of hair unnecessarily.<sup>1,2,3</sup>

However, if needed, hair removal with a clipper should be performed as close as possible to incision time and only the necessary area.<sup>1</sup>

### RATIONALE

Shaving, plucking, threading or waxing is strongly discouraged at all times due to micro-trauma to the skin leading to bacterial multiplication. Usage of depilatory cream may cause an allergic reaction in some individuals. These hair removal techniques have been shown to increase the risk of SSI.<sup>1,2</sup>

### REMARKS / CAVEAT

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### REFERENCE

- 1) World Health Organization. Global guidelines for the prevention of surgical site infection. (2018).
- 2) Berríos-Torres, S. I. et. al. (2017). Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. JAMA Surgery, 152(8), 784. doi.org/10.1001/jamasurg.2017.0904
- 3) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>

## FACTOR C5.1 – Operating Room Setup (Traffic)

### RECOMMENDATIONS

The TWG advises to keep the number of personnel in operating room to a minimum without compromising the surgery.<sup>1</sup>

We recommend keeping the movement in and out of the operating room to a minimum from the time instruments are laid out until the wound is closed.<sup>2</sup>

### RATIONALE

Managing traffic flow is to reduce air turbulence that disrupts surface particulates which may contain micro-organisms.

Adequate working space may reduce risk of SSI.

It is important to control number of HCWs, traffic and activities in operating theatre as the number of people and the amount of activity influence the number of microorganisms present and therefore influence the risk of infection.<sup>2</sup>

### REMARKS

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### REFERENCE

- 1) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>
- 2) Ministry of Health, Malaysia. (2019) KKM Policies & Procedures on Infection Prevention and Control. Medical Development Division. [https://www.moh.gov.my/moh/press\\_releases/KKM%20Policies%20&%20Procedures%20on%20Infection%20Prevention%20and%20Control%202019.pdf](https://www.moh.gov.my/moh/press_releases/KKM%20Policies%20&%20Procedures%20on%20Infection%20Prevention%20and%20Control%202019.pdf)

## FACTOR C5.2 - Operating Room Setup (Temperature, Humidity & Ventilation)

### RECOMMENDATIONS

The TWG recommends maintaining the Operating Room temperature, humidity and ventilation as in the table below:<sup>1</sup>

Types of Operating Theatre	Humidity	Air Sampling (cfu/m <sup>3</sup> )	Room air changes (ACH)	Flow rate (m/s)	Temperature (°C)
Conventional	50-60%	<10	15-25	0.65 – 0.75	18-22
Ultraclean	50-60%	<1	>25	0.2	16-21

### RATIONALE

The temperature and humidity are measured to prevent the growth of moulds and fungi to reduce the risk of SSI.<sup>2</sup>

### REMARKS

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### REFERENCE

- 1) Ministry of Health, Malaysia. (2019) KKM Policies & Procedures on Infection Prevention and Control. Medical Development Division.  
[https://www.moh.gov.my/moh/press\\_releases/KKM%20Policies%20&%20Procedures%20on%20Infection%20Prevention%20and%20Control%202019.pdf](https://www.moh.gov.my/moh/press_releases/KKM%20Policies%20&%20Procedures%20on%20Infection%20Prevention%20and%20Control%202019.pdf)
- 2) Joint Commission International. (2018). Evidence-Based Principles and Practices for Preventing Surgical Site Infections.  
[https://store.jointcommissioninternational.org/assets/3/7/JCI\\_SSI\\_Toolkit.pdf](https://store.jointcommissioninternational.org/assets/3/7/JCI_SSI_Toolkit.pdf)

## FACTOR C6 – Change of Gloves

### RECOMMENDATIONS

The TWG recommends changing of gloves during the operation.<sup>1</sup>

- 1) when the gloves are visibly soiled or torn, or
- 2) when changing from dirty to clean surgery on the same patient, or
- 3) before insertion of implants

We advise double-gloving for surgeries based on universal precaution for infection.<sup>1,2</sup>

### RATIONALE

The risk of micro-perforations is higher with longer surgical time. Double gloving has been shown to reduce the risk of contamination in the event of micro-perforations.<sup>1</sup>

### REMARKS

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### REFERENCE

- 1) National Institute for Health and Care Excellence (NICE). (2020). Surgical site infections: prevention and treatment.  
<https://www.nice.org.uk/guidance/ng125/resources/surgical-site-infections-prevention-and-treatment-pdf-66141660564421>
- 2) Healthcare Providers | Hand Hygiene | CDC.  
<https://www.cdc.gov/handhygiene/providers/index.html>

## FACTOR C7 – Hand Washing or Scrubbing

### RECOMMENDATIONS

The TWG recommends that all members of the surgical team must perform a surgical hand scrub before donning sterile gowns and gloves for surgical procedures with:<sup>1,2</sup>

1. Water & antiseptic solution:
  - Polyvinylpyrrolidone iodophors (PVP-I) scrub solution
  - Chlorhexidine gluconate (CHG) scrub solution

Or

2. Alcohol based hand rub (ABHR):
  - CHG solution plus ethyl alcohol
  - Ethanol plus isopropanol

### RATIONALE

Hand washing/ scrubbing minimises the risk for SSI by reducing the microbial skin count to a minimum, while leaving a long-acting antimicrobial residue.

### REMARKS

Brush is only used for cleaning nails if necessary.

Usage of the above solutions as per manufacturers' recommendation.

### REFERENCE

- 1) Ministry of Health, Malaysia. (2019) KKM Policies & Procedures on Infection Prevention and Control. Medical Development Division.  
[https://www.moh.gov.my/moh/press\\_releases/KKM%20Policies%20&%20Procedures%20on%20Infection%20Prevention%20and%20Control%202019.pdf](https://www.moh.gov.my/moh/press_releases/KKM%20Policies%20&%20Procedures%20on%20Infection%20Prevention%20and%20Control%202019.pdf)
- 2) Joint Commission International. (2018). Evidence-Based Principles and Practices for Preventing Surgical Site Infections.  
[https://store.jointcommissioninternational.org/assets/3/7/JCI\\_SSI\\_Toolkit.pdf](https://store.jointcommissioninternational.org/assets/3/7/JCI_SSI_Toolkit.pdf)

## FACTOR C8 - Irrigation

### RECOMMENDATIONS

The TWG recommends the use of aqueous povidone-iodine (PVP-I) solution irrigation of the incisional wound (skin) before closure for the purpose of preventing SSI, particularly in clean and clean contaminated wounds.<sup>1,2</sup>

Alternatively, a saline irrigation is a suitable substitute when the use of PVP-I is contraindicated.<sup>1</sup>

The TWG is against the use of antibiotic incisional wound irrigation for any surgeries.<sup>2</sup>

### RATIONALE

Irrigation of the incisional wound with an aqueous PVP-I solution is beneficial in reducing the risk of SSI when compared to irrigation with a saline solution.

Antibiotic irrigation may increase the emergence of AMR.

### REMARKS

Insufficient evidence to recommend for or against saline irrigation of incisional wounds before closure for the purpose of preventing SSI.

Based on in-vitro studies, there is a concern about the potential toxic effects of PVP-I on fibroblasts, mesothelium and the healing of tissue. Hence, diluting the PVP-I is an option to reduce this risk.

### REFERENCE

- 1) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>
- 2) World Health Organization. (2018). Global guidelines for the prevention of surgical site infection.

## FACTOR C9 – Homeostasis\*

*\*Homeostasis includes Normothermia, Normovolemia, Oxygenation and Normoglycemia\*\*.*

*\*Homeostasis is to be maintained in the entire perioperative period (Pre-operatively, Intra-operatively & Post-operatively)*

\*\* For Glycemic Control refer Factor A3 in Pre-Operative Factor

## RECOMMENDATIONS

The TWG recommends to maintain the patient's homeostasis as below:

- Body temperature is maintained between 36.5°C to 37.5°C.<sup>1,2,3</sup>
- Goal-Directed Fluid Therapy (GDFT) is recommended to maintain normovolemia.<sup>3,4,5</sup>
- Maintain SpO<sub>2</sub> > 95% intra-operatively with basic standard monitoring.<sup>3,1,6</sup>

The TWG advises for continuation of measures to prevent hypothermia post-operatively.

We recommend maintaining optimal oxygenation even during recovery period to ensure that haemoglobin oxygen saturation (SpO<sub>2</sub>) of more than 95%.

## RATIONALE

Careful monitoring of the oxygen level is part of the overall strategy to maintain patient's homeostasis. This includes normovolaemia, normoglycaemia and normothermia to reduce the risk of infection throughout the perioperative phase.

### a) Normothermia

- Perioperative hypothermia, which is common during major surgeries, may increase the risk for SSI.

### b) Normovolaemia

- Normovolaemia prevents peripheral vasoconstriction to ensure adequate tissue perfusion. Therefore, local immunity is preserved and wound healing is improved.<sup>3</sup>
- Perioperative fluid therapy prevents tissue hypoxia by maximizing the cardiac output and thus improving arterial oxygenation.
- Adequacy of tissue perfusion can be monitored by various means including Point-of-care testing (POCT) to optimize tissue oxygenation.

### c) Oxygenation

- Good oxygenation promotes wound healing.
- Adequate wound tissue oxygenation can trigger healing responses and favourably influence the outcome of other treatment modalities.

## REMARKS

### a) Normothermia

- Normothermia is to be maintained except for surgical procedures where hypothermia is required (e.g. Heart and aortic surgery).<sup>3</sup>
- Optimizing blood flow to the surgical incision reduces SSI rates through the avoidance of hypothermia.
- Normal core body temperature is 36.0 - 37.5 °C.<sup>6</sup>
- Recommended pre-operative core temperature 36.5 – 37.5 degree Celsius.<sup>6</sup>

### b) Normovolaemia

- GDFT refers to a haemodynamic treatment based on the titration of fluid and inotropic agents according to cardiac output or similar parameters.
- Normovolemia can be assessed and monitored by urinary output, serum markers or other methods (e.g. central venous pressure monitoring etc.).

## REFERENCE

- 1) Joint Commission International. (2018). Evidence-Based Principles and Practices for Preventing Surgical Site Infections.  
[https://store.jointcommissioninternational.org/assets/3/7/JCI\\_SSI\\_Toolkit.pdf](https://store.jointcommissioninternational.org/assets/3/7/JCI_SSI_Toolkit.pdf)
- 2) National Institute for Health and Care Excellence (NICE). (2020). Surgical site infections: prevention and treatment.  
<https://www.nice.org.uk/guidance/ng125/resources/surgical-site-infections-prevention-and-treatment-pdf-66141660564421>
- 3) World Health Organization. (2018). Global guidelines for the prevention of surgical site infection.
- 4) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control.  
<http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>
- 5) Berríos-Torres, S. I. et. al., (2017). Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. JAMA Surgery, 152(8), 784. doi.org/10.1001/jamasurg.2017.0904
- 6) National Institute for Health and Care Excellence (NICE). (2020). Surgical site infections: prevention and treatment.  
<https://www.nice.org.uk/guidance/ng125/resources/surgical-site-infections-prevention-and-treatment-pdf-66141660564421>



## FACTOR C10 - Antimicrobial-impregnated sutures

### RECOMMENDATIONS

The TWG advises that the antimicrobial-impregnated sutures may be considered as a strategy to prevent SSI.

However, where there are high SSI rates, in spite of basic preventive measures, individual centres should consider the use of antimicrobial-impregnated sutures.<sup>1,2</sup>

### RATIONALE

Antimicrobial-impregnated sutures showed benefit in reducing SSI rates in patients undergoing surgical procedures when compared to non-coated sutures however the evidence was moderate to low.

### REMARKS

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### REFERENCE

- 1) World Health Organization. (2018). Global guidelines for the prevention of surgical site infection.
- 2) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>

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## FACTOR C11 - Wound Dressing

### RECOMMENDATIONS

The TWG recommends dressings used on primarily closed surgical wounds should be sterile and should be applied with an aseptic technique.<sup>1,2</sup>

The dressings applied in the operating theatre are generally allowed to remain on the wound for 48 to 72 hours or when indicated.<sup>1,2</sup>

We emphasise the usage of advanced dressings is dependent on the patient's risk for SSI and cost-consideration.

### RATIONALE

Evidence shows that in primarily-closed wounds, advanced dressings do not offer an advantage in preventing SSI over standard dressings.

### REMARKS

Advanced dressings refer to occlusive types of dressing materials such as hydrocolloid, hydro active, silver-containing, metallic or ionic dressing and polyhexamethylene biguanide dressings.

Negative Pressure Wound Therapy (NPWT) falls under a different category and considered separately.

### REFERENCE

- 1) Joint Commission International. (2018). Evidence-Based Principles and Practices for Preventing Surgical Site Infections.  
[https://store.jointcommissioninternational.org/assets/3/7/JCI\\_SSI\\_Toolkit.pdf](https://store.jointcommissioninternational.org/assets/3/7/JCI_SSI_Toolkit.pdf)
- 2) World Health Organization. (2018). Global guidelines for the prevention of surgical site infection.

## **FACTOR C12 - Prophylactic Negative Pressure Wound Therapy (NPWT)**

### **RECOMMENDATIONS**

The TWG does not recommend a routine use of NPWT for primarily-closed wounds except in high-risk wounds for SSI.<sup>1</sup>

### **RATIONALE**

Evidence shows that prophylactic NPWT has a benefit in reducing the risk of SSI in patients with a primarily closed surgical incision following high-risk wounds (e.g. in case of poor tissue perfusion due to soft tissue and skin damage, decreased blood flow, dead space and intra-operative contamination).<sup>1,2</sup>

### **REMARKS**

NPWT is expensive and may not be available in some centres.

### **REFERENCE**

- 1) World Health Organization. (2018). Global guidelines for the prevention of surgical site infection.
- 2) Asia Pacific Society of Infection Control. (2018). APSIC guidelines for the prevention of surgical site infections. Antimicrobial Resistance and Infection Control. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Prevention-guideline-March-2018.pdf>

A photograph of a hospital room. In the foreground, there is a white metal bed frame with a wooden table attached to it. The bed is covered with white linens. In the background, another similar bed is visible. The room has yellow walls, a window with yellow curtains, and a white air conditioning unit mounted on the wall. A blue banner with white text is overlaid on the image.

# POST – OPERATIVE

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## FACTORS

<b>D1</b>	Standard Precautions of Infection Prevention & Control
<b>D2</b>	Patient and Caretaker Education
<b>D3</b>	Surgical Wound Care
<b>D4</b>	Surgical Drain

## FACTOR D1 - Standard Precautions of Infection Prevention & Control

### RECOMMENDATIONS

The TWG recommends maintaining the components of Standard Precautions of Infection Prevention & Control at all times pertaining to SSI, which include:<sup>1,2</sup>

- hand hygiene,
- personal protective equipment,
- disinfection & sterilization,
- environmental hygiene,

### RATIONALE

Compliance of the Standard Precautions may reduce complications and risk of SSI.

### REMARKS

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### REFERENCE

- 1) Ministry of Health, Malaysia. KKM Policies & Procedures on Infection Prevention and Control (2019) Medical Development Division.  
[https://www.moh.gov.my/moh/press\\_releases/KKM%20Policies%20&%20Procedures%20on%20Infection%20Prevention%20and%20Control%202019.pdf](https://www.moh.gov.my/moh/press_releases/KKM%20Policies%20&%20Procedures%20on%20Infection%20Prevention%20and%20Control%202019.pdf)
- 2) World Health Organization (2017). Global Guidelines for the Prevention of Surgical Site Infection.

## FACTOR D2 - Patient and Caretaker Education

### RECOMMENDATIONS

The TWG emphasizes on patient and caretaker education regarding wound care and in identifying potential or early signs of SSI.<sup>1,2</sup>

### RATIONALE

Providing adequate information and education to the patient and family may reduce complications and risk of SSI.

### REMARKS

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### REFERENCE

- 1) Joint Commission International. (2018). Evidence-Based Principles and Practices for Preventing Surgical Site Infections.  
[https://store.jointcommissioninternational.org/assets/3/7/JCI\\_SSI\\_Toolkit.pdf](https://store.jointcommissioninternational.org/assets/3/7/JCI_SSI_Toolkit.pdf)
- 2) Ministry of Health, Malaysia (2023), Wound Care Manual 2nd edition

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## FACTOR D3 - Surgical Wound Care

### RECOMMENDATIONS

The TWG recommends that HCWs should be trained and educated in wound care as well as in signs and symptoms of infection.<sup>1,2</sup>

We advise for HCWs to be able to identify and treat the surgical wound in case of an SSI or to refer to the relevant teams for an optimal management.<sup>1</sup>

### RATIONALE

Proper wound management education and training to the HCWs may prevent wound contamination, potential of SSI and its complications.

### REMARKS

Management of wound (i.e. wound care) is based on the type of wounds.

### REFERENCE

- 1) Joint Commission International. (2018). Evidence-Based Principles and Practices for Preventing Surgical Site Infections.  
[https://store.jointcommissioninternational.org/assets/3/7/JCI\\_SSI\\_Toolkit.pdf](https://store.jointcommissioninternational.org/assets/3/7/JCI_SSI_Toolkit.pdf)
- 2) Ministry of Health, Malaysia (2023), Wound Care Manual 2nd edition

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## FACTOR D4 - Surgical Drain

### RECOMMENDATIONS

The TWG recommends against the routine use of surgical drains.

However, in certain surgeries where post-operative surgical drain is required, regular inspection of the drain and the drain site must be done to ensure that it is functioning properly and there are no signs of infection<sup>1,2</sup>.

We advise removing the drain when clinically indicated.

The TWG emphasizes the presence of a drain is not an indication to prolong the usage of prophylactic antibiotic<sup>2</sup>.

### RATIONALE

A drain can be a source of infection and may prolong the unnecessary usage of antibiotics.

### REMARKS

Wound drains are single-use devices and must not be reused.

### REFERENCE

- 1) World Health Organization. (2018). Global guidelines for the prevention of surgical site infection.
- 2) Joint Commission International. (2018). Evidence-Based Principles and Practices for Preventing Surgical Site Infections.  
[https://store.jointcommissioninternational.org/assets/3/7/JCI\\_SSI\\_Toolkit.pdf](https://store.jointcommissioninternational.org/assets/3/7/JCI_SSI_Toolkit.pdf)





# PART 3 - SURVEILLANCE

## INTRODUCTION

CDC defines surveillance as the ongoing and systematic collection, analysis, and interpretation of health data in the process of describing and monitoring a health event. This information is used for planning, implementing, and evaluating interventions and programs<sup>1</sup>.

SSI monitoring requires active, patient-based prospective surveillance. Till date, Malaysia does not have an SSI surveillance programme in place. Based on the requirements at a global and national level, there is a pressing need for a national SSI Surveillance programme.

To kick start the initiative, the TWG has convened to focus on elective surgeries only in all MOH hospitals. Once the surveillance is well established, the programme will then be expanded in future to include emergency surgeries and other hospitals nationwide (public and private hospitals).

## METHODS

All patients who have undergone the elective surgeries (Table 1) will be accounted for in the surveillance, regardless of prolonged hospitalisation, readmission or outpatient, emergency department and private centre visits. These patients, will be educated upon discharge to identify SSI and will be provided with a discharge leaflet containing information on early signs and symptoms of SSI as well as to inform or to be referred back to the operating hospitals in the event of an SSI. This mechanism is in place to minimise underreporting of cases especially for superficial SSIs.

Below are the inclusion and exclusion criteria for this surveillance programme:

### I. Inclusion Criteria

- Infection of surgical wound occurring within 30-days post-surgery (without implant) or within 90-days\* post-surgery (with implant).
- Inpatient elective surgeries by the respective fraternity as listed in Table 1 in the participating hospitals (pilot) as listed in Table 2\*\*.

*\*Although the definition for SSI in surgeries with implants is up to 1 year, but for the purpose of this surveillance, we are only monitoring till 90-days.*

*\*\*For the purpose of this surveillance, data will be collected only from the selected hospitals in the list below. However, all MOH hospitals are expected to monitor their SSI rates based on this guideline.*

### II. Exclusion Criteria

- Emergency surgeries (except paediatric semi-emergency vascular access surgeries (VAS))
- Day-care (except ophthalmology cataract surgeries), outpatient and procedure room surgeries
- SSI not related to the primary surgery

**Table 1**

**List of Elective Surgeries for Surveillance\*<sup>2,3</sup>**

Discipline	Types of Surgery	Duration of Surveillance
General surgery / Colorectal / Breast & Endocrine Surgery	Colectomy +/- proctocolectomy	30 days
	Mastectomy +/- axillary clearance	90 days
	Hernioplasty	90 days
	Thyroid surgeries	30 days
	Elective laparoscopic/ open cholecystectomy	30 days
Orthopaedic Surgery	Primary Hip Arthroplasty	90 days
	Primary Knee Arthroplasty	90 days
Neurosurgery	Elective Craniotomy	90 days
Paediatric Surgery*	Pull-through Procedure (open / laparoscopic)	30 days
	Vascular Access Surgery (surgical incision only) <i>* including all Vascular Access Surgeries done in semi-emergency list</i>	30 days
Hepatobiliary Surgery	All Elective Surgery ( <i>including elective transplant</i> )	30 days
Urology	Open Cystectomy	30 days
	Open Nephrectomy	30 days
Vascular Surgery	Open AAA Repair	30 days
	Renal Access Surgery (i.e. AVF)	30 days
Cardiothoracic Surgery	Primary CABG (Sternal & Harvest Site)	90 days (both chest and donor sites)
	Aortic Valve Replacement Surgery	90 days
Thoracic Surgery	Lung Lobectomy	30 days
Plastic Surgery	Cleft Lip Repair	30 days
	Flap Donor Site	30 days
	Full Thickness Skin Graft Donor Site	30 days
Obstetrics & Gynaecology	Open Total Abdominal Hysterectomy (TAH) +/- Bilateral Salpingo-Oophorectomy (BSO)	30 days
	Elective Lower Segment Caesarean Sections (LSCS)	30 days
Otorhinolaryngology	Parotidectomy	30 days
	Submandibulectomy	30 days
	Neck Dissection	30 days
	Sistrunk Surgery (Excision of Thyroglossal cyst)	30 days
	Excision of Branchial cyst	30 days
	Thyroidectomy	30 days
Oromaxillofacial Surgery	Ear Surgery - Cochlea Implant	90 days
	Minor Oral Surgery	30 days
Oromaxillofacial Surgery	Elective Oral & Maxillofacial trauma surgery	30 days 90 days (with implant)
	Ophthalmology <i>(all cataract surgeries done in day-care (as per Ophthalmology National Registry))</i>	Cataract

\*This list may be amended from time to time, based on the fraternity and HOS preference.

**Table 2****List of Pilot Hospitals for Data Collection and Reporting (Surveillance)**

State	Pilot Hospitals
Perlis	Hospital Tuanku Fauziah, Perlis
Kedah	Hospital Sultanah Bahiyah, Alor Setar
	Hospital Sultan Abdul Halim, Sungai Petani
Pulau Pinang	Hospital Pulau Pinang
	Hospital Seberang Jaya
Perak	Hospital Raja Permaisuri Bainun, Ipoh
	Hospital Taiping
Wilayah Persekutuan Kuala Lumpur	Hospital Kuala Lumpur
	Hospital Tunku Azizah, Kuala Lumpur
Wilayah Persekutuan Putrajaya	Hospital Putrajaya
Selangor	Hospital Tengku Ampuan Rahimah, Klang
	Hospital Sungai Buloh
	Hospital Selayang
	Hospital Serdang
Negeri Sembilan	Hospital Shah Alam
	Hospital Tuanku Ja'afar, Seremban
Melaka	Hospital Melaka
Johor	Hospital Sultanah Aminah, Johor Bahru
	Hospital Sultan Ismail, Johor Bahru
Pahang	Hospital Tengku Ampuan Afzan, Kuantan
	Hospital Sultan Haji Ahmad Shah, Temerloh
Terengganu	Hospital Sultanah Nur Zahirah, Kuala Terengganu
	Hospital Kemaman
Kelantan	Hospital Raja Perempuan Zainab II, Kota Bharu
Sarawak	Hospital Umum Sarawak, Kuching
	Pusat Jantung Sarawak
Sabah	Hospital Queen Elizabeth I, Kota Kinabalu
	Hospital Queen Elizabeth II, Kota Kinabalu
	Hospital Wanita & Kanak-Kanak Sabah, Likas
Wilayah Persekutuan Labuan	Hospital Labuan

**CALCULATION**

The SSI rate is determined by the formula below:

$$\frac{\text{Number of SSI in the Selected Surgery}}{\text{Total Number of Selected Surgery*}} \times 100\%$$

- Calculation of the SSI rate should comprise of the fraternity SSI rate and the individual SSI rate of each type of surgery in the fraternity.
- The elective surgery is based on the fraternity or discipline's Elective list that provide the service (e.g. if an elective nephrectomy is done by General Surgery, it is not included in the SSI calculation for the time being).

\*The total number of selected surgery should be obtained from the OT Elective List/ OT Book.

## MECHANISM OF REPORTING AND MONITORING

### HOSPITAL

Each department must appoint a minimum of one (1) PIC who should be a Medical Officer.

The PIC's tasks are:

- i) to identify the patients who are going for the selected elective surgeries
- ii) to ensure that the SSI Data Collection Form (Appendix 1) is attached to the patient's operative file and completed perioperatively (pre, intra and post-operatively)
- iii) to collect and compile the SSI Data Collection Form upon discharge of the patient
- iv) to keep record of the denominator (number of elective surgery) in the Google Sheet
- v) to enter the data from the SSI Data Collection Form into the SSI Module in the MPIS system
- vi) to ensure that the patients who have undergone these surgeries are educated on the early signs and symptoms of SSI
- vii) to ensure that these patients are discharged with the SSI Surveillance Discharge Leaflet (Appendix 2a and 2b)
- viii) to report identified SSI cases into the SSI Module in the MPIS System once the case has been verified by a surgeon in the department.

In order for the surveillance implementation to be effective, each hospital must have their own SSI Committee which will be chaired by the Hospital Deputy Director and consists of members from all surgical-based departments as well as Anaesthesiologist, Infectious Diseases Physician (if available), Hospital Quality Officer, Hospital Infection Control representative, Hospital Wound Care Committee representative, Nursing representative, Assistant Medical Officer (AMO) and Pharmacist (Table 3).

**Table 3**  
**Hospital SSI Committee**

Position	Committee Members	No. of representatives
Advisor	Hospital Director	1
Chairperson	Hospital Deputy Director*	1
Deputy Chairperson	HOD/ Senior Consultant Surgeon** (Surgical Based Discipline)	1
Secretariat	Hospital Quality or Infection Control Officer***	1
Member	Surgeons from All Surgical Disciplines	1 (from each discipline)
	Anaesthesiologist	1
	Infectious Disease Physicians (if available)	1
	Department Person In-Charged (PIC)	1
	Hospital Infection Control Representative	1
	Hospital Quality Unit Representative	1
	Hospital Wound Care Representative	1
	Nursing Representative	1
	Assistant Medical Officer (AMO)	1
Pharmacist	1	

\*/\*\*/\*\*\* appointed by the Hospital Director

The Hospital Quality Officer or Infection Control Officer tasks are:

- i) as the Secretariat for Hospital SSI Committee (appointed by the Hospital Director).
- ii) to monitor, compile and analyse the data from the MPIS System on a monthly basis.
- iii) to coordinate Hospital SSI Committee meetings biannually.
- iv) to present the analysis of SSI data including identified issues as well as recommendations from the Hospital SSI committee during the Hospital Infection & Antibiotics Control Committee (HIACC) meeting.
- v) to give feedback of the analysis and the HIACC meeting to the Departments involved as well as the JKN.

## **STATE**

Concurrently, each JKN must have their own State SSI Committee which will be chaired by the State Deputy Director and consists of members from all surgical-based State Chief Surgeons and Anaesthesiologist, State Infectious Diseases Physician (if available), State Quality Officer, State Infection Control representative, State Wound Care Committee representative, Nursing representative, Assistant Medical Officer (AMO) and Pharmacist (Table 4).

**Table 4**  
**State SSI Committee**

Position	Committee Members	No. of representatives
Advisor	State Health Director	1
Chairperson	Deputy State Health Director (Medical)	1
Deputy Chairperson	State Chief Surgeon (Surgical Based)*	1
Secretariat	State Quality Officer	1
Member	Surgeons (every Surgical-based discipline)	1
	Anaesthesiologist	1
	State Infectious Diseases Physician (if available)	1
	State Infection Control Representative	1
	State Wound Care Committee Representative	1
	State Nursing Representative	1
	State Assistant Medical Officer Representative	1
	Hospital's SSI Secretariat (each hospital)	1

\*appointed by the State Health Director

The State Quality Officer's tasks are:

- i) as the Secretariat for State SSI Committee.
- ii) to monitor, compile & analyse the data from the hospitals under their purview on a monthly basis.
- iii) to coordinate State SSI Committee meetings biannually.
- iv) to present the analysis of SSI data including identified issues as well as recommendations from the State SSI committee during the State Infection & Antibiotics Control Committee (SIACC) meeting.
- v) to give feedback of the analysis to the hospitals involved and to the SSI National Secretariat i.e. the Clinical Audit Unit.

## **NATIONAL**

At the National level, the National SSI Committee meets biannually. The National SSI Committee members:

- i) must agree to the Terms of Reference (TOR).
- ii) are expected to review SSI cases and make recommendations for improvement.
- iii) are expected to prepare case summaries to be published in the bulletin or report.
- iv) are expected to prepare annual National SSI Surveillance Report.
- v) are expected to assist the Hospital and State Committee to ensure the smooth process of surveillance and reporting.
- vi) are expected to aid in education, training and awareness of SSI programme at the hospital, state or national level.
- vii) are expected to participate and contribute in SSI programme activities such as Conference, Workshop, Audit and Roadshow.

**Table 5**

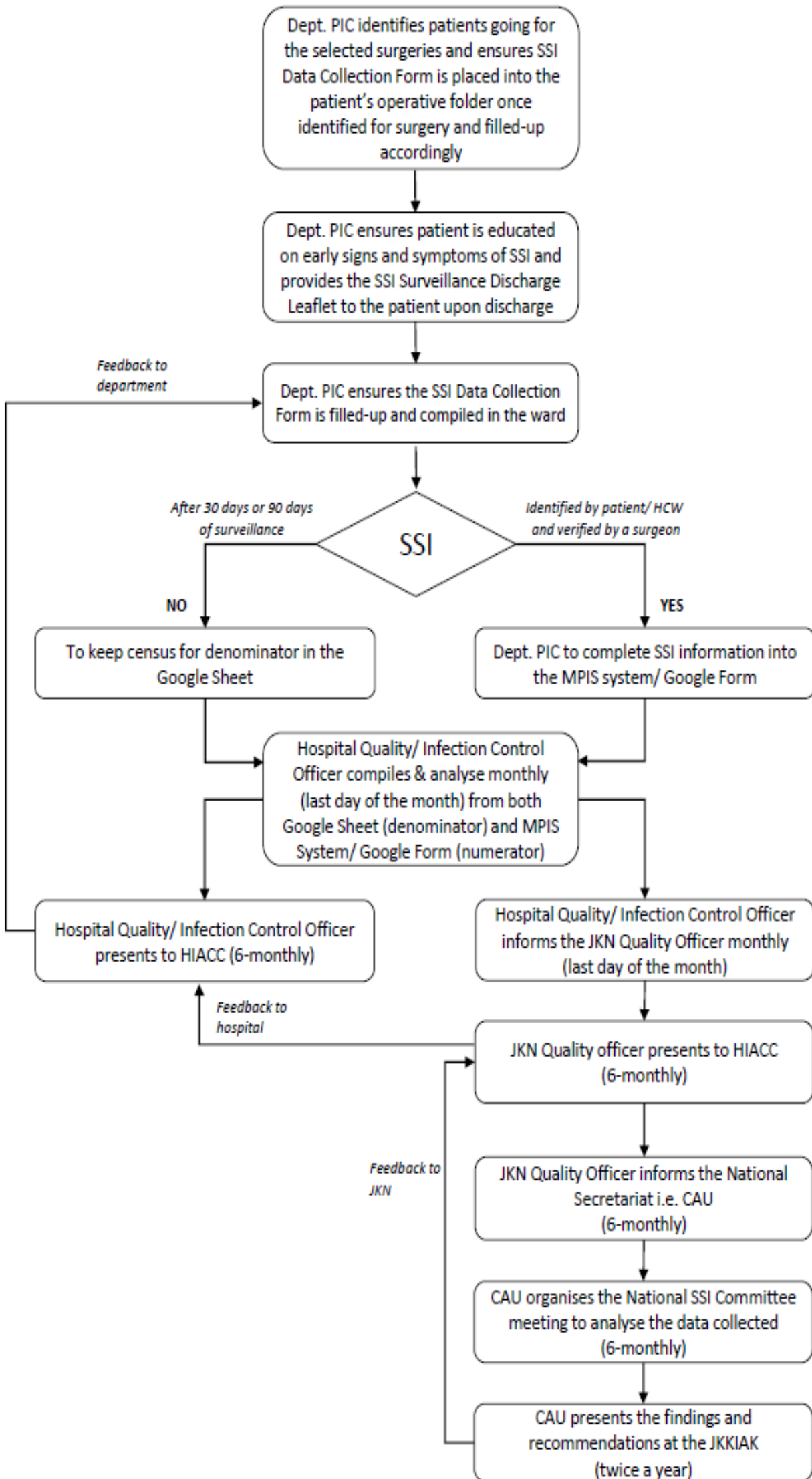
### **National SSI Committee**

Position	Committee Members
Advisor 1	Deputy Director General of Health (Medical)
Advisor 2	Director of Medical Development Division
Chairperson	Senior Consultant Surgeon (Surgical Based)
Deputy Chairperson	Senior Consultant Surgeon (Surgical Based)
Secretariat	Deputy Director, Medical Care Quality Section
	Clinical Audit Unit, Medical Care Quality Section
Member	Senior Consultant Surgeons
	Senior Consultant Anaesthesiologist
	Senior Consultant Internal Medicine Physician (Infectious Disease)
	Representative from Infection Prevention and Control Unit, MOH
	Representative from Surgical Services Unit, MOH
	Representative from Ministry of Defence
	Representative from Ministry of Higher Education

Summary of the findings and recommendations must be presented at the *Jawatankuasa Kawalan Infeksi dan Antibiotik Kebangsaan* (JKKIAK) twice a year by the National Secretariat, i.e. Clinical Audit Unit or the committee member. The Secretariat shall provide feedback to all the stakeholders based on the findings and recommendations.

The flow of the reporting mechanism and surveillance is as followed:

## SSI Reporting Flow Chart





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## Reference

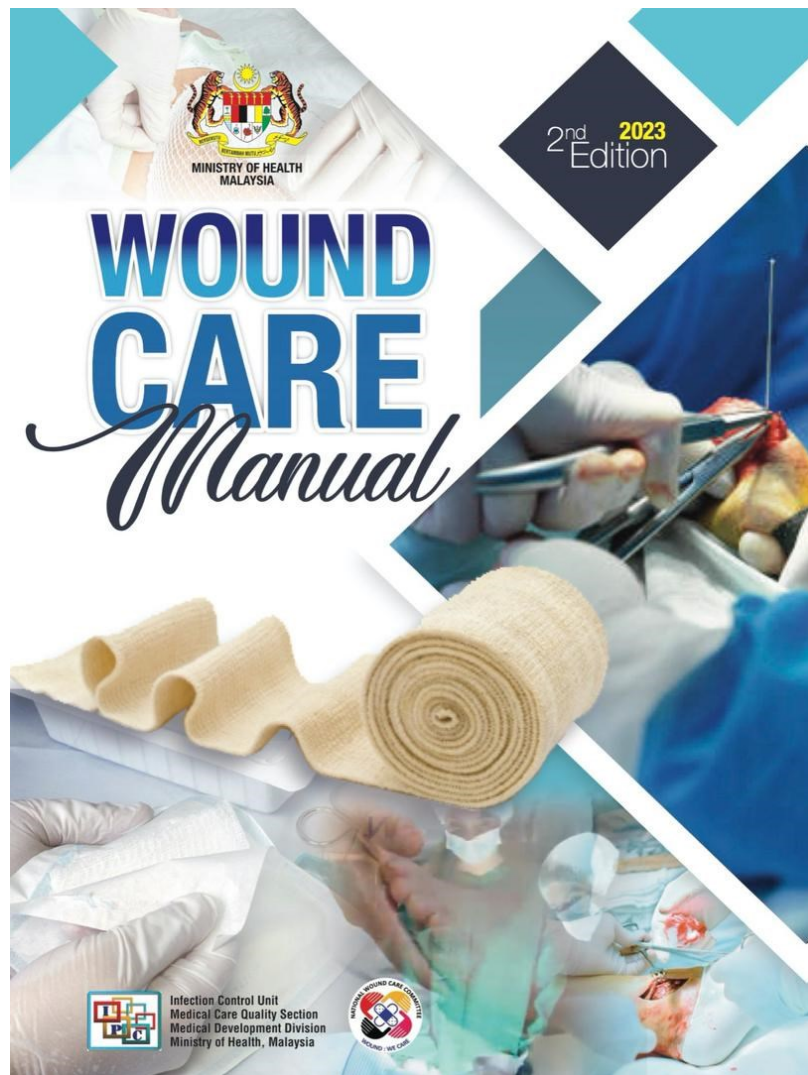
- 1) Berríos-Torres, S. I. et. el. (2017). Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. JAMA Surgery, 152(8), 784. doi.org/10.1001/jamasurg.2017.0904
- 2) Centers for Disease Control and Prevention. (2023). Surgical Site Infection Event (SSI). National Healthcare Safety Network (NHSN). <https://www.cdc.gov/nhsn/pdfs/pscmanual/9pscscssicurrent.pdf>
- 3) Malaysia One Health Antimicrobial Resistance. (2022, November 29). Point Prevalence Survey (PPS) On Healthcare Associated Infection & Antibiotics - Malaysia One Health Antimicrobial Resistance. Malaysia One Health Antimicrobial Resistance -. <https://myohar.moh.gov.my/point-prevalence-survey-pps-on-healthcare-associated-infection-antibiotics/>

A close-up, blue-tinted photograph of a person's hand. The hand is positioned with the palm facing upwards, and a white bandage is wrapped around the palm. The background is a textured, light blue surface. The overall image has a soft, clinical feel.

## PART 4 - WOUND MANAGEMENT

## WOUND MANAGEMENT

Please refer to Wound Care Manual, Second Edition 2023, Ministry of Health, Malaysia





# APPENDIX



# APPENDIX 1

### Withholding Anticoagulant Tables

Table 1: Withholding warfarin pre-procedure for patients not requiring bridging therapy.

	6 days prior to surgery	5 days prior to surgery	4 days prior to surgery	3 days prior to surgery	2 days prior to surgery	1 days prior to surgery	Morning of surgery
Warfarin	Take last dose of warfarin	No warfarin	No warfarin	No warfarin	No warfarin	No warfarin	No warfarin
INR Test	X	X	X	X	X	Check if INR <1.5	



Table 2: Withholding warfarin and commencing enoxaparin pre-procedure for patients requiring bridging therapy.

	6 days prior to surgery	5 days prior to surgery	4 days prior to surgery	3 days prior to surgery	2 days prior to surgery	1 days prior to surgery	Morning of surgery
Warfarin	Take last dose of warfarin	No warfarin	No warfarin	No warfarin	No warfarin	No warfarin	No warfarin
INR Test	X	X	Check INR			Either 1 day prior or morning of surgery, Check if INR <1.5	
Enoxaparin	No enoxaparin	No enoxaparin	Commence enoxaparin when INR is $\leq 2$			Cease enoxaparin 24 hours before procedure	



Table 3: Withholding novel anticoagulants in patients with normal renal profile

Type of Anticoagulants with dose	When to cease anticoagulant in <b>Low bleeding Risk Surgery</b>	When to cease anticoagulant in <b>High Bleeding Risk Surgery</b>
Dabigatran (Pradaxa) 110 mg or 150 mg twice a day	Last dose 24 hours before surgery	Last dose 48 hours before surgery
Apixaban (Eliquis) 2.5 mg or 5 ml twice a day	Last dose 24 hours before surgery	Last dose 48-72 hours before surgery
Rivoroxaban (Xareto) 15 mg or 20 mg once a day	Last dose 24 hours before surgery	Last dose 48-72 hours before surgery

Table 4: Withholding antiplatelet therapy prior to surgery (if required).

Type of Antiplatelet agents	When to cease antiplatelet therapy (if required)
Aspirin	At least 5 days prior
Clopidogrel	At least 7 days prior
Prasugrel	At least 7 days prior
Ticagrelor	At least 5 days prior
Ticlopidine	At least 14 days prior

# APPENDIX 2

## Surgical Site Infection (SSI) Data Collection Form\*

Hospital:	Department:
-----------	-------------

Patient Detail			
Name			
Race		Male <input type="checkbox"/>	Female <input type="checkbox"/>
Age:	Date of Birth (dd/mm/yyyy):	ID No./ Passport:	MRN No.:
Contact No.			

Date of surgery			
Date of readmission			
Surgery start time		Surgery end time	
Duration of surgery			
Surgery performed			
Type of surgery	Clean <input type="checkbox"/>	Clean contaminated <input type="checkbox"/>	Contaminated <input type="checkbox"/>
Primary surgeon	Specialist >5 Years <input type="checkbox"/>	Specialist <5 Years <input type="checkbox"/>	Medical Officer <input type="checkbox"/>

PRE-OPERATIVE	
Diagnosis	
Date of Admission:	
Body Mass Index (BMI)	
Antibiotic Prophylaxis: Yes <input type="checkbox"/> No <input type="checkbox"/>	Diabetes Mellitus: Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input type="checkbox"/>
Bathing: Yes <input type="checkbox"/> No <input type="checkbox"/>	Hair Removal: Shaving <input type="checkbox"/> Clipping <input type="checkbox"/> Not Done <input type="checkbox"/>
Smoking/ Vaping: Non <input type="checkbox"/>	Active <input type="checkbox"/> Ex (≥ 4 Weeks) <input type="checkbox"/>
Immunosuppressant Therapy	Steroids <input type="checkbox"/> Chemotherapy <input type="checkbox"/> Biologic <input type="checkbox"/> Radiotherapy <input type="checkbox"/> None <input type="checkbox"/>

INTRA-OPERATIVE	
Skin Preparation	Alcohol Base <input type="checkbox"/> Aqueous Base <input type="checkbox"/> Povidone <input type="checkbox"/> Chlorhexidine <input type="checkbox"/> Unknown <input type="checkbox"/>
Antibiotic Prophylaxis	Yes <input type="checkbox"/> No <input type="checkbox"/> Time of Administration (1st Dose):
Redosing	2nd Dose <input type="checkbox"/> 3rd Dose <input type="checkbox"/>
Redosing Reason	Bleeding <input type="checkbox"/> Prolonged Surgery <input type="checkbox"/> Others:
Drain	Yes <input type="checkbox"/> No <input type="checkbox"/>

POST-OPERATIVE	
Uncontrolled Sugar (>11.1 mm/l)	Yes <input type="checkbox"/> No <input type="checkbox"/>
Duration of Antibiotic	Within 24 Hours <input type="checkbox"/> ≥ 24 Hours <input type="checkbox"/>
Duration of Antibiotic (Only Cardiac & Vascular Surgery)	≥ 48 Hours <input type="checkbox"/> ≤ 48 Hours <input type="checkbox"/>

TYPE OF SSI	
Day of SSI Identified – Post-op	
Site of SSI	
Diagnosis	Clinical <input type="checkbox"/> Lab Confirmed <input type="checkbox"/>
If Lab Confirmed – Type of Organism	

\*Link for the form:

1. MPIS System
  - [www.cprchospital.moh.gov.my](http://www.cprchospital.moh.gov.my)
2. Google Form
  - <https://docs.google.com/forms/d/e/1FAIpQLSfFPbsbZnS7NCIFOGAjBLBJYhKThd3vLnZ8dqlIRsT47ueFw/viewform>



The background features abstract, wavy shapes in various shades of green, ranging from light mint to dark forest green, set against a light blue background. The shapes are layered and overlap, creating a sense of depth and movement.

# **APPENDIX 3A**

## SSI SURVEILLANCE DISCHARGE LEAFLET

If you experience **any of these following symptoms**, please go to nearest Emergency Department or Health Clinic/ Clinic.\*

Hospital		
Patient's Name		
Discharge Ward		
Name of Surgery		
Diagnosis		
Signs and Symptoms		
• Pain	<input type="checkbox"/> Yes	<input type="checkbox"/> No
• Swelling	<input type="checkbox"/> Yes	<input type="checkbox"/> No
• Discharge	<input type="checkbox"/> Yes	<input type="checkbox"/> No
• Fever	<input type="checkbox"/> Yes	<input type="checkbox"/> No
• Wound Gap / Open Wound	<input type="checkbox"/> Yes	<input type="checkbox"/> No

\* For attending doctors (from Emergency Department/ Health Clinic/ Private Clinic), in case an SSI is detected, kindly refer this patient back to us or contact us at this number: \_\_\_\_\_.

Attending Doctor,

.....

( )

\*Official stamp and date.

# APPENDIX 3B

## RISALAH DISCAJ SURVELAN SSI

Jika anda mengalami **mana-mana gejala berikut**, sila pergi ke Jabatan Kecemasan atau Klinik (KK/ Swasta) yang terdekat\*.

Hospital	
Nama Pesakit	
Wad	
Nama Pembedahan	
Diagnosis	
Tanda dan gejala	
• Rasa sakit	<input type="checkbox"/> Ya <input type="checkbox"/> Tidak
• Bengkak	<input type="checkbox"/> Ya <input type="checkbox"/> Tidak
• Lelehan/ Berair/ Nanah	<input type="checkbox"/> Ya <input type="checkbox"/> Tidak
• Demam	<input type="checkbox"/> Ya <input type="checkbox"/> Tidak
• Jurang Luka/ Luka Terbuka	<input type="checkbox"/> Ya <input type="checkbox"/> Tidak

\* Bagi doktor di Jabatan Kecemasan/ Klinik Kesihatan/ Klinik Swasta, sekiranya SSI dikesan, sila rujuk pesakit ini kembali kepada kami atau hubungi kami di nombor ini: \_\_\_\_\_.

Yang benar,

.....  
( )

\*Cop rasmi dan tarikh.

# APPENDIX 4

No.	Surgery	Definition	Reference
1	Colectomy	Surgical procedure to remove part or all of colon.	myclevelandclinic.org
2	Proctocolectomy	Surgical procedure to remove part or all of colon and rectum.	myclevelandclinic.org
3	Mastectomy +/- Axillary Clearance	Removal all breast tissue, including the overlying skin, the nipple, areola, and at least 6 axillary lymph nodes at level 2.	www.facs.org
4	Hernioplasty	Surgical procedure performed to transfix the hernia sac and reinforcement of the weakened or damaged abdominal wall using a mesh.	myclevelandclinic.org
5	Thyroidectomy	Surgical removal of all (total thyroidectomy) or part (partial thyroidectomy) of the thyroid gland.	myclevelandclinic.org
6	Cholecystectomy	A surgery to remove the gallbladder.	myclevelandclinic.org
7	Arthroplasty	The surgical replacement of a joint with artificially produced material. Total arthroplasty refers to the replacement of all joint surfaces concerned, while partial replacement involves the replacement of only one or some of the surfaces but not the entire joint.	Seidlitz C, Kip M. Introduction to the Indications and Procedures. In: Bleß HH, Kip M, editors. White Paper on Joint Replacement: Status of Hip and Knee Arthroplasty Care in Germany [Internet]. Berlin (Germany): Springer; 2018. Chapter 1. Available from: <a href="https://www.ncbi.nlm.nih.gov/books/NBK546138/">https://www.ncbi.nlm.nih.gov/books/NBK546138/</a> doi: 10.1007/978-3-662-55918-5_1
8	Craniotomy	A craniotomy is the surgical removal of part of the bone from the skull to expose the brain. Specialized tools are used to remove the section of bone called the bone flap. The bone flap is temporarily removed, then replaced after the brain surgery has been done	<a href="https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/craniotomy">https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/craniotomy</a>

9	Pull-through Procedure	This involves taking out the diseased segment of colon in case of Hirschsprung's disease and anorectal anomaly. Then the rest of the colon is pulled down and connected to the anus. Sometimes, the surgeon can do this surgery using minimally invasive laparoscopic or robot-assisted surgery. This can mean less pain, less blood loss, smaller scars with faster healing and shorter hospital stays, compared to what patients may have with an "open" or traditional surgery	<a href="https://www.cincinnatichildrens.org/health/h/hirschsprung">https://www.cincinnatichildrens.org/health/h/hirschsprung</a>
10	Vascular Access Surgery (VAS) - (paediatric)	Involves the insertion of a flexible and sterile thin plastic tube, or catheter, into a blood vessel to provide an effective method of drawing blood or delivering medications, blood products, or nutrition into a patient's bloodstream over a period of weeks, months or even years.	<a href="http://radiologyinfo.org">radiologyinfo.org</a>
11	Cystectomy	Complex surgical procedure in which a surgeon removes some or all the urinary bladder	<a href="http://myclevelandclinic.org">myclevelandclinic.org</a>
12	Nephrectomy	Surgery to remove a kidney. Bilateral nephrectomy is removal of both kidneys. A partial nephrectomy is to remove only a portion of the kidney. A radical nephrectomy is removal of the entire kidney and surrounding tissue.	<a href="http://myclevelandclinic.org">myclevelandclinic.org</a>
13	Open AAA Repair	An abdominal incision is made to gain access to abdominal aorta; to identify the aneurysm. The aneurysm is opened and the graft is sewn onto it. The graft reinforces the aneurysm to prevent a rupture.	<a href="http://myclevelandclinic.org">myclevelandclinic.org</a>
14	Renal Access Surgery/ AVF (vascular adult)	Skin incision made to identify and anastomose vein and artery for creation of renal venous access.	<a href="http://radiologyinfo.org">radiologyinfo.org</a>

15	Coronary Artery Bypass Graft Surgery	Surgery to create a new way (bypass) for blood to reach the heart without going through the blocked artery. A blood vessel is taken from some other parts of the body e.g., arm, leg or chest to create the bypass	myclevelandclinic.org
16	Aortic Valve Replacement Surgery	Surgery to replace the aortic valve; either a biological valve (from human or animal tissue) or a mechanical valve.	myclevelandclinic.org
17	Lung Lobectomy	A surgery to remove one of the lobes of the lungs	<a href="https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/lobectomy">https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/lobectomy</a>
18	Cleft Lip Repair and Cleft Palate Repair	Surgery used to correct abnormal development a special technique to suture the two sides of the lip together, leaving a scar which blends into the lip	Garb & Smith's Plastic Surgery
19	Flap Donor Site	Site of tissue where flap has been harvested	Garb & Smith's Plastic Surgery
20	Full Thickness Skin Graft Donor Site	Skin graft that contains entire dermis	Garb & Smith's Plastic Surgery
21	Total Abdominal Hysterectomy	A total hysterectomy is the surgical removal of the uterus and cervix. In an abdominal hysterectomy, the uterus is removed through an incision in the abdomen	<b>The Royal College of Obstetricians and Gynaecologists</b>
22	Bilateral Salpingo-Oophorectomy	Both the ovaries and the fallopian tubes are removed	myclevelandclinic.org
23	Lower Segment Caesarean Sections (LSCS)	The delivery of a baby through a surgical incision in the abdomen and lower	<a href="https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/cesarean-section">https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/cesarean-section</a>
24	Parotidectomy	Partial or complete removal of the parotid gland	El Sayed Ahmad Y, Winters R. Parotidectomy. [Updated 2023 Jan 3]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <a href="https://www.ncbi.nlm.nih.gov/books/NBK557651/">https://www.ncbi.nlm.nih.gov/books/NBK557651/</a>
25	Submandibulectomy/ Submandibular Gland Excision	Surgical procedure to remove one or both salivary glands under the jaw (mandible).	<a href="https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/submandibular-gland-excision">https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/submandibular-gland-excision</a>



26	Neck Dissection	A surgical procedure in which the fibro-fatty soft tissue content of the neck is excised to remove the lymph nodes that are contained therein	Harish K. Neck dissections: radical to conservative. World J Surg Oncol. 2005 Apr 18;3(1):21. doi: 10.1186/1477-7819-3-21. PMID: 15836786; PMCID: PMC1097761.
27	Sistrunk Surgery (Excision of Thyroglossal Cyst)	Excision of thyroglossal duct cyst, the middle part of hyoid bone and the surrounding tissue around the thyroglossal tract.	Kartini D, Panigoro SS, Harahap AS. Sistrunk Procedure on Malignant Thyroglossal Duct Cyst. Case Rep Oncol Med. 2020 Jan 16;2020:6985746. doi: 10.1155/2020/6985746. PMID: 32395358; PMCID: PMC7201451.
28	Excision of Branchial Cyst	Complete surgical removal of branchial cyst	Houck J. Excision of branchial cyst. Operative Techniques in Otolaryngology Head and Neck Surgery. Updated September 2005. doi:http://doi.org/10.1016/j.otot.2005.09.007
29	Cochlear Implant Surgery	Surgical implantation of a small, complex electronic device that can help to provide a sense of sound to a person who is profoundly deaf or severely hard-of-hearing	Cochlear implants. NIDCD Fact Sheet. National Institute on Deafness and Other Communicable Disorders. NIH Publication No. 00-4798. February 2016. Last updated March 2021.
30	Laryngectomy	Surgical procedure in which the entire larynx is removed from hyoid bone superiorly to the cricoid cartilage and often extending down to the tracheal rings inferiorly for the purpose of resecting advanced laryngeal cancer.	Joo, D., Kim, P.D. (2013). Total Laryngectomy and Laryngopharyngectomy. In: Kountakis, S.E. (eds) Encyclopedia of Otolaryngology, Head and Neck Surgery. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-23499-6_123
31	Tumour Debulking	Partial removal of a surgically incurable malignant neoplasm without curative intent to make subsequent therapy with drugs, radiation or other adjunctive measures more effective and, thereby, improve the length of survival.	Silberman AW. Surgical debulking of tumors. Surg Gynecol Obstet. 1982 Oct;155(4):577-85. PMID: 6750827
32	Minor Oral Surgery	Simple surgical procedures that involve the hard and soft tissues of the oral cavity which may or may not be related to dental problems	www.harlestone dental.co.uk

33	Elective Oral & Maxillofacial Trauma Surgery	A planned, non-emergency surgical management of facial bone fractures	<a href="http://www.harlestone-dental.co.uk">www.harlestone-dental.co.uk</a>
34	Cataract Surgery	Removal of an opaque or cloudy natural crystalline lens and usually is replaced by an artificial lens	<a href="https://www.nei.nih.gov/cataract/cataract-surgery">https://www.nei.nih.gov/cataract/cataract-surgery</a>



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CLINICAL AUDIT UNIT  
MEDICAL CARE QUALITY SECTION  
MEDICAL DEVELOPEMENT DIVISION  
MINISTRY OF HEATH MALAYSIA