

# **REDUCING THE HEAVY USAGE OF CONTROLLED ANTIBIOTICS IN HOSPITAL SEBERANG JAYA**



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# GROUP MEMBERS

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**Pharmacist**

**Pharmacist**

**Pharmacist**

**Pharmacist**

**Pharmacist**

**Pediatrician**

**ID Specialist**

**Microbiologist**

**Microbiologist**

**Anesthetist**

- **HOSPITAL SEBERANG JAYA**



# PROBLEM IDENTIFICATION

1. Medication administration error in wards
2. Accumulation of non floor stock medications in wards
3. Heavy usage of controlled antibiotics in wards
4. Illegible handwriting prone for medication errors
5. Inconvenient accessibility to quota medications name list



# PROBLEM PRIORITIZATION

PROPOSED TOPICS	S	M	A	R	T	TOTAL
<b>Medication administration error in wards</b>	3+3+3+3+3	3+2+3+3+3	1+1+1+1+1	1+2+2+1+2	1+1+1+1+2	<b>47</b>
<b>Accumulation of non floor stock medications in wards</b>	1+2+1+2+1	1+2+2+1+2	2+1+2+1+1	3+3+2+2+3	1+1+2+2+1	<b>42</b>
<b>Heavy usage of controlled antibiotics in wards</b>	3+3+3+3+2	2+3+3+3+2	2+2+2+2+3	3+2+2+2+2	3+2+2+3+3	<b>65</b>
<b>Illegible handwriting prone for medication errors</b>	2+3+3+2+3	1+2+1+1+2	2+1+2+2+3	1+1+1+1+1	1+1+1+2+2	<b>42</b>
<b>Inconvenient accessibility to quota medications name list</b>	1+1+1+1+2	1+1+1+1+1	1+2+2+2+2	3+3+2+2+3	3+3+3+3+3	<b>48</b>

Rating scale: 1=low 2=medium 3=high

*Done as a group*

Group members: 5



# TERMS DEFINITION

- **CRE** : Carbapenem-Resistant Enterobacteriaceae
- **DDD** : Defined Daily Dose
- **ESBL** : Extended-spectrum beta-lactamase
- **FBW** : *Farmasi Bekalan Ward* (Inpatient Pharmacy)
- **NAG** : National Antibiotics Guideline
- **BHT** : Bed Head Ticket
- **CMR** : Cumulative Medication Record
- **AMR** : Antimicrobial Resistance



# Heavy usage of controlled antibiotics in wards

Heavy usage = DDD above upper limit

**Controlled antibiotics** = Cefepime, Tazocin, Imipenem, Meropenem, Ertapenem, Vancomycin and Ciprofloxacin

**Upper limit formula**= Average DDD + Std Deviation

Total Antibiotics Usage (GRAM)  
for Adults Inpatient in a year

----- = **No of DDD's per year**  
DDD<sub>WHO</sub>

No. of DDD's per year

No. of Patients days X 1000 = **No of DDD's per 1000  
patient days**  
for that particular year



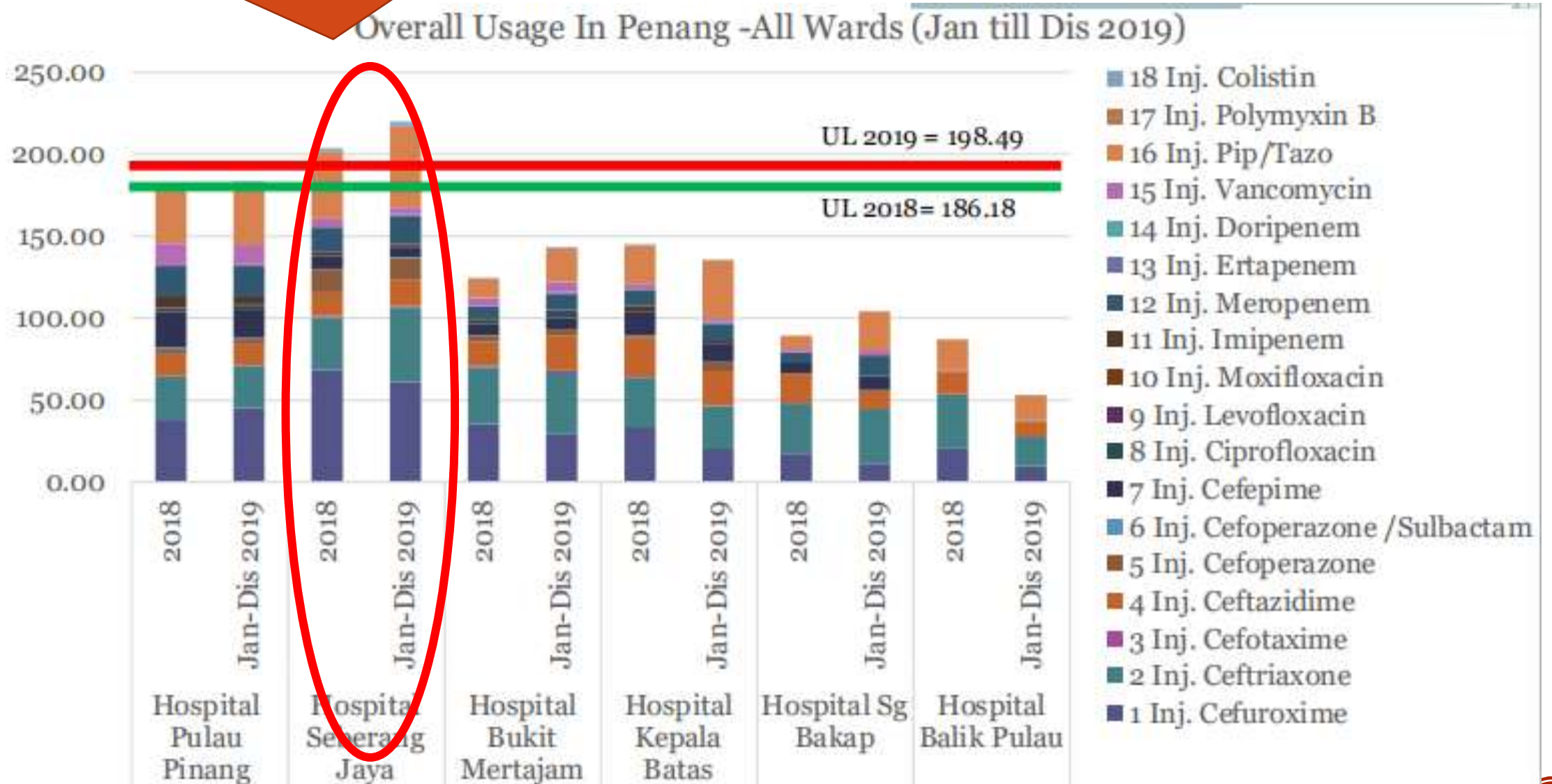
# SMART

PARAMETERS	EXPLANATION
Seriousness	<ul style="list-style-type: none"><li>• Increase hospital stay</li><li>• Increase cost of medication/accessories</li><li>• Increase CRE incidence/outbreak due to resistance</li><li>• Increase DDD</li><li>• Increase mortality rate</li></ul>
Measurable	<ul style="list-style-type: none"><li>• DDD is measurable</li><li>• Resistance rate is measurable</li></ul>
Appropriateness	<ul style="list-style-type: none"><li>• Resistance is an issue which requires urgent attention and immediate action due to AMR!</li></ul>
Remediable	<ul style="list-style-type: none"><li>• Strict review by prescribers</li><li>• Monitor usage by pharmacists</li></ul>
Timeliness	<ul style="list-style-type: none"><li>• Effect to be seen in 1 to 2 years</li></ul>



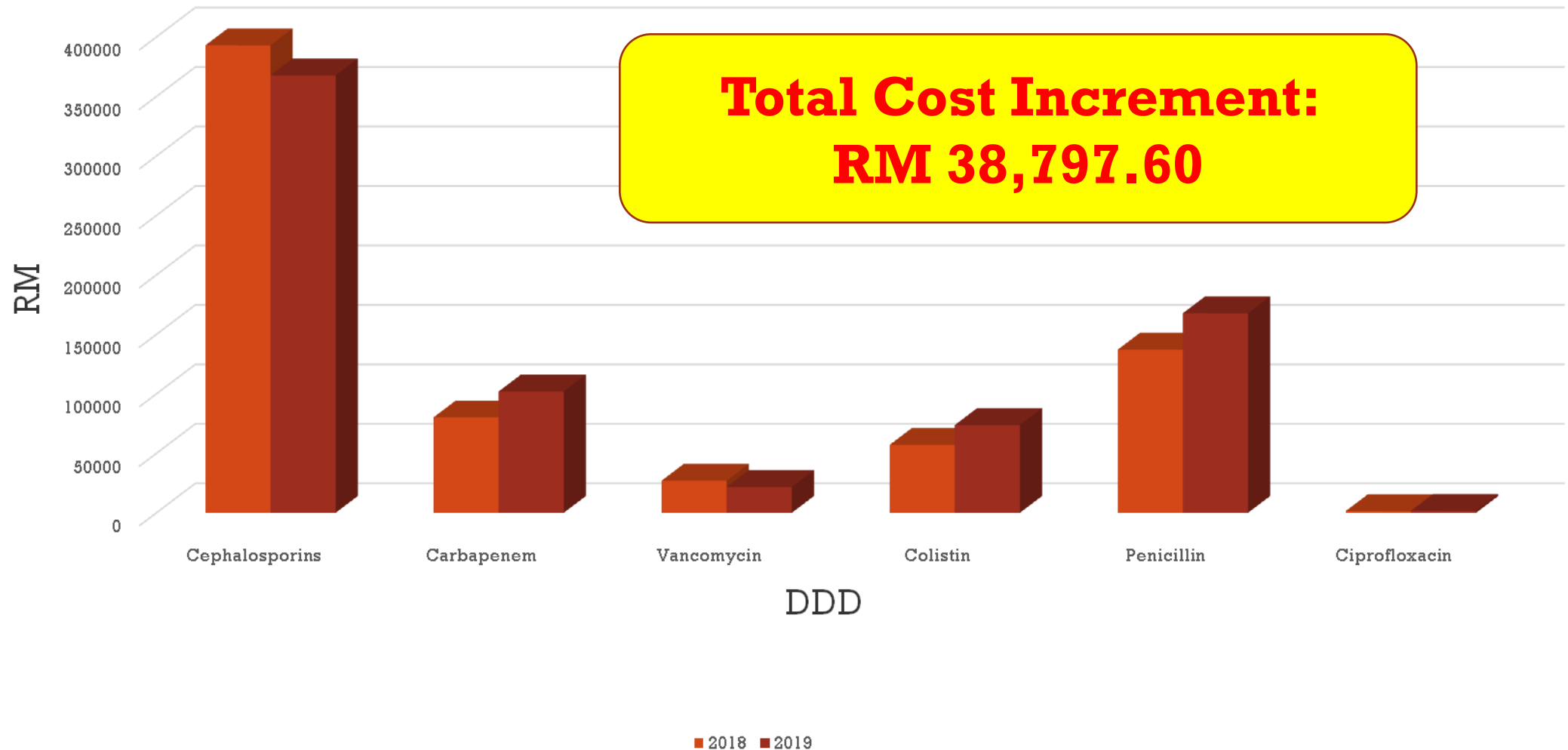
# VERIFICATION STUDY

DDD in HSJ exceeds the upper limit





# EXPENDITURE COMPARISON



# ANTIBIOGRAM 2018

**Green color- Sensitive**  
**Orange- Intermediate**  
**Red- Resistant**

Sensitive *E. coli*

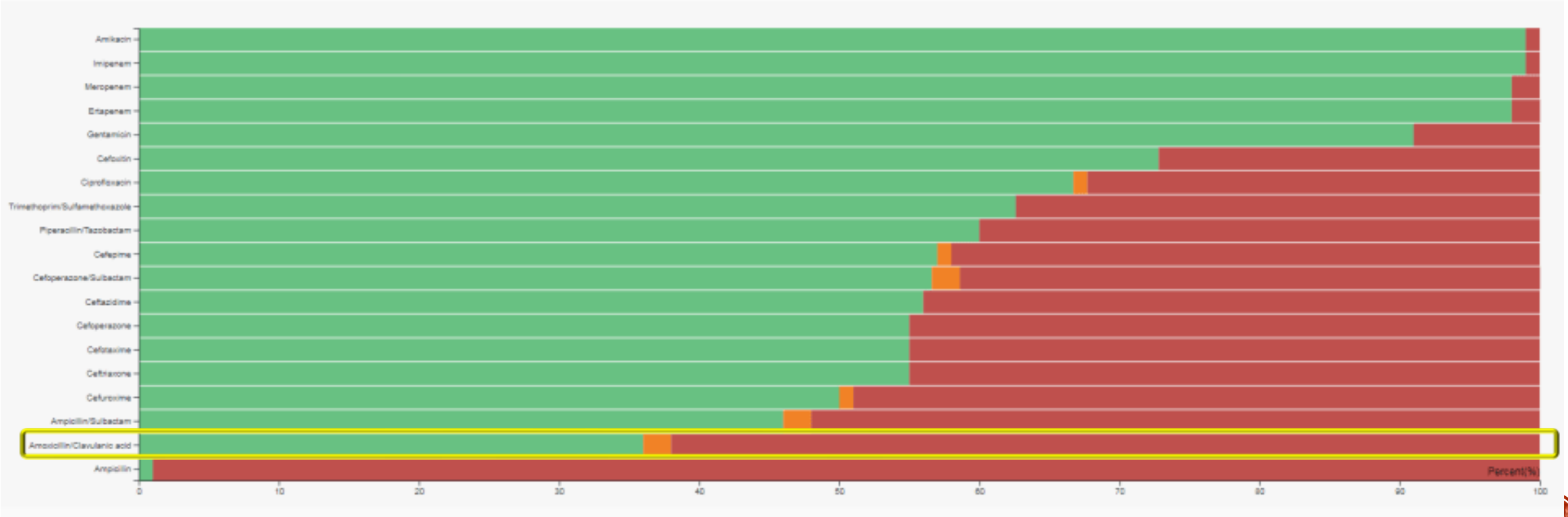
Current Date Range

Month From: January 2018 Month Until: December 2018

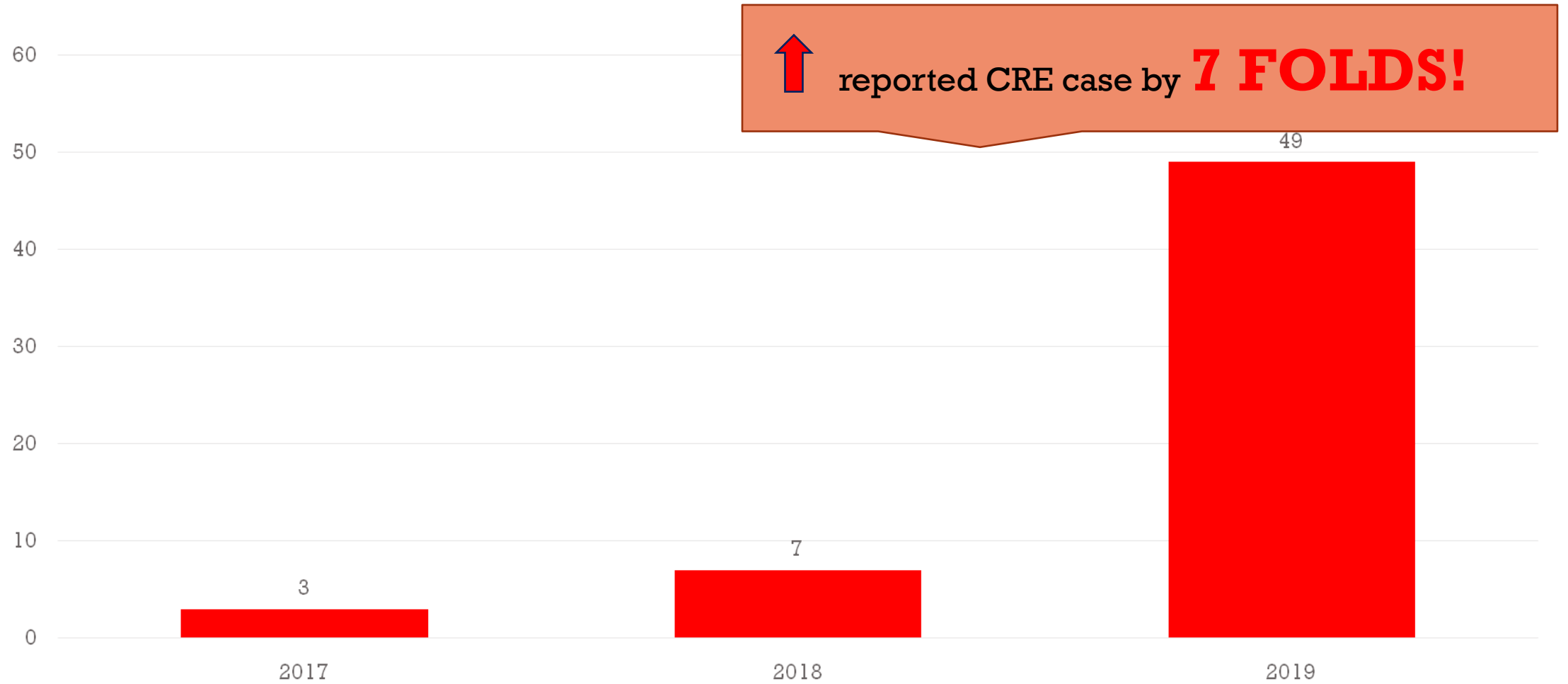
Microbe Source Department Ward Alert Organism Options

Submit Export as CSV Export as PDF

Remove "Not Tested" Sort by Sensitive Sort by Sensitive + Intermediate

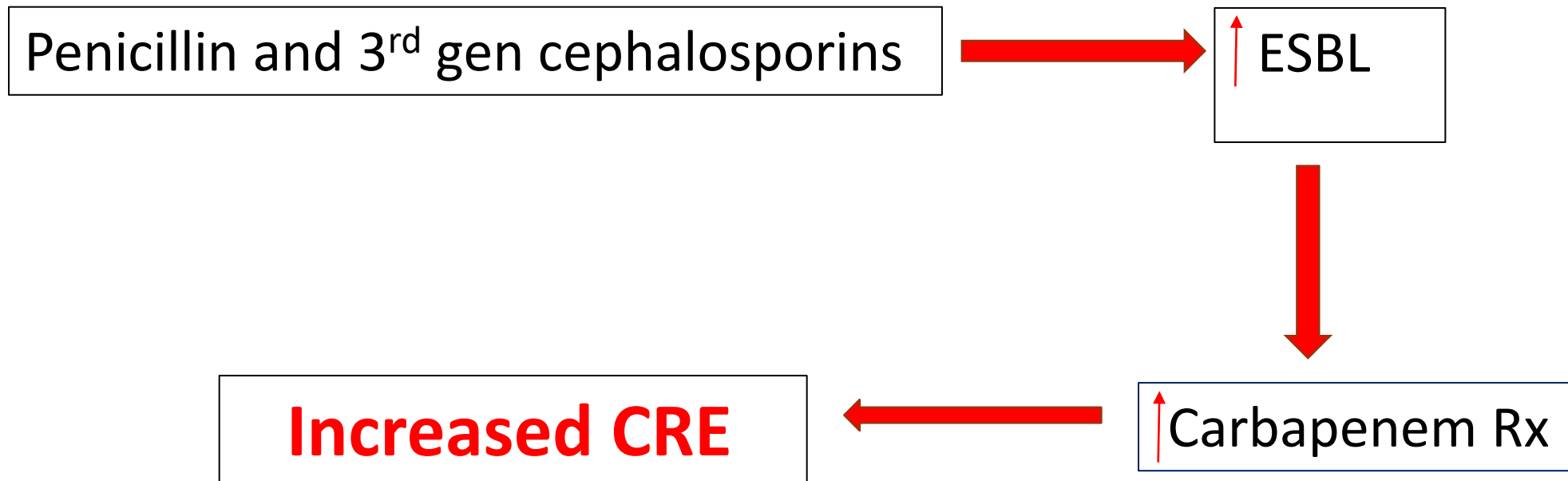


# REPORTED CRE CASES IN HSJ



# LITERATURE REVIEW

- Recent years, the rate of **Carbapenem-resistant bacteria has steadily increased** [1, 2]. Antibiotic resistance greatly **limits therapeutic options**, consequently resulting in higher patient morbidity, mortality and considerable economic burden [3].
- According to the study conducted by Ping Yang et al. there is a **correlation between increased Carbapenem use and increased CRE** [4].



# PROBLEM STATEMENT

There is a **problem** of heavy usage of controlled antibiotics.

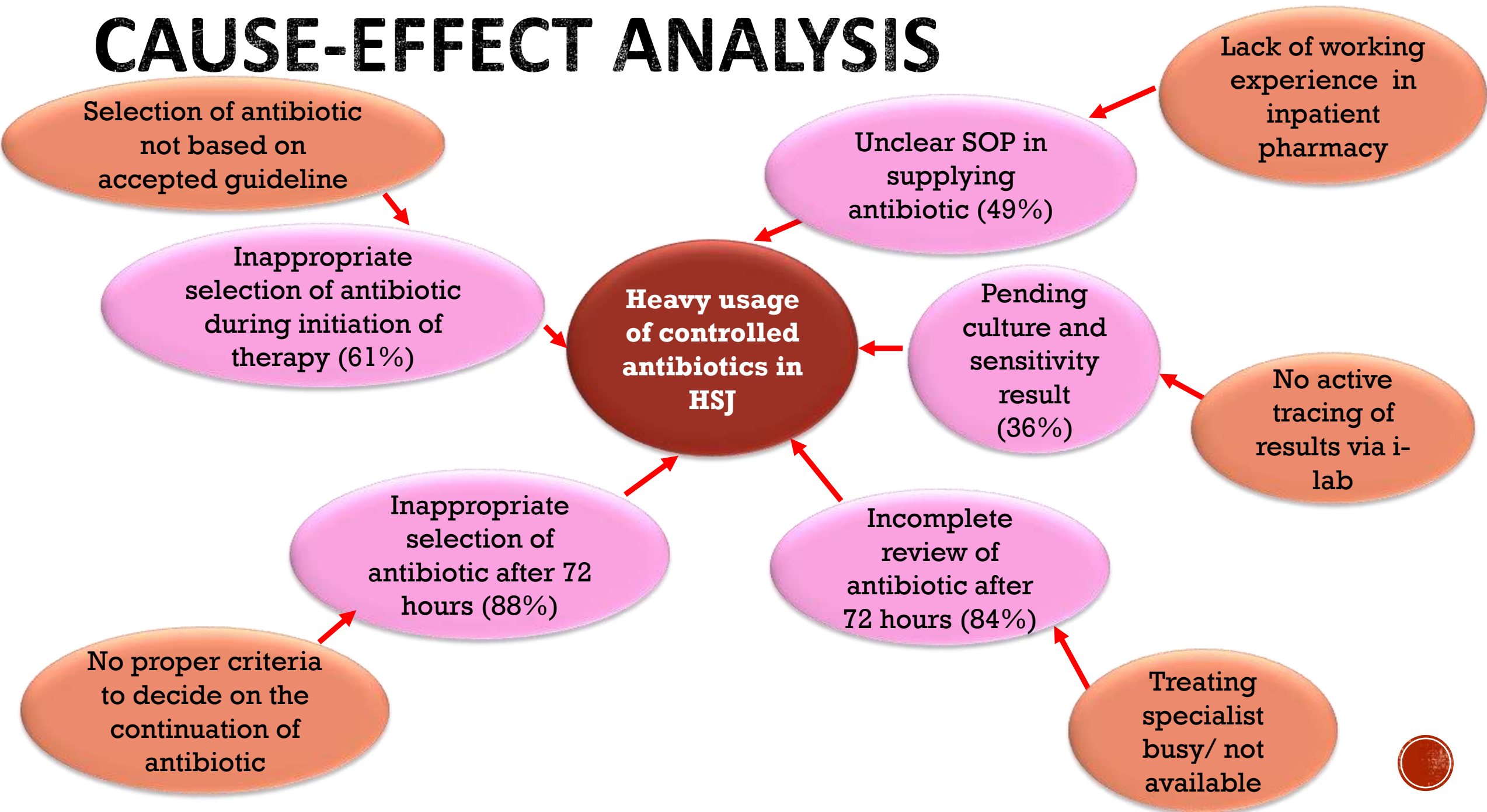
This will **lead to** increase hospital stay, increase cost of medication/accessories, increase CRE incidence/outbreak due to resistance, increase DDD and increase mortality rate.

Heavy usage of controlled antibiotics may be **due to** incomplete review of antibiotic form, pending culture and sensitivity result, unclear SOP in supplying antibiotic and inappropriate selection of antibiotic upon initiation and post 72 hours.

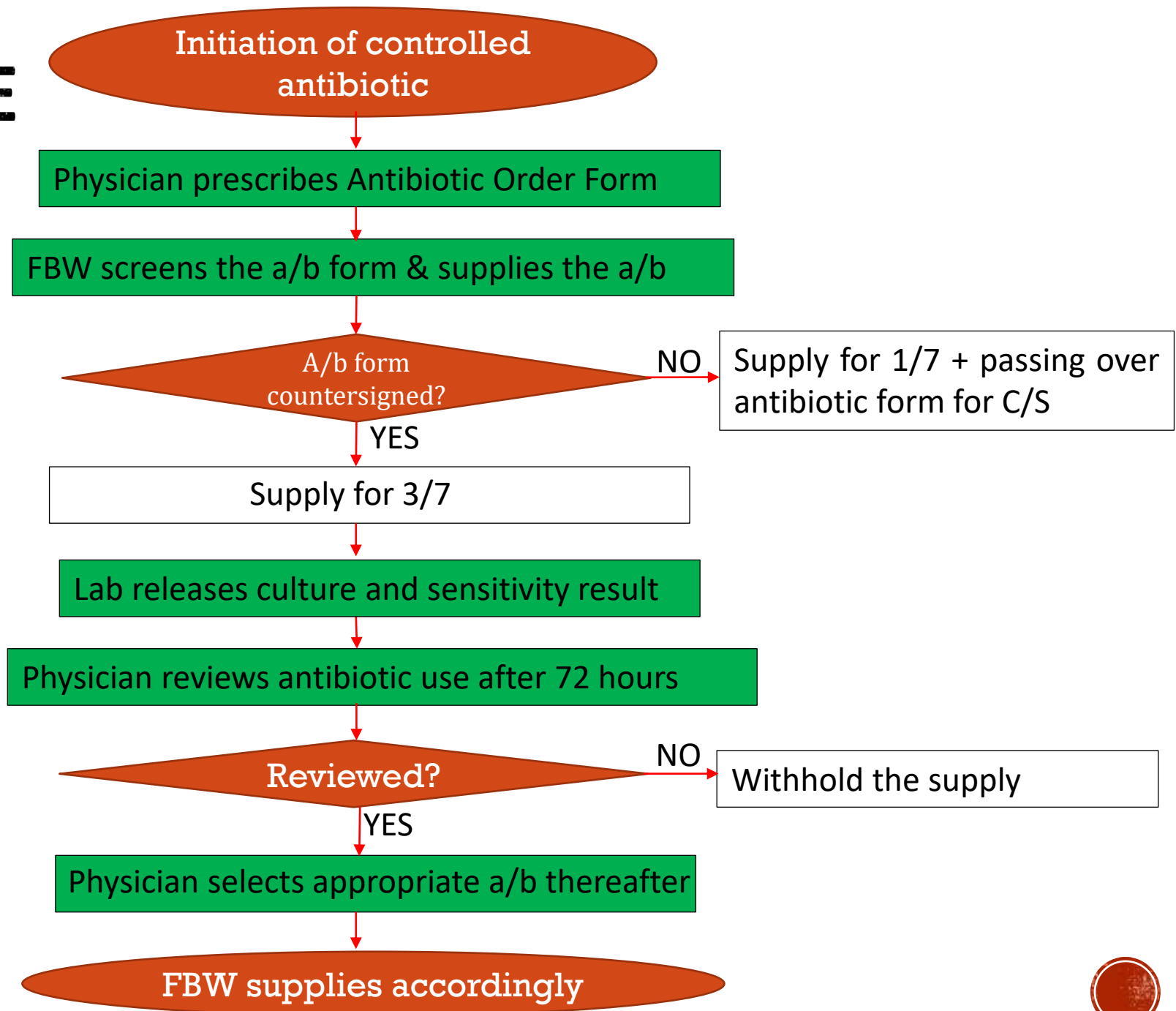
We **hope to** identify factors contributing to the heavy usage of controlled antibiotics and propose appropriate remedial measures to overcome the problem effectively.



# CAUSE-EFFECT ANALYSIS



# PROCESS OF CARE



# MODEL OF GOOD CARE

Process	Criteria	Standard
Physician prescribes Antibiotic Order Form	Antibiotic selection based on National Antibiotic Guideline or ICU Guideline	100%
FBW screens the a/b form & supplies the a/b	Supply made after review with justification (as per the flow chart on supply of controlled antibiotics )	100%
Lab releases culture and sensitivity result	Trace results latest by 72 hours after antibiotic use	100%
Physician reviews antibiotic use after 72 hours	Review of antibiotic at 72 hours for empirical cases	100%
Physician selects appropriate a/b thereafter	<p>For all empirical a/b cases, decision made based on the reported C&amp;S result and septic parameters:-</p> <ul style="list-style-type: none"> <li>*temperature</li> <li>*WBC</li> <li>*CRP</li> <li>*procalcitonin</li> <li>*inotropic</li> <li>*ventilator support.</li> </ul> <p><i>For the septic parameters, minimum 2 criteria need to be fulfilled</i></p>	100%



# GENERAL OBJECTIVE

To reduce the heavy usage of controlled antibiotics in Hospital Seberang Jaya by **reducing DDD** from **above upper limit** in year 2018 (UL: 186.18) to **below upper limit by  $\geq 30\%$**  in year 2022.

# SPECIFIC OBJECTIVE

- To **determine the DDD** of controlled antibiotics in HSJ
- To **identify the possible causes** and contributory factors attributing to high DDD
- To **formulate remedial actions** as to reduce the DDD
- To **implement remedial actions** to accomplish the objective
- To **evaluate the effectiveness** of the remedial measures implemented.



# STUDY INDICATOR

$$\text{Percentage reduction of DDD from upper limit} = \frac{\text{Average upper limit} - \text{DDD per 1000 patient days}}{\text{Average upper limit of DDD}} \times 100\%$$

STANDARD

**$\geq 30\%$**



# STUDY INDICATOR JUSTIFICATION

HOSPITALS	DDD 2019	AVERAGE DIFFERENCE (%)
HSJ	220	
HPP	176	11.1%
HKL	164	14.6%
HRPB	159	16.1%

**AVERAGE = 15% X 2**

**STANDARD**

**$\geq 30\%$**





# Sampling Tool 1: Controlled Antibiotic Order Form

- Order form created in 2014 by inpatient pharmacy
- To **provide brief data** on the infection treated and previous antibiotic history
- To **review the antibiotic use at 72 hours** for empirical cases

**CONTROLLED ANTIBIOTIC ORDER FORM**  
Pharmacy Department, Hospital Seberang Jaya  
-This form must be **COMPLETELY FILLED** before sending to Pharmacy.  
-Supply will **NOT BE MADE** for an incomplete form.

Form ID  
(for pharmacy use)

1. Name: .....

2. R/N: ..... 3. Ward/ Bed No: .....

i. Gender: M / F ..... ii. Age: ..... years ..... iii. Weight: ..... kg

4. Renal Impairment/ Failure:  Yes, SrCr: ..... mmol/L  No

5. Purpose of Antimicrobial Usage (Please ✓):  
Infection Treated: .....

i)  Empiric (Supply will be withheld for any antibiotic forms not review after 72 hours)

Infection Source:  
 Community-Acquired  
 Nosocomial

ii)  Targeted

Date Culture Sent	Source	Targeted Organism	Sensitivity	Resistance

6. Previous Antibiotics Used  
 No Previous Antibiotics

Route / Drug / Dose / Frequency	Date started	Date stopped

7. Antibiotic Requested:

Cefepime  Ertapenem  Imipenem/ Cilastatin  
 Meropenem  Piperacillin/ Tazobactam  Vancomycin  
 Ciprofloxacin

Dose	Frequency	Date Start	Duration

8. Signature & Stamp of Doctor In Charge (H/O or M/O)

8a. Name of Specialist/ H.O./D/ Consultant who Ordered the Antibiotic

9. Signature & Stamp of Specialist/ H.O./D/ Consultant

Controlled Antibiotic Order Form Version 2.1 (Revised on 30<sup>th</sup> July 2014)

# Sampling Tool 2:

## Antimicrobial Stewardship Database

- Created and maintained by **Pharmacy Department HSJ**
- Data will be **entered by FBW** based on completed controlled antibiotics forms
- To **facilitate statistical analysis** for antibiotic usage in HSJ.



**Antimicrobial Stewardship Database**  
Hospital Seberang Jaya

[About](#)

Antibiotic Defined Daily Dose Database    Controlled Antibiotic Order Form Database    Rounds Database



## Sampling Tool 3:

### Knowledge Assessment Questionnaire

- Consists of sets of questions targeting both **doctors and pharmacists**
- Verified by **ID Specialists and Senior Pharmacists**
- To **access the knowledge** on antibiotics selection based on multiple case studies
- To **access the understanding** on the SOP of controlled antibiotic supply in HSJ.





# Knowledge Assessment Questionnaire

## QUESTIONNAIRE FOR PHARMACIST

1	Can controlled antibiotics be supplied if indented via manual forms?	Yes	No
2	If the controlled antibiotics supply was terminated in view of failure of approval or review process, would you inform the staff nurse or doctor?	Yes	No
3	Can Tazosin be supplied despite the form has expired?	Yes	No
4	Can Colistin be supplied if reviewed by other specialists instead of ID consultants?	Yes	No
5	Can the STAT dose of one of the controlled antibiotics be supplied without e-Antibiotic form?	Yes	No
6	Can IV Vancomycin STAT dose be supplied without e-Antibiotic form?	Yes	No
7	Does the approval and review process inclusive of weekends and public holidays?	Yes	No
8	Can the controlled antibiotics be supplied if the prescriber sent in another form in view the previous form has expired for the same antibiotic?	Yes	No
9	If the prescriber sent in three separate e-forms at 3 different time intervals continuously as the previous forms were expired, do you still supply the controlled antibiotics for the 4 <sup>th</sup> time without review process?	Yes	No
10	What is the username and password for the e-Antibiotics Form Registry?	farmasi hghjshj	Hsj farmasihsj

## QUESTIONNAIRE FOR PHYSICIAN

### ANTIBIOTICS RELATED QUESTIONS

1. Patient had history of post trauma in 2019 and sustained right femur fracture. Impression is infected implant. Latest cultures were as follows:

Blood: No Growth  
Tissue: ESBL E. Coli – Sensitive: Tazosin & Cefepime  
PUS: ESBL E.Coli – Sensitive: Tazosin & Cefepime

Currently on IV Tazosin D4. Clinically, patient is not septic looking. What would be your recommendation on the antibiotic?

- A) Continue IV Tazosin
- B) Escalate to Carbapenem
- C) Discontinue IV Tazosin
- D) Add in high dose Unasyn

2. i) Can IV Augmentin be given for primary SBP?

- A) Yes
- B) No

ii) How long would be the duration of the treatment for the above indication?

- A) 3 days
- B) 5 days
- C) 7 days
- D) 14 days

3. A 54 years old patient, presented with seizure and initially was treated as meningococcalitis with IV Ceftriaxone 2g BD and IV Acyclovir 500mg TDS. Subsequently, the diagnosis was excluded and wanted to cover empirically for aspiration pneumonia. In view of poor GCS 10/15 @ ED. Thus, what would your recommendation be for the management of antimicrobial therapy?

- A) Continue IV Ceftriaxone 2g BD and IV Acyclovir 500mg TDS
- B) Off IV Acyclovir. Continue IV Ceftriaxone 2g BD
- C) Off IV Acyclovir. Continue IV Ceftriaxone at reduced dose of 1g BD
- D) Off both IV Acyclovir and IV Ceftriaxone. Start IV Augmentin 1.2g TDS

4. What is the dose of IV Cloxacillin for MSSA bacteremia in ESRF patient?

- i) With vegetation
  - A) 2g QID
  - B) 2g 4hrly
  - C) 1g QID
  - D) 1g 4hrly

ii) Without vegetation

- A) 2g QID
- B) 2g 4hrly
- C) 1g QID
- D) 1g 4hrly

5. Which of the antibiotics listed below does not cover *Pseudomonas aeruginosa*?

- A) Ceftriaxone
- B) Ceftazidime
- C) Cefepime
- D) Tazosin

6. Which of the organism/pathogen that can be treated with IV Ertapenem?

- A) Acinetobacter
- B) Pseudomonas
- C) Enterococcus
- D) Enterobacter

7. Name one type of echinocandin available at HSI.

8. What would be your choice of antibiotic to treat:

- i) *Proteus vulgaris*:
  - A) Cefepime
  - B) Unasyn
  - C) Ceftriaxone
  - D) Cefoperazone

ii) *Enterococcus faecalis*:

- A) Vancomycin
- B) Ampicillin
- C) Unasyn
- D) Cefepime

9. Does IV Colistin use requires pre-authorization from the Infectious Disease physician?

- A) Yes
- B) No

10. What would be the consequences if third generation cephalosporins are used injudiciously?

- A) MRSA
- B) ESBL
- C) Acinetobacter XDR
- D) Pseudomonas



# PLAN FOR DATA COLLECTION

Factors	Variables	Source of data	Method of collection	Sample unit	Sample size	Standard
Prescribing antibiotic form	Knowledge on selection of antibiotics	Questionnaire Audit	Self-administered	Medical wards and ICU	50 medical officers & house officers	100% adherence
Screening antibiotic form and supplying antibiotic	Knowledge on SOP of supplying antibiotics	Questionnaire Audit	Self-administered	Pharmacists & pharmacist assistants	All FRP, PRP & PPF	100% understanding
Pending culture and sensitivity result	Trace results latest by 72 hours after antibiotic use	Antimicrobial Stewardship Database	Online tracing	Medical wards and ICU	100 patients	100% tracing
Reviewing antibiotic use after 72 hours	Review of antibiotic use at 72 hours for empirical treatment	<ul style="list-style-type: none"> <li>Antibiotic Order Form</li> <li>Antibiotic Application</li> </ul>	Review antibiotic form	Medical wards and ICU	All medical & anesthesiology specialists	100% understanding
Physician selects appropriate a/b	<p>For all empirical a/b cases, decision made based on the reported C&amp;S result and septic parameters:-</p> <ul style="list-style-type: none"> <li>*temperature</li> <li>*WBC</li> <li>*CRP</li> <li>*procalcitonin</li> <li>*inotropic</li> <li>*ventilator support</li> </ul> <p><i>For the septic parameters, minimum 2 criteria need to be fulfilled</i></p>	<ul style="list-style-type: none"> <li>Antibiotic Order Form</li> <li>Antibiotic Application</li> </ul>	Review antibiotic form	Medical wards and ICU	All medical & anesthesiology specialists	100% understanding

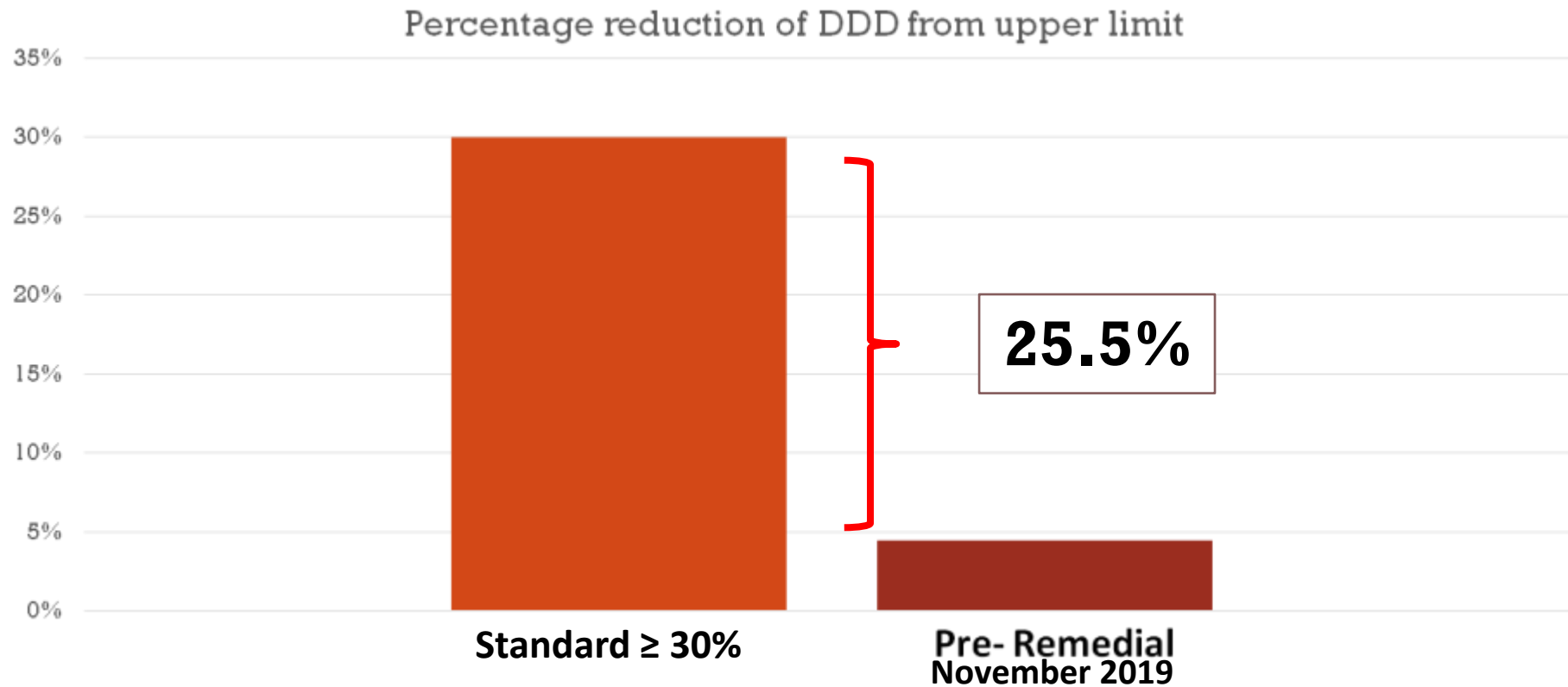
# DATA ANALYSIS



# CONFORMATION TO MOGC

Processs	Criteria	Standard	Pre-remedial November 2019
Physician prescribes Antibiotic Order Form	Antibiotic selection based on National Antibiotic Guideline or ICU Guideline	100%	<b>39%</b>
FBW screens the a/b form & supplies the a/b	Supply made after review with justification (as per the flow chart on supply of controlled antibiotics)	100%	<b>51%</b>
Lab releases culture and sensitivity result	Trace results latest by 72 hours after antibiotic use	100%	<b>64%</b>
Physician reviews antibiotic use after 72 hours	Review of antibiotic at 72 hours for empirical cases	100%	<b>16%</b>
Physician selects appropriate a/b thereafter	<p>For all empirical a/b cases, decision made based on the reported C&amp;S result and septic parameters:-</p> <ul style="list-style-type: none"> <li>*temperature</li> <li>*WBC</li> <li>*CRP</li> <li>*procalcitonin</li> <li>*inotropic</li> <li>*ventilator support.</li> </ul> <p><i>For the septic parameters, minimum 2 criteria need to be fulfilled</i></p>	100%	<b>12%</b>

# ACTUAL BENEFIT NOT ACHIEVED (ABNA)



No.	Shortfall in Quality (SIQ)	Strategy for Change
1	<b>Inappropriate selection of antibiotic after 72 hours (88%)</b>	<ul style="list-style-type: none"> <li>✓ <b>HSJ Inpatient Empirical Antibiotic Guide</b></li> <li>✓ <b>HSJ Antimicrobial Guideline</b></li> <li>✓ <b>HSJ Antibiotic Application</b></li> </ul>
2	<b>Incomplete review of antibiotic after 72 hours (84%)</b>	<ul style="list-style-type: none"> <li>✓ <b>Antimicrobial Formulary Restriction</b></li> <li>✓ <b>Persistency on Culture Updates</b></li> <li>✓ <b>HSJ Antimicrobial Guideline</b></li> <li>✓ <b>HSJ Antibiotic Application</b></li> <li>✓ <b>Flow Chart on Supply of Controlled Antibiotics</b></li> <li>✓ <b>Antibiotic e-form Manual</b></li> </ul>
3	<b>Inappropriate selection of antibiotic during initiation of therapy (61%)</b>	<ul style="list-style-type: none"> <li>✓ <b>HSJ Inpatient Empirical Antibiotic Guide</b></li> <li>✓ <b>Antimicrobial Formulary Restriction</b></li> <li>✓ <b>HSJ Antimicrobial Guideline</b></li> <li>✓ <b>HSJ Antibiotic Application</b></li> </ul>
4	<b>Unclear SOP in supplying antibiotic (49%)</b>	<ul style="list-style-type: none"> <li>✓ <b>Antimicrobial Formulary Restriction</b></li> <li>✓ <b>HSJ Antimicrobial Guideline</b></li> <li>✓ <b>HSJ Antibiotic Application</b></li> <li>✓ <b>Flow Chart on Supply of Controlled Antibiotics</b></li> <li>✓ <b>Antibiotic e-form Manual</b></li> </ul>
5	<b>Pending culture and sensitivity result (36%)</b>	<ul style="list-style-type: none"> <li>✓ <b>Antimicrobial Formulary Restriction</b></li> <li>✓ <b>Persistency on Culture Updates</b></li> <li>✓ <b>HSJ Antimicrobial Guideline</b></li> <li>✓ <b>HSJ Antibiotic Application</b></li> <li>✓ <b>Antibiotic e-form Manual</b></li> </ul>



# STRATEGY FOR CHANGE

REMEDIAL PHASE 1



## Strategy 1:

### HSJ Inpatient Empirical Antibiotic Guide

- This general guideline is **pasted on the medication chart** as reference
- A simplified guide for a **quick reference**
- To facilitate on the **appropriate selection of antibiotics** based on various indications
- A **collaboration project** among the pharmacists, microbiologists and ID physicians.

*SIQ 1: Inappropriate selection of antibiotic after 72 hours*

*SIQ 3: Inappropriate selection of antibiotic during initiation of therapy*





# HSJ Inpatient Empirical Antibiotic Guide



Infections	SEND CULTURES BEFORE STARTING ANTIBIOTICS		
Blood Stream/ Unknown Source	Empirical Therapy	Septic Shock* + Low Risk Nosocomial Infection*	Septic Shock* + High Risk Nosocomial Infection*
	IV Amoxi-Clav 1.2g q8h OR IV Unasyn 3g q8h-q9h	IV Ceftriaxone 2g q24h	IV Pip-Tazobactam 4.5g q6h OR IV Meropenem/Imipenem (Risk of ESBL infection)
Respiratory	CAP	HAP (Early onset 2-4 days admission/intubation)	HAP (Late onset ≥5 days admission/intubation)
	IV Amoxi-Clav 1.2g q8h PLUS/MINUS IV/PO Azithromycin 500mg q24h	IV Amoxi-Clav 1.2g q8h OR IV Ceftriaxone 2g q24h (If had prior antibiotic)	IV Pip-Tazobactam 4.5g q6h OR IV Meropenem/Imipenem PLUS/MINUS High dose Unasyn (Critically ill)
Urinary	Uncomplicated UTI (Outpatient)	Complicated UTI including pyelonephritis	Asymptomatic bacteriuria
	T. Nitrofurantoin 50-100mg q6h OR T. Cephalexin 500mg q12h (pregnancy)	IV Unasyn 3g q8h-q9h OR IV Amoxi-Clav 1.2g q8h OR IV Cefuroxime (Pregnancy)	DO NOT TREAT except in pregnancy or undergoing invasive urological intervention
Skin & Soft Tissue	Cellulitis	Infected DFU - Debridement	Necrotising Fasciitis - Debridement
	IV Clindamycin 1-2g q6h	IV Unasyn 3g q8h-q9h OR IV Pip-Tazobactam 4.5g q6h	IV Pip-Tazobactam 4.5g q6h PLUS/MINUS IV Clindamycin 600-900mg q6h
<p>*Septic shock: Sepsis with persistent hypotension (fluid resuscitation to keep MAP≥65 mmHg, serum lactate&gt;2 despite adequate resuscitation)                      /Nosocomial infection risk: Previous isolation of MRO, recent hospitalization or treatment with broad spectrum antibiotics past 3 months                      Reminder: 1. De-escalate to narrowest-spectrum antibiotics once culture is available. Consider 5-7 days of treatment duration.                      2. Switch to oral if culture is sensitive/negative and patient responded clinically (afebrile&gt;24h, no signs of sepsis, tolerating orally)                      Please refer to National Antimicrobial Guideline 2019 (Access the link below or scan the QR code)  <a href="https://www.pharmacy.gov.sg/~/media/Default/Files/document/upload/national-antimicrobial-guideline-2019-full-version-3rd-edition.pdf">https://www.pharmacy.gov.sg/~/media/Default/Files/document/upload/national-antimicrobial-guideline-2019-full-version-3rd-edition.pdf</a></p>			



Medical Department · Pharmacy Department · Microbiology Unit · Hospital  
 Seberang Jaya · Updated July 2020



**SCAN ME!**



**PASTED ON THE MEDICATION CHART IN MEDICAL WARDS**



## Strategy 2:

### Antimicrobial Formulary Restriction

- Decided on the category of various antibiotics based on the **spectrum and implications** it may cause for over usage
- **7 types of antibiotics** have been listed as controlled antibiotics
- To **control the usage** of broad spectrum antibiotics
- A **collaboration** between pharmacy and Infection Control Unit.

**SIQ 3:** *Inappropriate selection of antibiotic during initiation of therapy*

**SIQ 4:** *Unclear SOP in supplying antibiotic*

**SIQ 2:** *Incomplete review of antibiotic after 72 hours*

**SIQ 5:** *Pending culture and sensitivity result*





## Appendix 4 : Antimicrobial Formulary Restriction

ANTIMICROBIAL FORMULARY RESTRICTION FOR HOSPITAL SEBERANG JAYA v2/2020

Restricted/ Pre-Authorization	Controlled (Review at 72 hours)	Conditional (Any specialist)	General use/Avail (Medical officer / host)
IV Colistin 7	IV Cefepime 1g	IV Acyclovir 250mg	IV Ampicillin 500mg
Polymyxin E 1MIU (80mg)	IV Ciprofloxacin 200mg	IV Amikacin 500mg	IV Artesunate 60mg
IV Linezolid 600mg	IV Ertapenem 1g	IV Amphotericin B 50mg	IV Benzylpenicillin (C-Pen) 1 MIU (600mg)
IV Micafungin 50mg	IV Imipenem 500mg	IV Augmentin 1.2g	IV Benzylpenicillin (C-Pen) 5 MIU (3g)
IV Polymyxin B 500,000 IU (50mg)	IV Meropenem 1g	IV Azithromycin 500mg	IM Benzathine Penicillin 2.4 MIU (1.8g)
*Tab Abacavir 300mg	IV Meropenem 500mg	IV Bactrim 400mg/80mg	IV Cloxacillin 500mg
*Tab Abacavir 600mg & Lamivudine 300mg	IV Piperacillin 4g & tazobactam 500mg	IV Cefazolin 1g	IV Gentamicin 80mg
*Tab Daclatasvir 30mg	IV Vancomycin 500mg	IV Cefotaxime 1g	IV Streptomycin 1g
*Tab Daclatasvir 60mg		IV Ceftazidime 2g	*Cap Cycloserine 250mg
*Tab Dolutegravir 50mg		IV Ceftriaxone 1g	*Tab Ethionamide 250mg
*Tab Entecavir 0.5mg		IV Cefuroxime 750mg	Cap Fluconazole 100mg
*Tab Efavirenz 200mg		IV Cefuroxime 1.5g	Tab Flucytosine 500mg
*Tab Efavirenz 600mg		IV Cefoperazone 1g	Tab Fusidic acid 250mg
*Tab Lamivudine 100mg		IV Clindamycin 300mg	Cap Itraconazole 100mg
*Tab Lamivudine 150mg		IV Erythromycin Lactobionate 500mg	*Tab Levofloxacin 500mg
*Tab Lopinavir 200mg & Ritonavir 50mg		IV Fluconazole 100mg	Tab Ofloxacin 100mg
*Tab Nevirapine 200mg		IV Ganciclovir 500mg	Cap Oseltamivir 75mg
Tab Pymethamine 25mg		*IV Kanamycin 1g	Tab Unasyn 375mg
*Tab Raltegravir 400mg		*IV Levofloxacin 500mg	
*Tab Ribavirin 200mg		IV Metronidazole 500mg	
*Tab Sofosbuvir 400mg		IV Pentamidine 300mg	
*Tab Tenofovir 300mg & Emtricitabine 200mg			
*Tab Zidovudine 300mg & Lamivudine 150mg			
<b>Restricted:</b> Require prior authorization from ID Physician before use.	<b>Controlled:</b> Prescribed by specialist. Reviewed at 72 hours with feedback.	<b>Conditional:</b> Prescribed by specialist. Usage may be subjected to audit. Category of restriction will be reviewed timely depends on volume of use.	<b>General:</b> Do not require specialist authorization. Usage may be subjected to audit. Category of restriction will be revised if necessary.

Abbreviations: ID, infectious disease; Rx, prescription; AMS, antimicrobial stewardship; IV, intravenous; Tab, tablet; Cap, capsule; Susp, suspension; MIU, million units;  
 a Can only be prescribed by ID Physician; Chronic cases on HAART OR post-exposure prophylaxis (occupational exposure) cases can be prescribed by any specialist.  
 b Can only be prescribed by Gastroenterologist for treatment of Hepatitis B; Chronic cases can be prescribed by any specialist.  
 c Can only be prescribed by Gastroenterologist or ID Physician for treatment of Hepatitis C; Chronic cases can be prescribed by any specialist.  
 d Can only be prescribed by Respiratory Physician.

**Footnote:**

- This restriction does not apply to antimicrobial usage in the pediatric and neonatal department.
- Restricted medications WILL NOT BE SUPPLIED without prior authorization (verbal or written) from ID physician/ Gastroenterologist.

Prepared by:

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 Ketua Pegawai Farmasi  
 Hospital Seberang Jaya

Reviewed by:

DR. GHALIB DOOTY  
 Pakar Perubatan  
 Jangkitan Perubatan  
 Hospital Seberang Jaya  
 No. MPM: 37102

Approved by:

DR. HJ SAIFUL AZLAN BIN HJ. SHARIF  
 Pengerah Hospital  
 Hospital Seberang Jaya  
 No. MPM: 36365



## Strategy 3:

### Persistency on Culture Updates- Microbiology Unit

- Each doctors and pharmacists are requested to **create an account** in the i-lab system to **facilitate the active culture tracing process**
- A permanent lab assistant is assigned to **update the culture on daily basis**
- **Active tracing via verbally** is also encouraged.

*SIQ 2: Incomplete review of antibiotic after 72 hours*

*SIQ 5: Pending culture and sensitivity result*







## Patologi Pulau Pinang Jabatan Kesihatan Negeri Pulau Pinang

Kluster Patologi: Hospital Pulau Pinang, Hospital Seberang Jaya, Hospital Bukit Mertajam, Hospital Kepala Batas, Hospital Sungai Bakap dan Hospital Balik Pulau

Salam sejahtera Dato/Datin/Dr/Tuan/Puan:

Selamat datang ke **Sistem eResults** Jabatan Patologi Hospital Seberang Jaya.

**DILARANG** berkongsi Nama Pengguna dan Kata Laluan. anda boleh dikenakan tindakan TATATERTIB.

Sila **DAFTAR** sebagai pengguna dengan menggunakan pautan dibawah:

[ [PENDAFTARAN PENGGUNA BAHARU](#) ]

[ [CETAK BORANG PENDAFTARAN](#) ]

Permohonan anda hanya akan diproses setelah pendaftaran atas talian ini dicetak, ditandatangani oleh Ketua jabatan dan dikemukakan ke Jabatan Patologi untuk proses kelulusan.

- Bersetuju dan maklum dengan semua syarat dan peraturan yang ditetapkan. Jika saya ingkar kepada peruntukan-peruntukan yang ditetapkan, maka tindakan yang sewajarnya boleh diambil ke atas diri saya.



Nama Pengguna:

Kata Laluan:

### Troponin T, high Sensitivity (hs-TnT)

Ujian Troponin T, high sensitivity (hs-TnT) akan mula ditawarkan oleh Makmal Patologi Kimia, Jabatan Patologi HSJ bermula daripada 21 Februari 2022, oleh yang demikian penawaran Ujian Profil Cardiac Enzyme akan ditamatkan berkuatkuasa pada tarikh yang sama. Sila klik pautan dibawah bagi mendapatkan maklumat lanjut berkaitan tatacara permohonan ujian hs-TnT.

[ [Troponin T, high Sensitivity \(hs-TnT\)](#) ]

#### DIREKTORI UJIAN

Sila **klik** pautan dibawah bagi maklumat senarai ujian yang ditawarkan:

[ [Type of container and specimen tube](#) ]

[ [Direktori Ujian yang ditawarkan di Jabatan Patologi Hospital Seberang Jaya](#) ]

[ [Direktori Ujian yang dihantar ke makmal rujukan](#) ]

[ [Senarai borang permohonan](#) ]

#### HUBUNGI KAMI

Pejabat Patologi : samb. 159  
Histopatologi : samb. 357/155  
Mikrobiologi : samb. 166

Kaunter Utama : samb. 170  
Tabung Darah : samb. 163/164  
Seminari : samb. 245



# EFFECTS OF CHANGE

**AFTER REMEDIAL PHASE 1**



# CONFORMATION TO MOGC

Processs	Criteria	Standard	Pre-remedial November 2019	Post 1 May 2020
Physician prescribes Antibiotic Order Form	Antibiotic selection based on National Antibiotic Guideline or ICU Guideline	100%	39%	<b>↑ 70%</b>
FBW screens the a/b form & supplies the a/b	Supply made after review with justification (as per the flow chart on supply of controlled antibiotics )	100%	51%	<b>↑ 78%</b>
Lab releases culture and sensitivity result	Trace results latest by 72 hours after antibiotic use	100%	64%	<b>↑ 87%</b>
Physician reviews antibiotic use after 72 hours	Review of antibiotic at 72 hours for empirical cases	100%	16%	<b>↑ 59%</b>
Physician selects appropriate a/b thereafter	<p>For all empirical a/b cases, decision made based on the reported C&amp;S result and septic parameters:-</p> <ul style="list-style-type: none"> <li>*temperature</li> <li>*WBC</li> <li>*CRP</li> <li>*procalcitonin</li> <li>*inotropic</li> <li>*ventilator support.</li> </ul> <p style="text-align: center;"><b><i>For the septic parameters, minimum 2 criteria need to be fulfilled</i></b></p>	100%	12%	<b>↑ 68%</b>

# STRATEGY FOR CHANGE

**REMEDIAL PHASE 2**



# Strategy 4: HSJ Antimicrobial Guideline

- A more **comprehensive guideline based on the local antibiogram** as reference
- Both **manual and electronic** (QR code) versions were distributed
- To **ease the accessibility** of the guideline in timely manner
- To **facilitate on the selection of antibiotics** based on various indications
- A **collaboration project** among the pharmacists, microbiologists and ID physicians.

**SIQ 1:** *Inappropriate selection of antibiotic after 72 hours*

**SIQ 2:** *Incomplete review of antibiotic after 72 hours*

**SIQ 3:** *Inappropriate selection of antibiotic during initiation of therapy*

**SIQ 4:** *Unclear SOP in supplying antibiotic*

**SIQ 5:** *Pending culture and sensitivity result*





# HSJ Antimicrobial Guideline

**SCAN ME!**



HSJ ANTIMICROBIAL GUIDELINE 2020

## ANTIMICROBIAL GUIDELINE HOSPITAL SEBERANG JAYA EDITION 1/ 2020



## MEMO HOSPITAL SEBERANG JAYA

Ruj Kami : HSJ/PER/09/006/Jid.10(77) Tarikh : 07 Januari 2021  
Kepada : Seperti Senarai Edaran  
Daripada : Pakar Paediatric merangkap Penyelaras Kawalan Infeksi  
Salinan : Pengarah Hospital  
Perkara : **EDARAN ANTIMICROBIAL GUIDELINE HOSPITAL SEBERANG JAYA EDITION 1/2020**

Tuan/Puan,

Dengan hormatnya merujuk kepada perkara tersebut di atas.

2. Sukacita dimaklumkan *Antimicrobial Guideline Hospital Seberang Jaya Edition 1/2020* telah diterbitkan sepertimana yang dilancarkan sempena Minggu Kesedaran Sedunia 2020 yang diadakan pada 19 November 2020.
3. Tujuan utama garis panduan ini adalah untuk memastikan penggunaan antimikrobal secara rasional dan mengawal kadar kerintangan antimikrobal di hospital sekaligus membenarkan rawatan yang optimum dan efektif kepada pesakit. Bersama ini disertakan buku garis panduan *Antimicrobial Guideline Hospital Seberang Jaya Edition 1/2020* berkenaan seperti di lampiran untuk rujukan di unit wad/ klinik dan jabatan masing-masing.
4. Kerjasama dan perhatian dari pihak Tuan/ Puan amatlah dihargai.

Sekian, terima kasih.

**"BERKHIDMAT UNTUK NEGARA"**

Saya Yang Menjalankan Amanah,

DR. LIM CHOO HAU  
Pakar Paediatric merangkap  
Penyelaras Kawalan Infeksi  
Hospital Seberang Jaya




**DR. LIM CHOO HAU**  
Pakar Paediatric merangkap Penyelaras Kawalan Infeksi  
Hospital Seberang Jaya

# EFFECTS OF CHANGE

**AFTER REMEDIAL PHASE 2**



# CONFORMATION TO MOGC

Process	Criteria	Standard	Pre-remedial November 2019	Post 1 May 2020	Post 2 Dec 2020
Physician prescribes Antibiotic Order Form	Antibiotic selection based on HSI Antimicrobial Guideline or ICU Guideline	100%	39%	70%	 <b>75%</b>
FBW screens the a/b form & supplies the a/b	Supply made after review with justification (as per the flow chart on supply of controlled antibiotics)	100%	51%	78%	 <b>86%</b>
Lab releases culture and sensitivity result	Trace results latest by 72 hours after antibiotic use	100%	64%	87%	 <b>94%</b>
Physician reviews antibiotic use after 72 hours	Review of antibiotic at 72 hours for empirical cases	100%	16%	59%	<b>55%</b>
Physician selects appropriate a/b thereafter	For all empirical a/b cases, decision made based on the reported C&S result and septic parameters:- <ul style="list-style-type: none"> <li>*temperature</li> <li>*WBC</li> <li>*CRP</li> <li>*procalcitonin</li> <li>*inotropic</li> <li>*ventilator support</li> </ul>	100%	12%	68%	<b>65%</b>

*For the septic parameters, minimum 2 criteria need to be fulfilled*

# STRATEGY FOR CHANGE

**REMEDIAL PHASE 3**



# Strategy 5: HSJ Antibiotic Application

- An **electronic way** to create, approve and review the antibiotic use
- To **ensure complete review** of antibiotic form
- To **ensure active tracing** of culture and sensitivity results before review
- **Initiative by HSJ Pharmacy Department**
- In parallel to **KKM Strategic Plan 2021-2025** – towards digital healthcare services

**SIQ 1:** *Inappropriate selection of antibiotic after 72 hours*

**SIQ 2:** *Incomplete review of antibiotic after 72 hours*

**SIQ 3:** *Inappropriate selection of antibiotic during initiation of therapy*

**SIQ 4:** *Unclear SOP in supplying antibiotic*

**SIQ 5:** *Pending culture and sensitivity result*





# HSJ Antibiotic Application



**CONTROLLED ANTIBIOTIC ORDER FORM**  
Pharmacy Department, Hospital Seberang Jaya  
This form must be COMPLETELY FILLED before sending for Pharmacy. Copy and PASTE OF ORDER FOR an individual form.

1. Name: [Redacted]  
2. Age: 40/10  
3. Ward/Bed No: 1/10  
4. Gender: M  
5. Weight: 60  
6. Height: 170  
7. Renal Impairment/Failure:  Yes, No  No  
8. Purpose of Antimicrobial Usage (Please V) Infection Treated: Streptococcus pneumoniae  
9. Infection Source:  Community Acquired,  Nosocomial  
10. Targeted Organism:  

Date Culture Sent	Source	Targeted Organism	Sensitivity	Resistance
24/1/2021	blood	ESBL <u>Streptococcus pneumoniae</u>	- Imipenem - meropenem - amikacin - ertapenem	- ampicillin - ampicillin-sulbactam - amoxicillin-clavulanate - cefotaxime - ceftriaxone - cefazidime - cefuroxime - imipenem - sulfamethoxazole - cefepime

  
11. Previous Antibiotics Used:  

Route / Drug / Dose / Frequency	Date started	Date stopped
IV Meropenem 63 mg TDS	24/1/2021	26/1/2021
IV Augmentin 200mg TDS	24/1/2021	26/1/2021

  
12. Antibiotic Requested:  
 Cefepime,  Meropenem,  Ciprofloxacin,  Ertapenem,  Piperacillin/Tazobactam,  Imipenem/Cilastatin,  Vancomycin  

Dose	Frequency	Date Start	Duration
96mg	QID	24/1/2021	

  
13. Signature & Stamp of Doctor in Charge (H/O or M/O): [Signature]  
14. Name of Specialist/ H.O./ Consultant who Ordered the Antibiotic: (verbal order by Mr Ken pardi surgeon, Hosp. Sultanah Bahiyah)  
15. Signature & Stamp of Specialist/ H.O./ Consultant: [Signature]



2:33  
Done 10.158.134.64

Hi Ann Lisa from Hospital Seberang Jaya,  
What do you want to do?

- Create Antibiotic Form
- Approve Antibiotic Form
- Review Antibiotic Form
- Find Antibiotic Form
- Manage Users
- Change Password
- Logout

# Antibiotic Form

Username:

This usually means your IC without '-', e.g. 881112075747

Password:

Show Password

Login

[Forgot your password? Click here.](#)

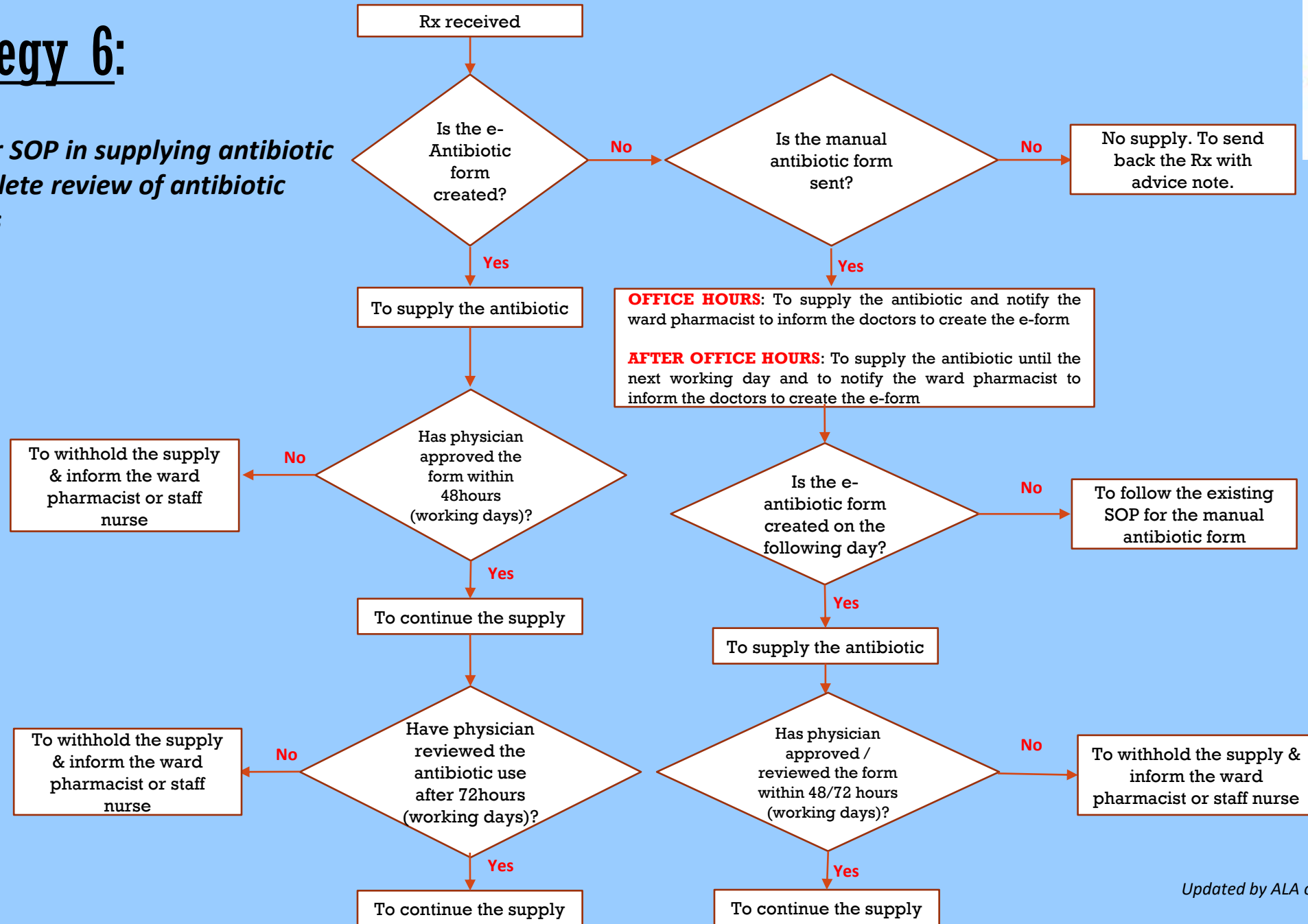
# E-Antibiotic Form: An Overview



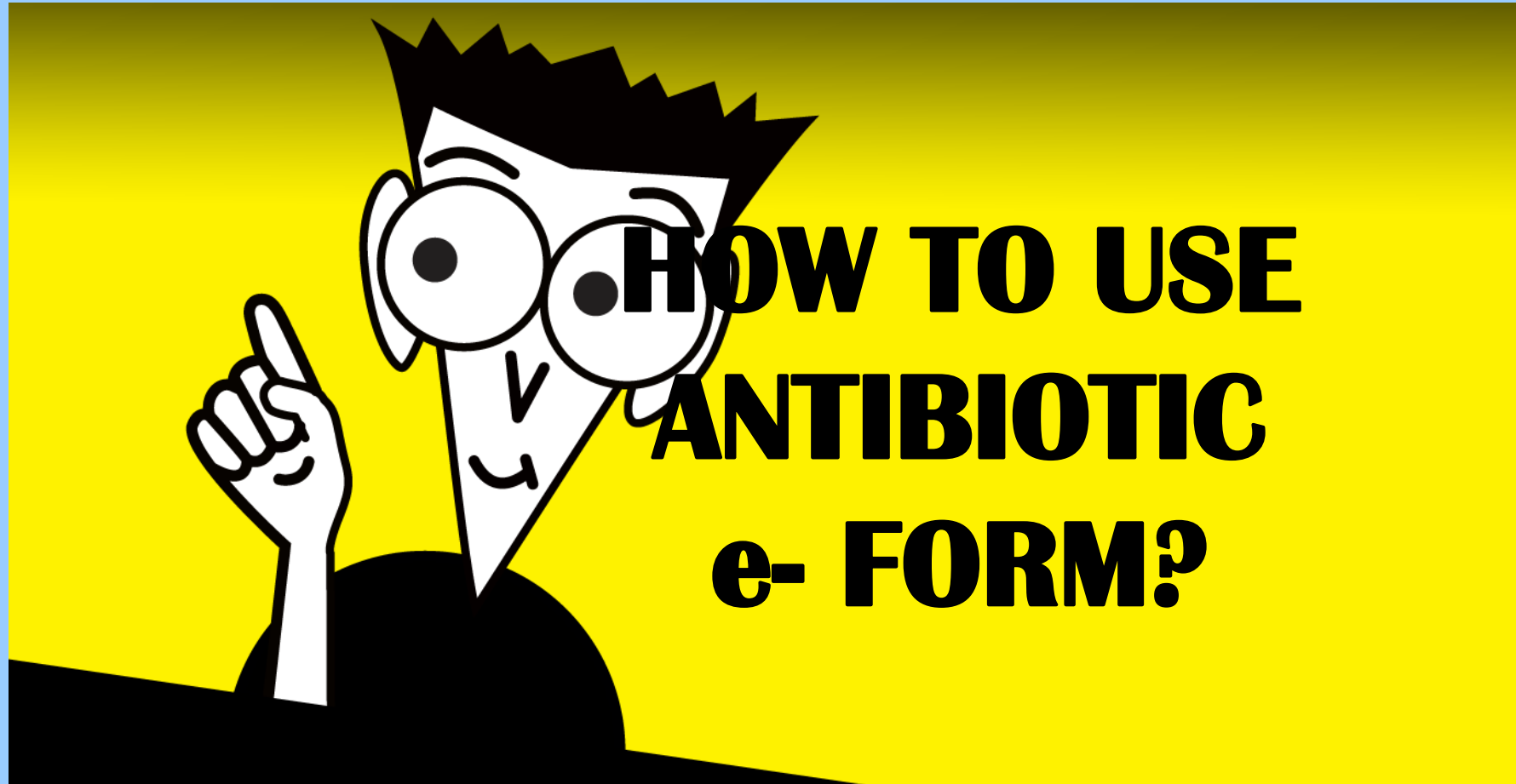
# FLOW CHART ON SUPPLY OF CONTROLLED ANTIBIOTICS IN HSJ

## Strategy 6:

**SIQ 4: Unclear SOP in supplying antibiotic**  
**SIQ 2: Incomplete review of antibiotic**  
**after 72 hours**



# Strategy 7: ANTIBIOTIC e- FORM MANUAL



**SIQ 4:** Unclear SOP in supplying antibiotic

**SIQ 5:** Pending culture and sensitivity result

**SIQ 2:** Incomplete review of antibiotic after 72 hours



# EFFECTS OF CHANGE

**AFTER REMEDIAL PHASE 3**



# CONFORMATION TO MOGC

Process	Criteria	Standard	Pre-remedial November 2019	Post 1 May 2020	Post 2 Dec 2020	Post 3 Dec 2021
Physician prescribes Antibiotic Order Form	Antibiotic selection based on HSJ Antimicrobial Guideline or ICU Guideline	100%	39%	70%	75%	↑ 99%
FBW screens the a/b form & supplies the a/b	Supply made after review with justification (as per the flow chart on supply of controlled antibiotics)	100%	51%	78%	86%	↑ 87%
Lab releases culture and sensitivity result	Trace results latest by 72 hours after antibiotic use	100%	64%	87%	94%	↑ 100%
Physician reviews antibiotic use after 72 hours	Review of antibiotic at 72 hours for empirical cases	100%	16%	59%	55%	↑ 100%
Physician selects appropriate a/b thereafter	For all empirical a/b cases, decision made based on the reported C&S result and septic parameters:- <ul style="list-style-type: none"> <li>*temperature</li> <li>*WBC</li> <li>*CRP</li> <li>*procalcitonin</li> <li>*inotropic</li> <li>*ventilator support</li> </ul> <div style="display: inline-block; vertical-align: middle; margin-left: 10px;"> <i>For the septic parameters, minimum 2 criteria need to be fulfilled</i> </div>	100%	12%	68%	65%	↑ 82%

# SUSTAINABILITY

**POST 4- JUNE 2022**



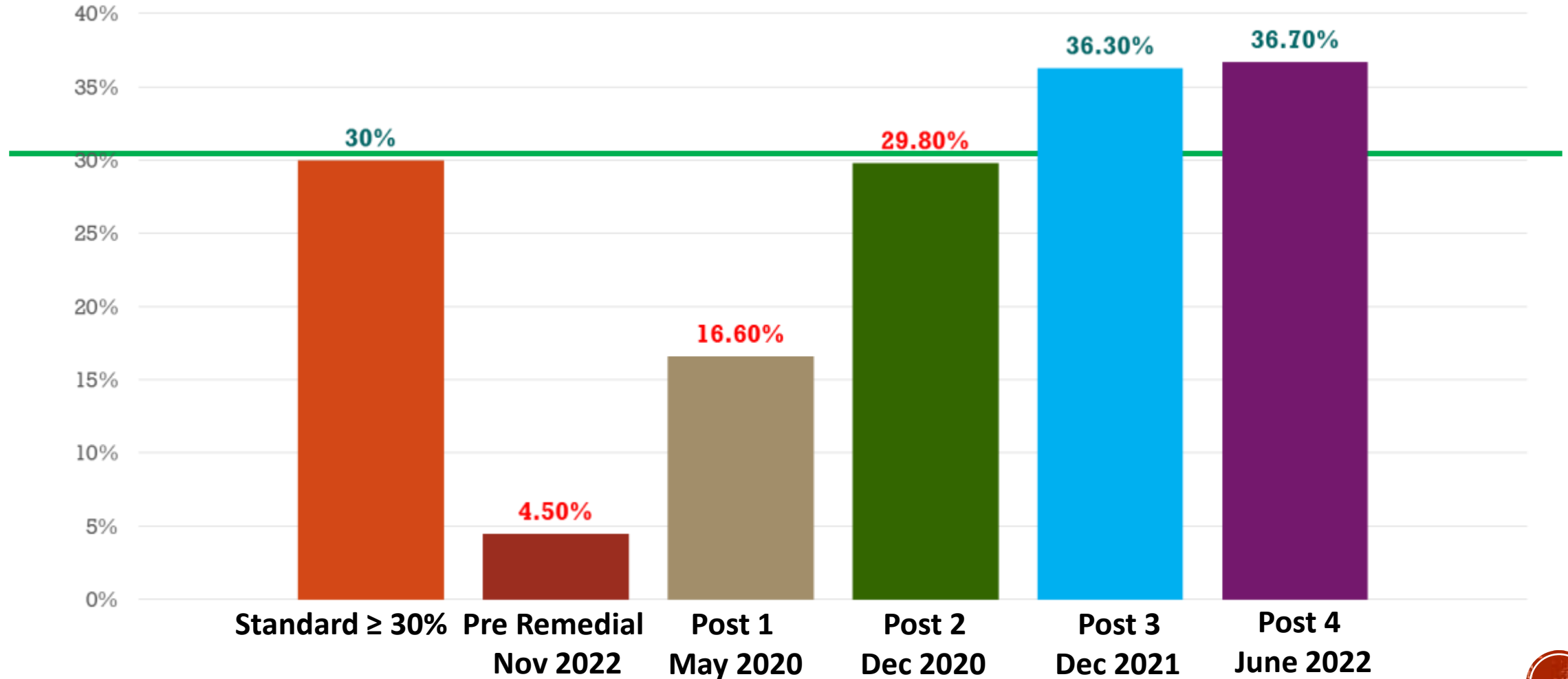
# CONFORMATION TO MOGC

Process	Criteria	Standard	Pre-remedial November 2019	Post 1 May 2020	Post 2 Dec 2020	Post 3 Dec 2021	Post 4 June 2022
Physician prescribes Antibiotic Order Form	Antibiotic selection based on HSJ Antimicrobial Guideline or ICU Guideline	100%	39%	70%	75%	99%	<b>99%</b>
FBW screens the a/b form & supplies the a/b	Supply made after review with justification (as per the flow chart on supply of controlled antibiotics)	100%	51%	78%	86%	87%	<b>↑ 90%</b>
Lab releases culture and sensitivity result	Trace results latest by 72 hours after antibiotic use	100%	64%	87%	94%	100%	<b>100%</b>
Physician reviews antibiotic use after 72 hours	Review of antibiotic at 72 hours for empirical cases	100%	16%	59%	55%	100%	<b>100%</b>
Physician selects appropriate a/b thereafter	For all empirical a/b cases, decision made based on the reported C&S result and septic parameters:- <ul style="list-style-type: none"> <li>*temperature</li> <li>*WBC</li> <li>*CRP</li> <li>*procalcitonin</li> <li>*inotropic</li> <li>*ventilator support</li> </ul>	100%	12%	68%	65%	82%	<b>↑ 87%</b>

*For the septic parameters, minimum 2 criteria need to be fulfilled*

# ACTUAL BENEFIT NOT ACHIEVED (ABNA)

Percentage reduction of DDD from the upper limit







Discussion with ID Specialists on HSJ Inpatient Empirical Antibiotic Guide.







CME on the use of HSJ Antibiotic Application to all the departments.





## Finalization of HSJ Antimicrobial Guideline Edition 1/2020



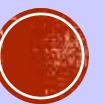
CME to the pharmacy staff on the Antibiotic Application







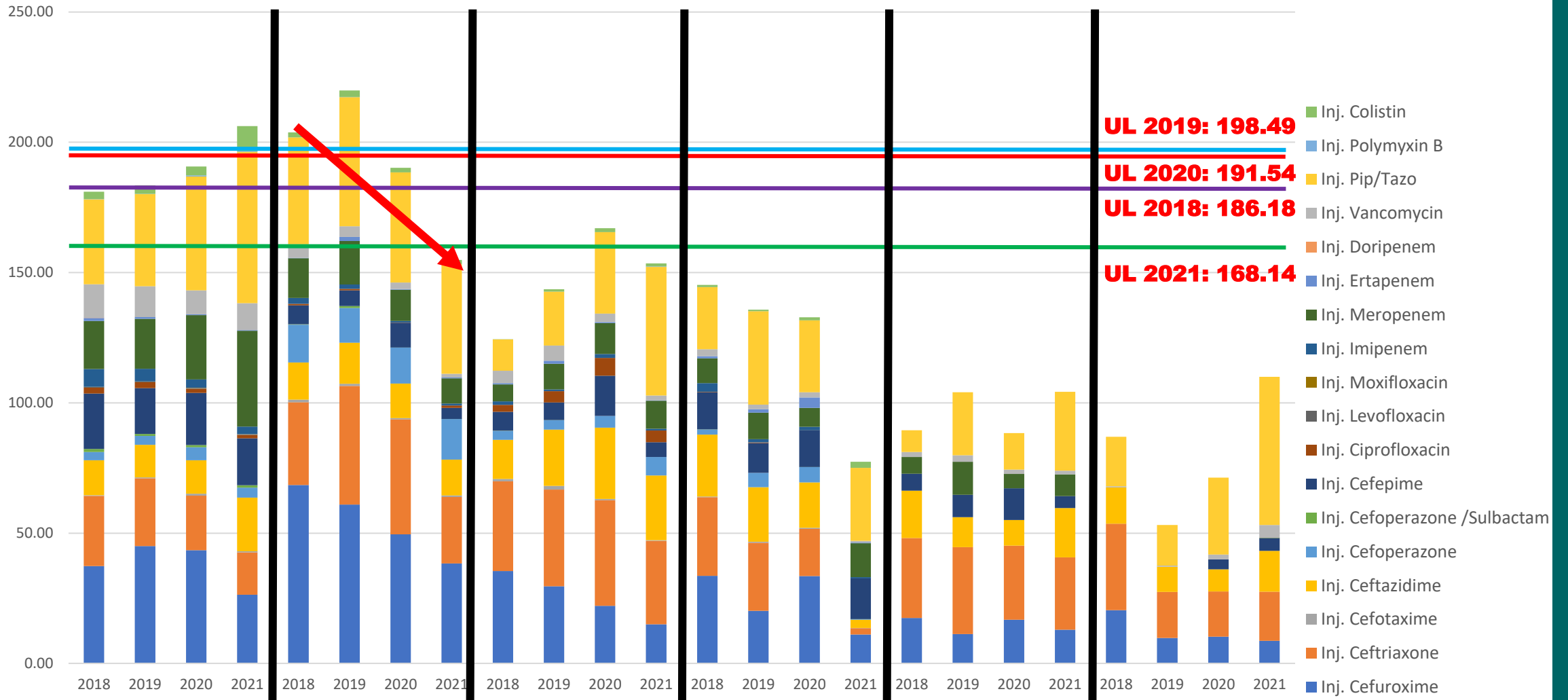
Launching of HSJ Antimicrobial Guideline Edition 1/2020 during Cluster Hospital Seberang Perai event in conjunction with World Antimicrobial Awareness Day.



# IMPACT OF CHANGE



# OVERALL USAGE (DDD) IN PENANG 2018 - 2021



**HPP**

**HSJ**

**HBM**

**HKB**

**HSB**

**HBP**



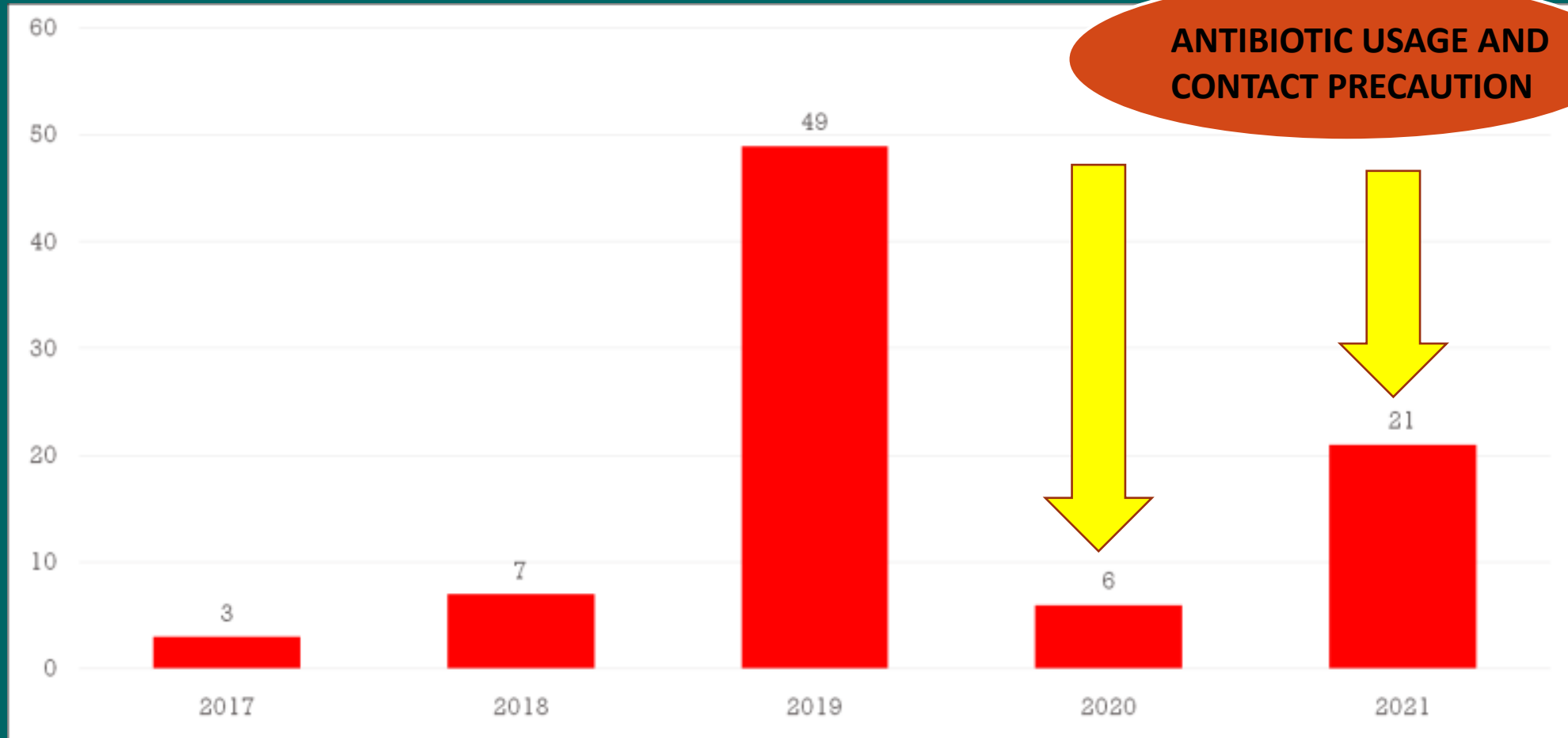
# EXPENDITURE COMPARISON



ANTIBIOTICS USAGE



# REPORTED CRE CASES IN HSJ



# ANTIBIOGRAM 2019

**Green color- Sensitive**  
**Orange- Intermediate**  
**Red- Resistant**

**Sensitive *E. coli***

Current Date Range

Month From: January 2019 Month Until: December 2019

Microbe Source Department Ward Alert Organism Options

Submit Export as CSV Export as PDF

Remove "Not Tested" Sort by Sensitive Sort by Sensitive + Intermediate



# ANTIBIOGRAM 2020

**Green color- Sensitive**  
**Orange- Intermediate**  
**Red- Resistant**

Sensitive *E. coli*

Current Date Range  
Month From: January 2020 Month Until: December 2020

Microbe Source Department Ward Alert Organism Options

Submit Export as CSV Export as PDF

Remove "Not Tested" Sort by Sensitive Sort by Sensitive + Intermediate

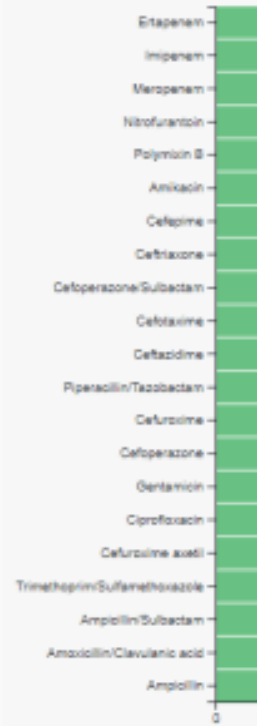


# ANTIBIOGRAM 2021

Sensitive *E. coli*

Green color- **Sensitive**  
 Orange- **Intermediate**  
 Red- **Resistant**

Remove "Not Tested"



Antibiotics	Sensitivity 2018 (%)	Sensitivity 2019 (%)	Sensitivity 2020 (%)	Sensitivity 2021 (%)
Augmentin	36	35.9	62.2 ↑	65.4 ↑
Unasyn	46	38.5	72.9 ↑	75.3 ↑
Ceftriaxone	55	56.8	98.2 ↑	95
Ceftazidime	56	75.7	97.2 ↑	94.1
Cefepime	57	67.3	97.7 ↑	96
Cefuroxime	50	42.3	94.9 ↑	91.1
Tazocin	60	75.2	94.9 ↑	93.1
Ertapenem	98	88.8	100 ↑	100
Imipenem	99	88.8	100 ↑	100
Meropenem	98	88.8	100 ↑	100



## SATISFACTORY SURVEY FORM IN USING ANTIBIOTIC e-FORM (n=135)

1) Does this antibiotic e-form **EASE** your daily work process?



83%



17%

2) Does this antibiotic e-form is **READILY ACCESSIBLE** to all HSJ staff?



84%



16%

3) Do you feel the Antibiotic e-Form is **USER FRIENDLY**?



89%



11%





# NEXT STEP

- **HBM adapted on our method in developing the customized facility antimicrobial guideline.** Once its developed, would further study on the implications towards DDD, resistance rate and cost savings.
- **Antibiotic Application (e-form) is being implemented in other cluster hospitals.** Currently being adapted by Mr Leow (hepatobiliary surgeon from HSB) and HBM. A proposal has been presented during recent HIACC meeting in HPP.
- **HSJ Antimicrobial Guideline has been used as the reference** for Point Prevalence Study (MOH).
- Dosage adjustment for antimicrobials (appendix in HSJ Antimicrobial Guideline) is being **adapted** for development of another guideline for renal dosing by HSJ.
- e-form is in the process of being **adapted** for other medications which requires local purchase (LP) form in order to monitor the usage. (E.g. Human Albumin, Injection Levetiracetam).



# CONCLUSION

- The DDD of controlled antibiotics in HSJ is determined and tabulated.
- The possible causes and contributory factors attributing to high DDD are ***incomplete review of a/b form, inappropriate selection of a/b upon initiation of therapy and post 72 hours, unclear SOP in supplying a/b and pending C&S result.***
- The formulated remedial actions are ***HSJ Inpatient Empirical Antibiotic Guide, Antimicrobial Formulary Restriction, HSJ Antimicrobial Guideline, HSJ Antibiotic Application, Persistency on Culture Updates, Flow Chart on Supply of Controlled Antibiotics in HSJ and Antibiotic e-form manual.***
- The effectiveness of the remedial measure is evaluated as below:-

**ABNA: *Achieved!***

**Cost Savings: *RM 165,878.50***

**Antibiogram: *Sensitivity improved tremendously & able to maintain***

**CRE cases: *From 49 (2019) reduced to 21 (2021).***



# GANTT CHART



Proposed



Actual

Task	Responsibility	05/19-06/19	07/19-10/19	11/19-12/19	01/20-05/20	06/20-10/20	11/20-03/21	04/21-12/21	01/22-02/22	03/22-06/22
Problem Identification	All members	Proposed Actual								
Briefing and Questionnaire Preparation	All members		Proposed Actual							
Data Collection and Analysis	All members			Proposed Actual						
Formulate Remedial Measures	All members			Proposed Actual	Proposed Actual					
Implementation of Remedial Measures	All members				Proposed Actual	Proposed Actual	Proposed Actual			
Re-evaluation	All members						Proposed Actual	Proposed Actual		Proposed Actual
Report Writing	All members								Proposed Actual	



# REFERENCES

- 1. World Health Organization, *Guidelines for the Prevention and Control of Carbapenem-Resistant Enterobacteriaceae, Acinetobacter baumannii and Pseudomonas aeruginosa in Health Care Facilities*, Geneva. 2017.
- 2. Fupin HU, Yan GUO, Demei ZHU. *Resistance Trends among Clinical Isolates in China reported from CHINET Surveillance of Bacterial Resistance 2005–2014*. Chin J Infect Chemother. 2017;17:93–9.
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- 5. Agodi A, Auxilia F, Barchitta M, et al. *Antibiotic Consumption And Resistance: Results of The SPIN-UTI Project of The Gisio-siti*. Epidemiol Prev. 2015;39:94–8.
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*Thank  
you*

