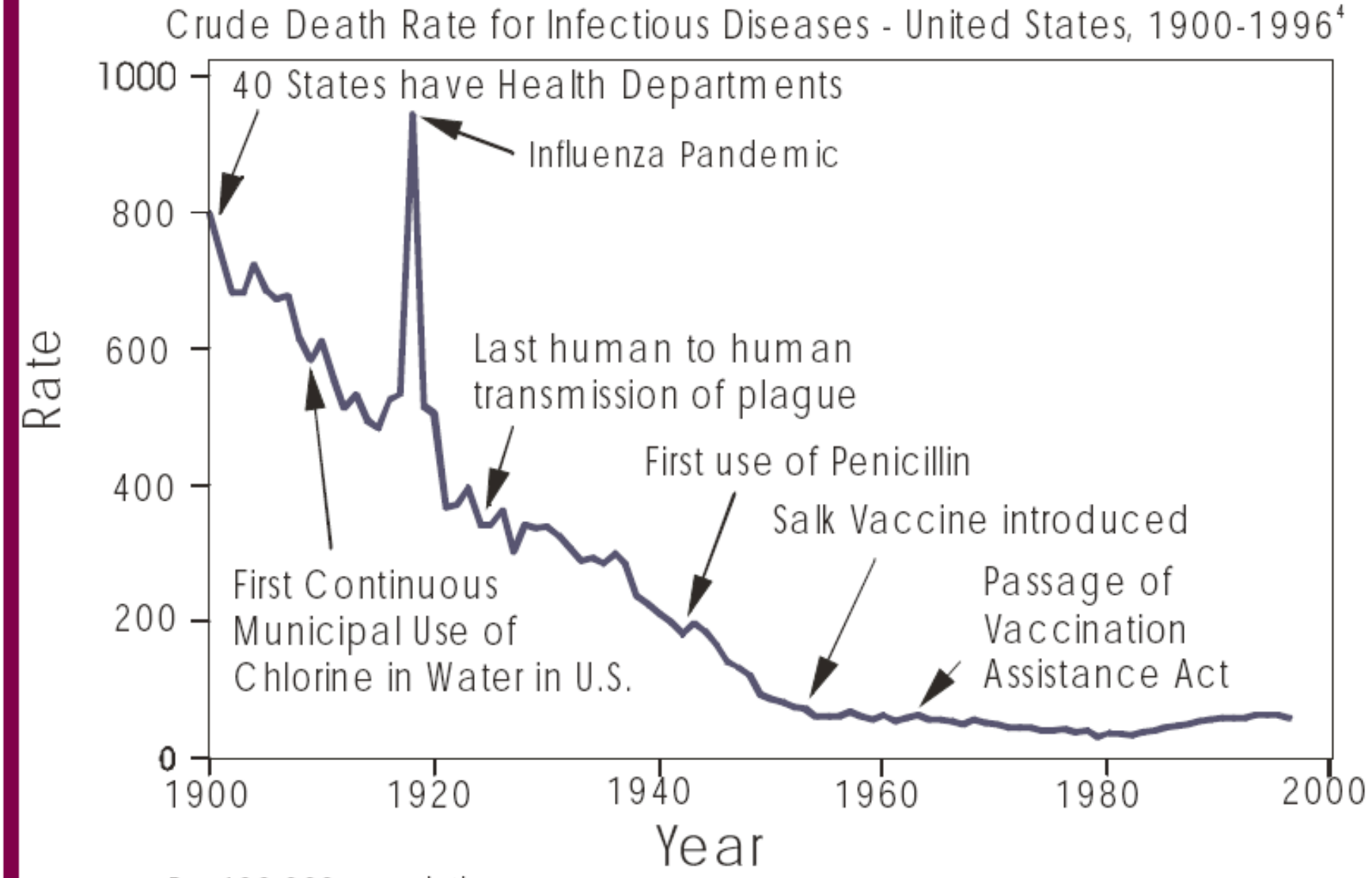
Multidisciplinary Antibiotic Stewardship Programme in the Department of Medicine & Geriatrics

Dr. Chan Kai Ming
Associate Consultant
Clinical Pathology
Tuen Mun Hospital

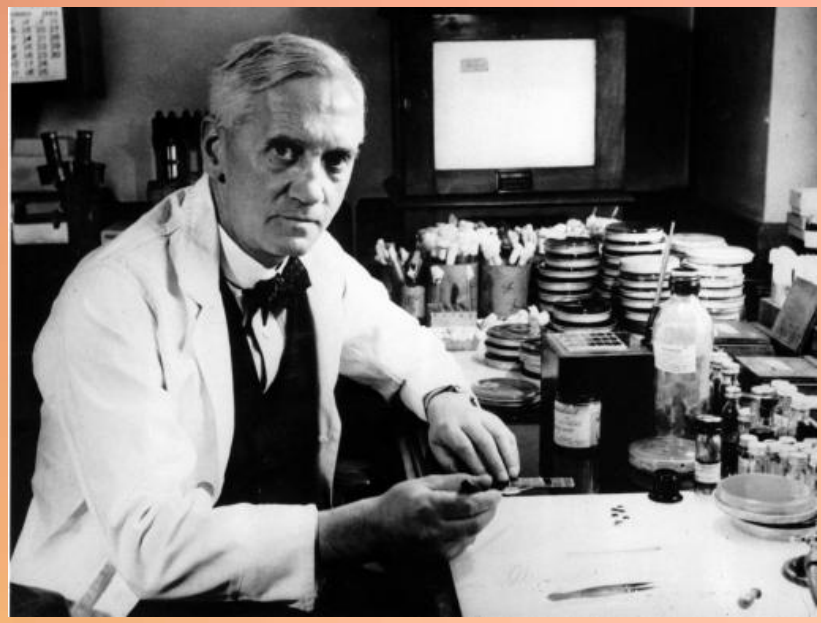


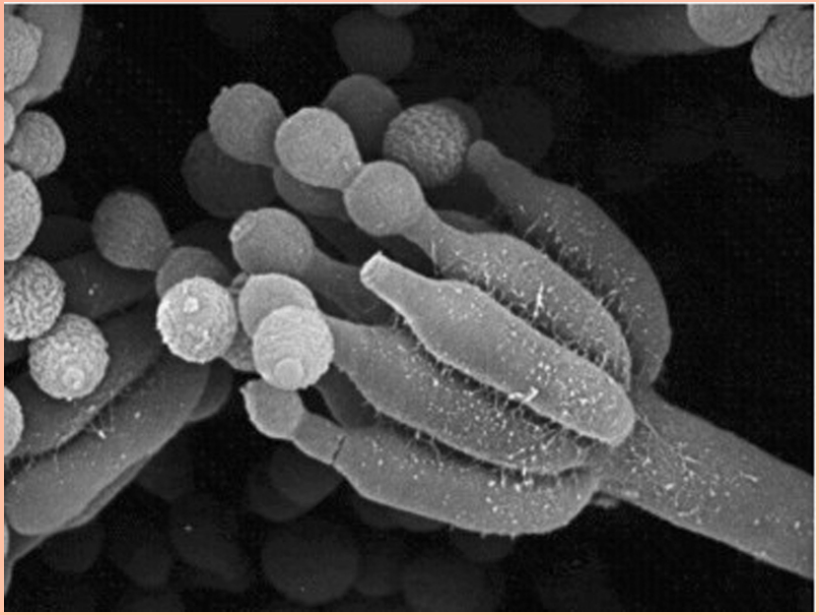
Per 100,000 population per year

Adapted from Armstrong GL, Conn LA, Pinner RW. Trends in infectious disease mortality in the United States during the 20th century. JAMA 1999:281;61-6.

American Water Works Association. Water chlorination principles and practices: AAWA manual M20. Denver, Colorado: America Water Works Association, 1973.

Alexander Fleming & Penicillium notatum





“One can think of the middle of the twentieth century as the end of one of the most important social revolutions in history, the virtual elimination of the infectious disease as a significant factor in social life”

Sir MacFarlane Burnett

(nearly 40 years ago)

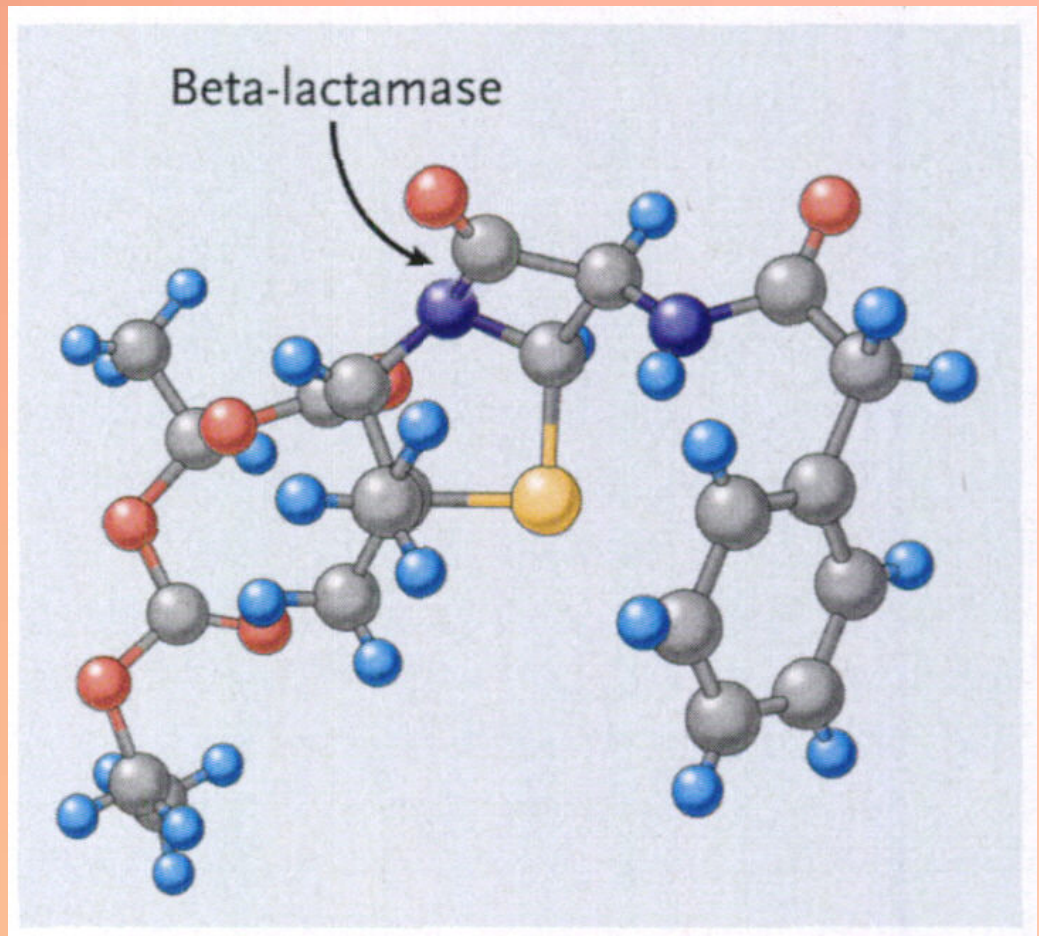

Beta-lactamase

Table 1: Estimated Cases of Hospital-Acquired Infections Caused by Selected Resistant Bacteria in the United States in 2002

Antibiotic-Resistant Bacteria	Estimated Cases
Methicillin/*S. aureus*	102,000
Methicillin/CNS	130,000
Vancomycin/enterococci	26,000
Ceftazidime/*P. aeruginosa*	12,000
Ampicillin/*E. coli*	65,000
Imipenem/*P. aeruginosa*	16,000
Ceftazidime/*K. pneumoniae*	11,000

Source: Centers for Disease Control and Prevention, Division of Healthcare Quality Promotion

These preliminary estimates were extrapolated by CDC staff from data collected from hospitals that participate in the National Nosocomial Infections Surveillance System. NNIS hospitals are disproportionately large, urban, and affiliated with medical schools and are more likely to have more seriously ill patients. As such, these estimates should be interpreted cautiously.
CNS=Coagulase-negative staphylococci

STRUBEN

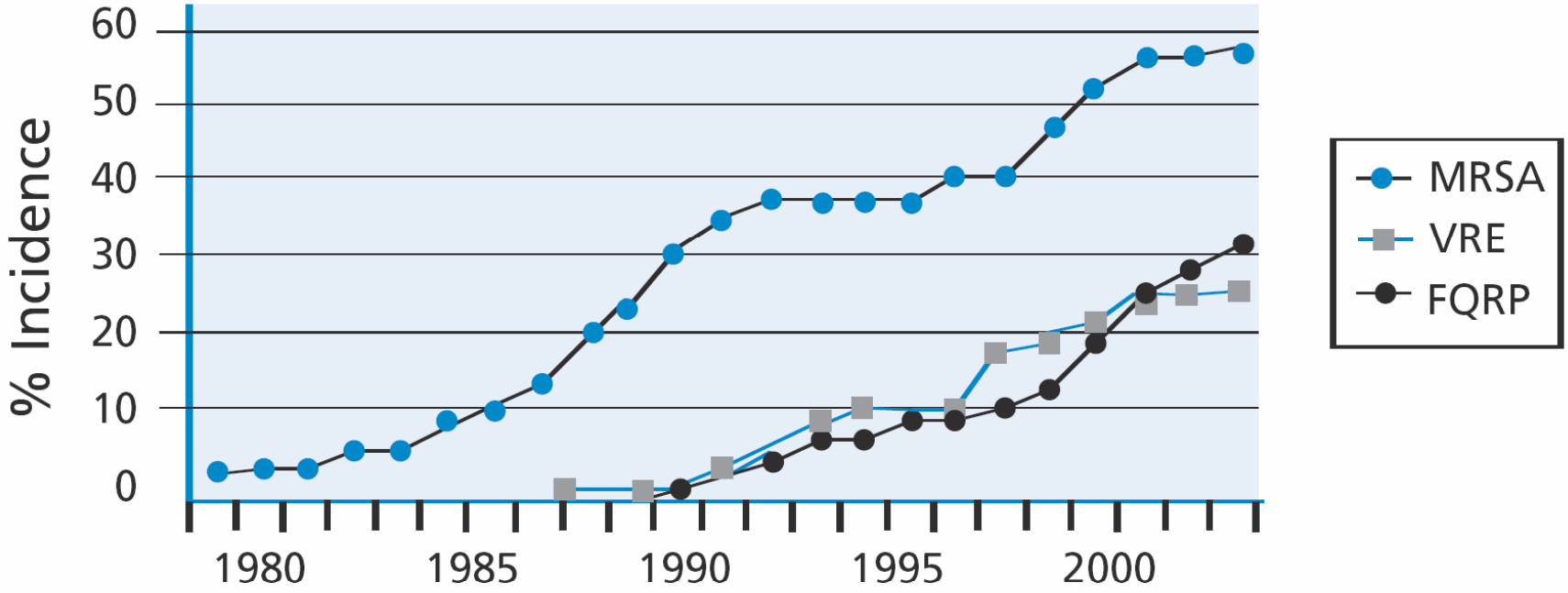
Table 2: History of Antibiotic Discovery and Approval

Year Introduced	Class of Drug
1935	Sulfonamides
1941	Penicillins
1945	Cephalosporins
1944	Aminoglycosides
1949	Chloramphenicol
1950	Tetracyclines
1952	Macrolides/ Lincosamides/ Streptogramins
1956	Glycopeptides
1957	Rifamycins
1959	Nitroimidiazoles
1962	Quinolones
1968	Trimethoprim
2000	Oxazolidinones
2003	Lipopeptides

Source: Food and Drug Administration (modified)

Presented by John H. Powers, MD, at April 15-16, 2004 "Antimicrobial Drug Development Workshop," co-sponsored by FDA, IDSA, and the International Society of Anti-Infective Pharmacology.

Chart 1: Resistant Strains Spread Rapidly



Source: Centers for Disease Control and Prevention

This chart shows the increase in rates of resistance for three bacteria that are of concern to public health officials: methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE), and fluoroquinolone-resistant *Pseudomonas aeruginosa* (FQRP). These data were collected from hospital intensive care units that participate in the National Nosocomial Infections Surveillance System, a component of the CDC.

Table 3: Percent of Drug Resistance in Hospital-Acquired Infections in 2002

Drug/Pathogen	Resistance (%)
Methicillin/*S. aureus*	57.1
Vancomycin/enterococci	27.5
Quinolone/*P. aeruginosa*	32.8
Methicillin/CNS	89.1
3rd-gen. Ceph./*E. coli*	6.3
3rd-gen. Ceph./*K. pneumoniae*	14.0
Imipenem/*P. aeruginosa*	22.3
3rd-gen. Ceph./*P. aeruginosa*	30.2
3rd-gen. Ceph./*Enterobacter spp.*	32.2
Penicillin/*S. pneumoniae*	11.3

Source: CDC National Nosocomial Infections Surveillance System, August 2003 for all, except penicillin resistant *Streptococcus pneumoniae*, which is the Active Bacterial Core Surveillance of the Emerging Infections Network.

This table provides a snapshot of selected drug-resistant pathogens associated with hospital infections in intensive care unit patients during 2002. CNS=Coagulase-negative staphylococci; 3rd Ceph=resistance to 3rd generation cephalosporins (either ceftriaxone, cefotaxime, or ceftazidime); Quinolone=resistance to either ciprofloxacin or ofloxacin.

A 46-year-old Maryland man received a transplant and was sent to the intensive care unit. His blood cultures grew *Acinetobacter* that was resistant to all antibiotics except colistin, a drug rarely used because it is very toxic. He died.

April 2004.

香港發現首宗社區抗藥惡菌死亡病例

資料來源： 中央社

張貼時間： **01/06 11:33**

（中央社記者
逐漸在香港社
健康市民感染
炎後迅速死亡
家高度關注。
署轄下的衛生
亡的三十七歲
年內也未曾入

濫用抗生素,人體發現抗藥惡菌

【大紀元5月19日訊】

家醫學院科學家邁克爾米勒說，有
人體內有能抵抗主流抗生素的細
英國超過1／10的儿童體內有能抵
种抗生素的"超級惡菌"，而成人中
的比例可能更高。

抗藥惡菌襲公立醫院

4月 6日 星期二 03:00

【東方日報專訊】抗藥性細菌肆虐公立醫院的情況愈來愈嚴重，其中復康醫院靈實醫院近日便出現病人集體感染抗藥性細菌。其中一個約四十人的病房，四分三病人感染抗藥性金黃葡萄球細菌呈廣譜霉抗藥反應，另有一名年老染幾乎無藥可醫的抗藥性綠膿桿菌，此

抗藥惡菌恐擴散全港 (明報)

11月 17日 星期五 05:05AM 【明報專訊】可致命的超級惡菌「社區性抗藥性金黃葡萄球菌（CA-MRSA）」恐已廣佈全港，衛生署繼上月接獲最少3宗有關呈報後，本月首2周再接獲4宗分佈於元朗、葵涌、將軍澳及大嶼山的個案，2男 廣 告_ 2女患者同屬22至40歲年輕一族，全部均是長出膿瘡需往醫院放膿，始發現身染惡菌。衛生署正積極研究將CA-MRSA列作法定傳染病，以及實施所須的具體措施。

再錄4宗 今年

署今年最新錄
宗，較去年全年的7宗增加近1.6倍，但有關個案數目1

抗藥惡菌襲社區４人中招

(2006-11-17 06:05:00)【東方日報專訊】㗎生防護中心本月首兩周接獲四宗社區感染抗藥性金黃葡萄球菌個案，令本港自去年中至今，接獲的同類個案增至廿五宗。四名患者包括一名懲㓥署人員 廣 告、兩名侍應和一名管理員，都是壯健的年輕人，近期沒有到過醫院或老人院等有機會出現抗藥性細菌的場所，相信在社區感染。他們經抗生素治療後康復，同住家人均沒有出現病徵。

㗎生防護中心最新一期《傳染病直擊》公布的四宗社區感染抗藥性金黃葡萄球菌個案，患者分別兩男兩女，廿

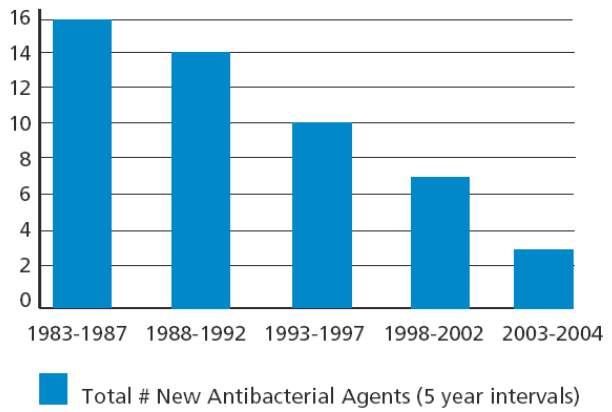
Only about five new antibiotics are in the drug pipeline, out of more than 506 agents in development.

Table 4: New Antibacterial Agents Approved Since 1998

Antibacterial	Year	Novel
rifapentine	1998	No
quinupristin/dalfopristin	1999	No
moxifloxacin	1999	No
gatifloxacin	1999	No
linezolid	2000	Yes
cefditoren pivoxil	2001	No
ertapenem	2001	No
gemifloxacin	2003	No
daptomycin	2003	Yes
telithromycin	2004	No

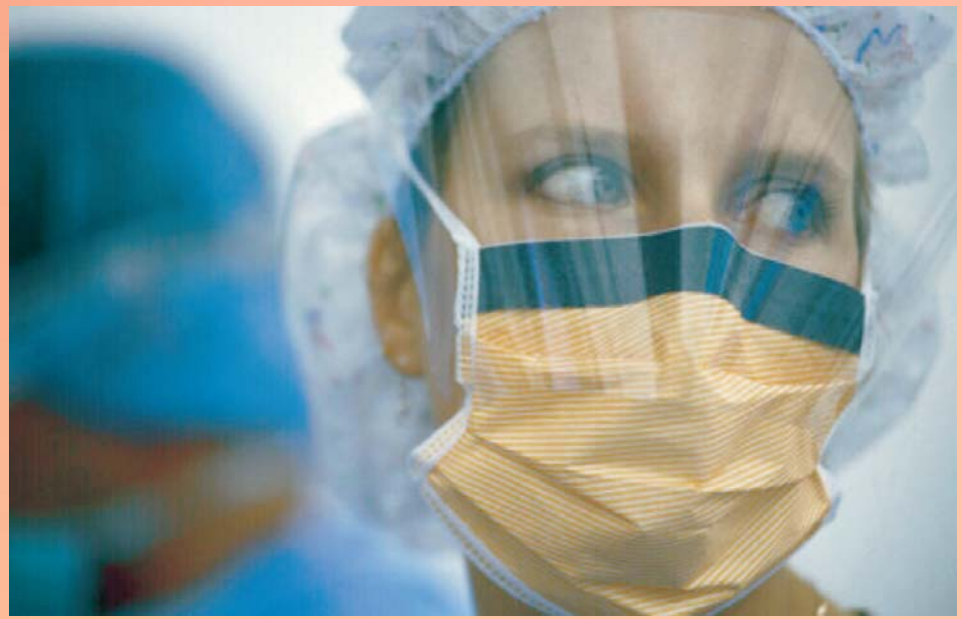
Source: Spellberg et al., *Clinical Infectious Diseases*, May 1, 2004 (modified)

Chart 2: Antibacterial Agents Approved, 1983-2004

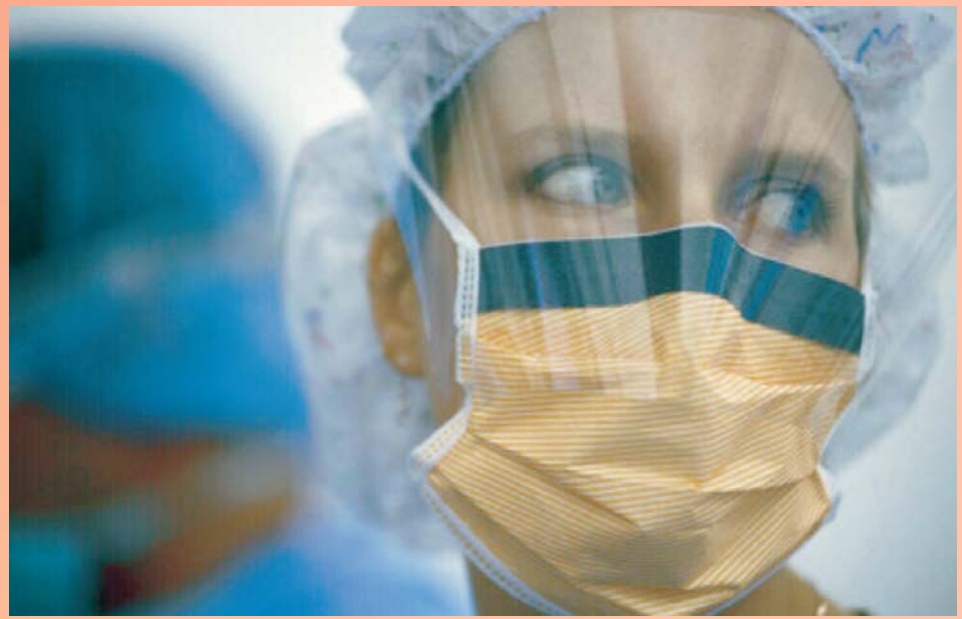


Source: Spellberg et al., *Clinical Infectious Diseases*, May 1, 2004 (modified)

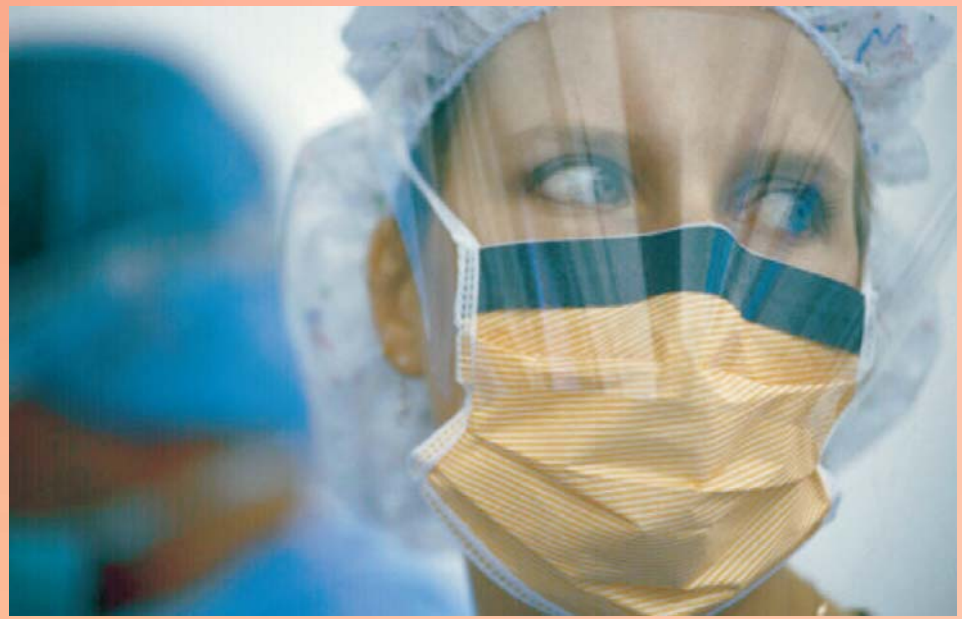
Antibiotics work so fast and so well, they produce weak returns on investment for manufacturer.

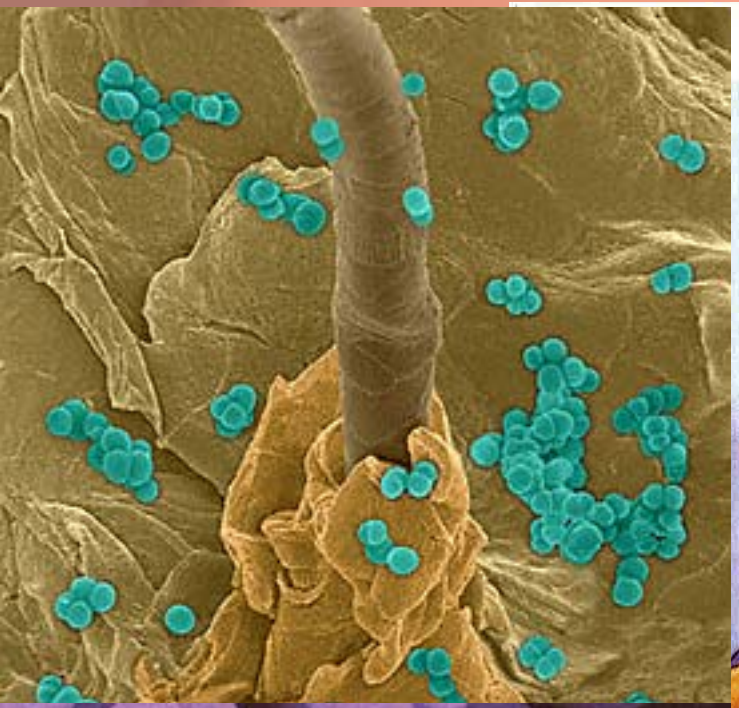


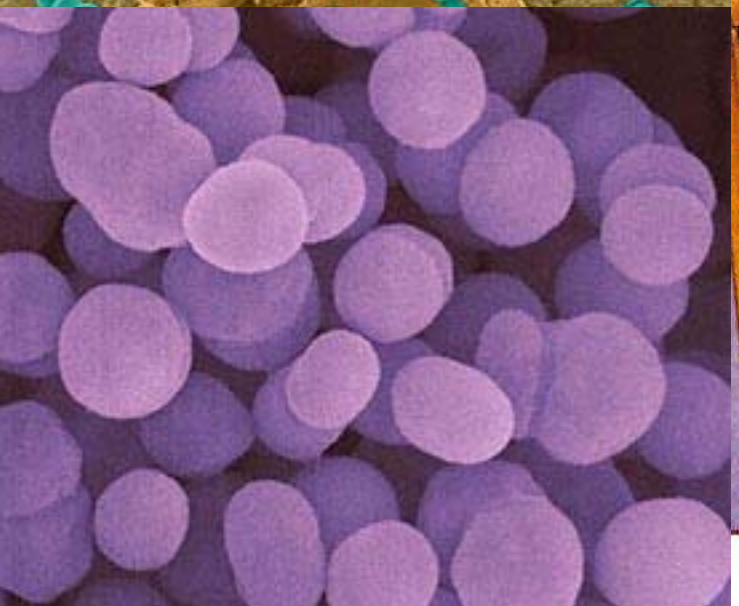
In 2002 out of 89 new drugs, no new antibiotics were approved.

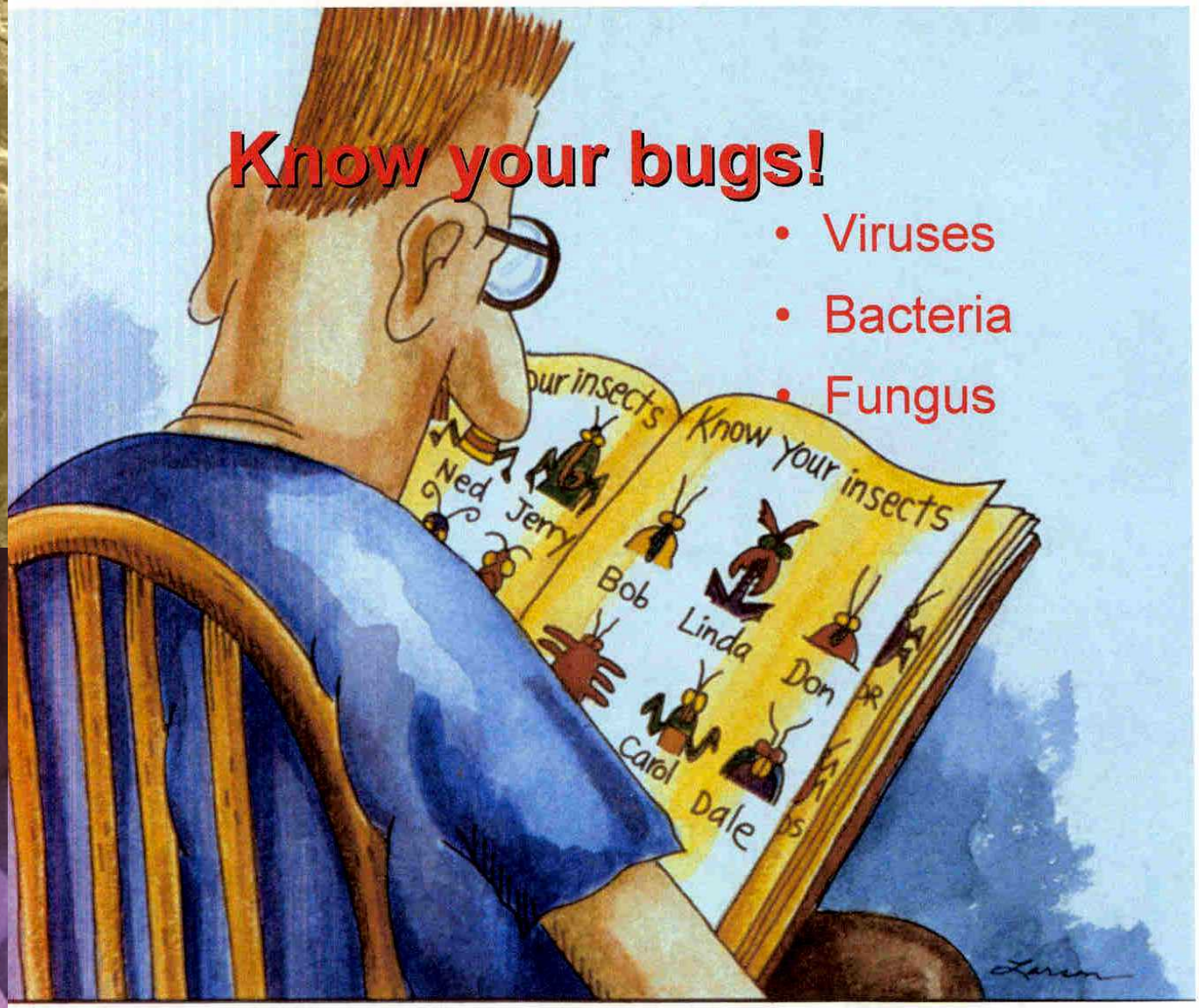


Bad Bugs! No Drugs!








Know your bugs!
• Viruses
• Bacteria
• Fungus
Know your insects
Ned
Jerry
Bob
Linda
Don
Carol
Dale

MISSION: IMPOSSIBLE!

Think before you act.
Use the right equipment.

NAA SAFETY 1

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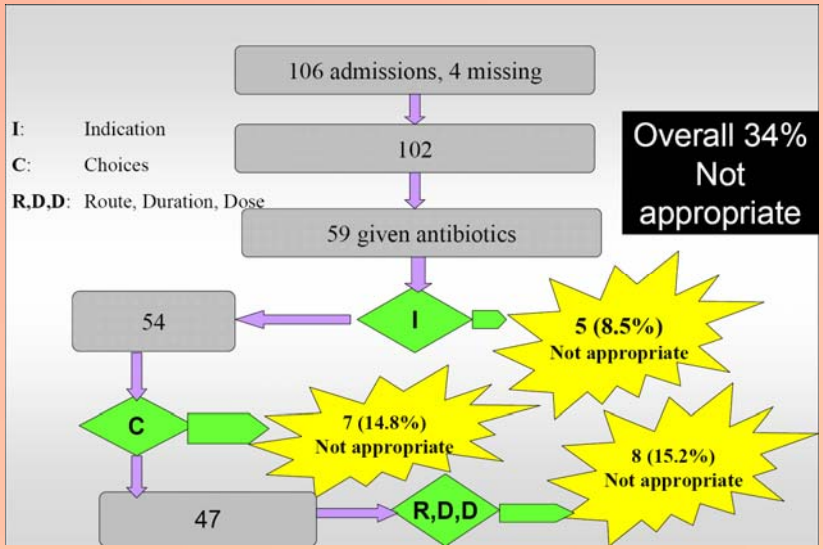
Multidisciplinary Antibiotic Stewardship Programme in the Department of Medicine & Geriatrics

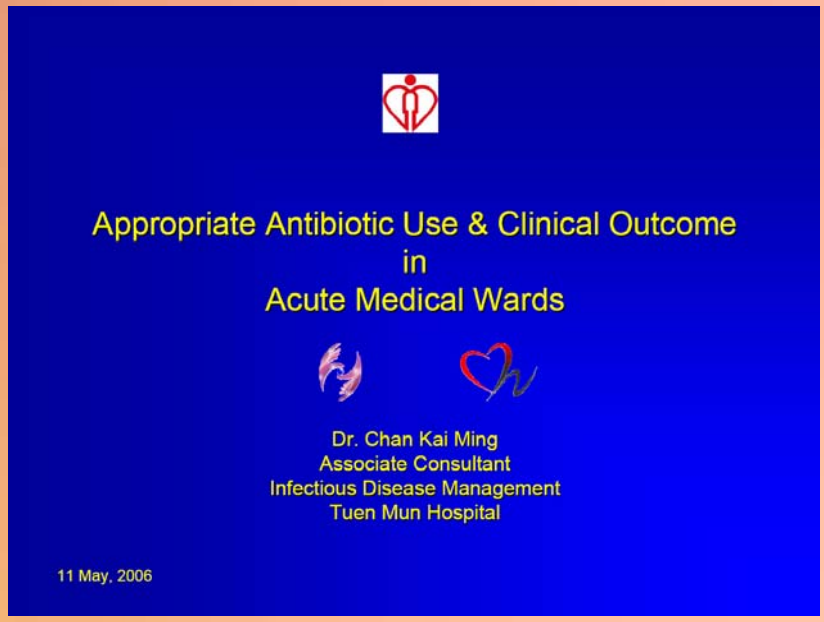
2005 HA Convention Presentation

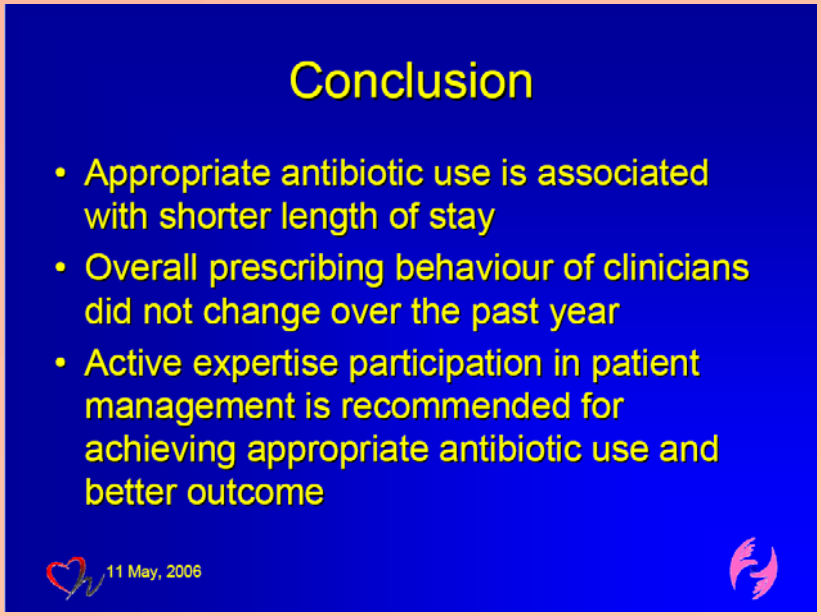
Clinical Audit of the Use of Antibiotics in Acute Medical Wards

Dr. Chan Kai Ming
MBBS (HK), MRCP (UK), FHKAM (Medicine),
FHKCP, DipID (HKU), DTM&H (Lond)
Specialist Infectious Disease
Microbiology / Infectious Disease Team
Department of Pathology / Department of Medicine & Geriatrics
Tuen Mun Hospital

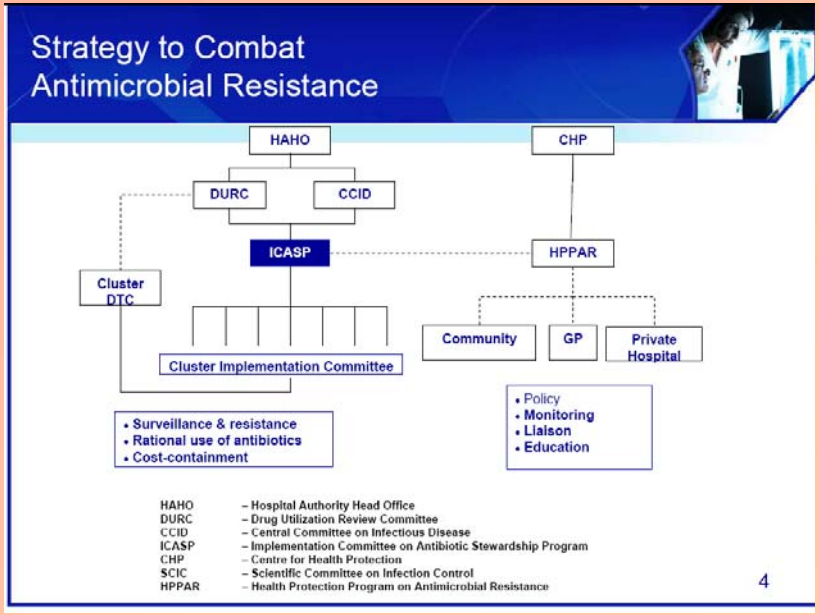


2006 HA Convention Presentation





2007 HA Convention Presentation



Multidisciplinary Approach
MID Team

- Microbiologist
- Infectious Disease Physicians
- Pharmacist with special interest in Infectious Disease
- Infection Control Nurses
- Parent Team and ward caring nurses

Defined Daily Doses of Broad Spectrum Antibiotics / Bedday (2001-2004)

Broad Spectrum Antibiotics

Cefepime

Ceftazidime

Meropenem

Sulperazon

Tazocin

Teicoplanin

Tienam

Vancomycin

IV Ciprofloxacin

IV Levofloxacin

Step by Step

- Phase I
  - Introduction of Antibiotic Order Form
- Phase II
  - Pilot study to examine the clinical outcome and financial impact of the implementation of multidisciplinary antibiotic stewardship programme.
- Phase III
  - Full implementation of antibiotic stewardship programme to ALL medical wards

Antibiotic Order Form (AOF)

Dec 2004 to Now

(Tienam, Meropenem, Vancomycin, Teicoplanin ONLY

Affix GUM Label Here Patient Name: Ward: Specialty: HN:		MO's Signature:_____ MO's Name/Code:_____(_____)	
Date Started: Suspected Infection: ☐ Empirical ☐ Prophylaxis ☐ Culture-based	Culture Taken: Yes/No Site:	Organism (if known)	Sensitivity (if known)

☐ **Tienam/☐ Meropenem**	Dose	Frequency	Route	Intended Duration

☐ **Infections attributed to ESBL-producing bacteria**

☐ **Empirical treatment of neutropenic fever in high risk patients**

☐ **Documented infection with bacteria strains ONLY sensitive to Tienam/ Meropenem**

☐ **LIFE-THREATENING infections (e.g. patients with septic shock)**

Pilot Study

April 2005

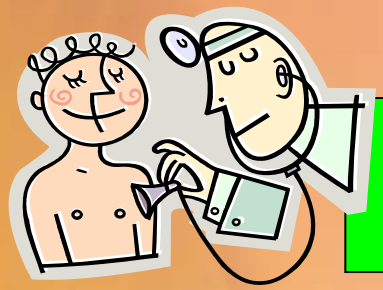
Generate Antibiotics Patient List

Intervention Wards

Control Wards

Gather Patient Data

No Assessment and Intervention



Case Assessment and Recommendations

Follow up

Pilot Study

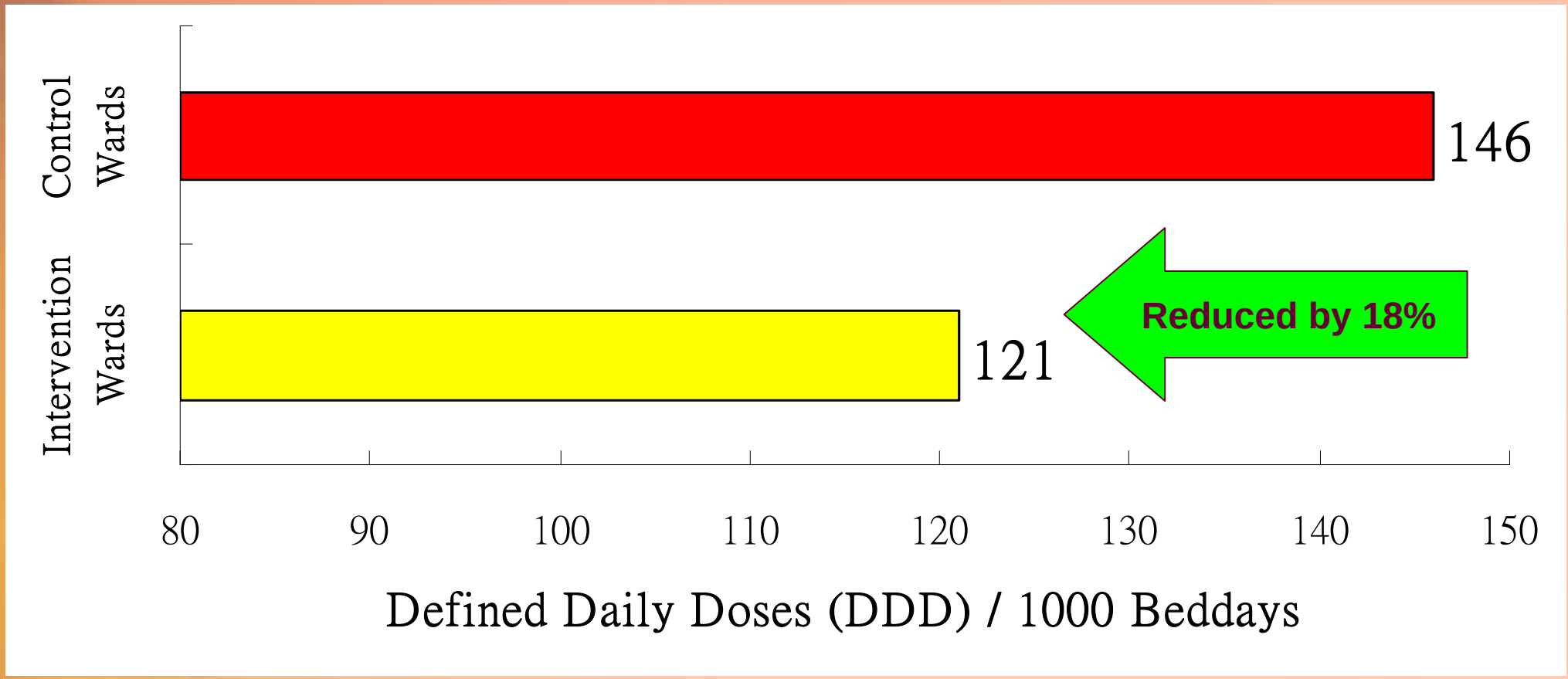
April 2005

	Intervention Group	***Control Group***
Mortality	**41.99/1000 Patients**	**37.44/1000 Patients**
Length of Stay	**3.18 days**	**3.34 days**
	P = 0.591	
Wards Involved	2 male acute medical wards 2 female acute medical wards	1 male acute medical ward 1 female acute medical ward
AOF	Strict control	Loose control
Level of feedbacks	Assess the appropriateness of use of **12** targeted abx: - (Cefepime, Cefotaxime, Ceftazidime, Ceftriaxone, IV Ciprofloxacin & Levofloxacin, Meropenem, Sulperazon, Tazocin, Teicoplanin, Tienam, Vancomycin) **Prompt feedbacks** on antibiotic use were given within two days after prescribed.	Clinicians were given full autonomy on the use of all antibiotics.

Pilot Study

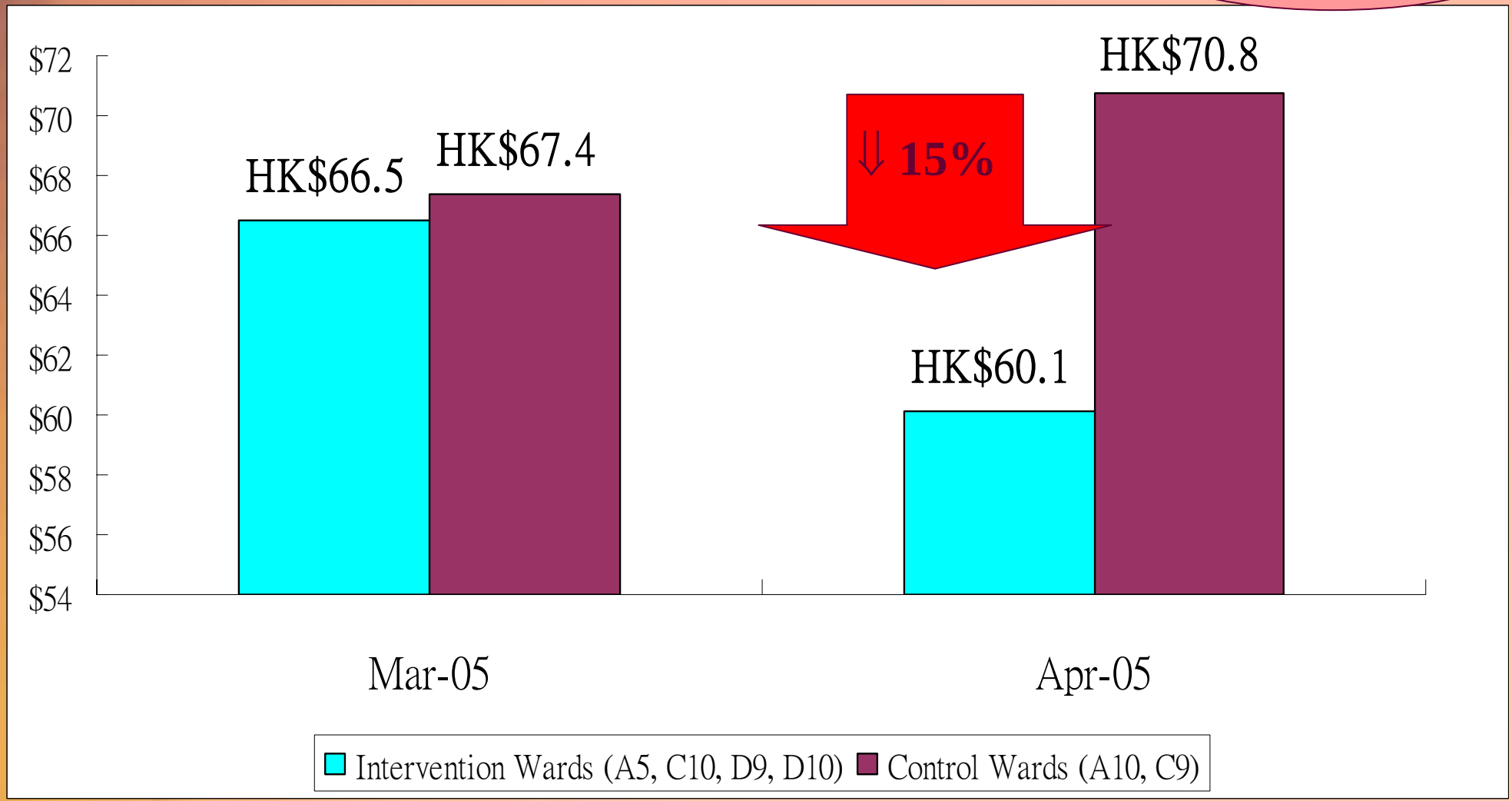
April 2005

- **Rate of Suboptimal Antibiotic Use = 29%**
- **Compliance Rate to Intervention = 85%**



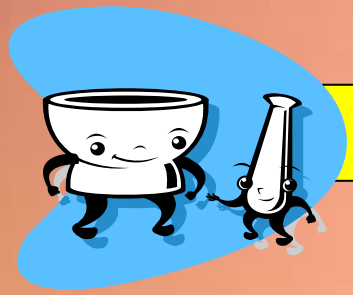
Pilot Study -Total Antibacterial Expenditure / Bedday

April 2005



Full Implementation

Nov 05 - Now



Generate Patient List

Gather Patient Data

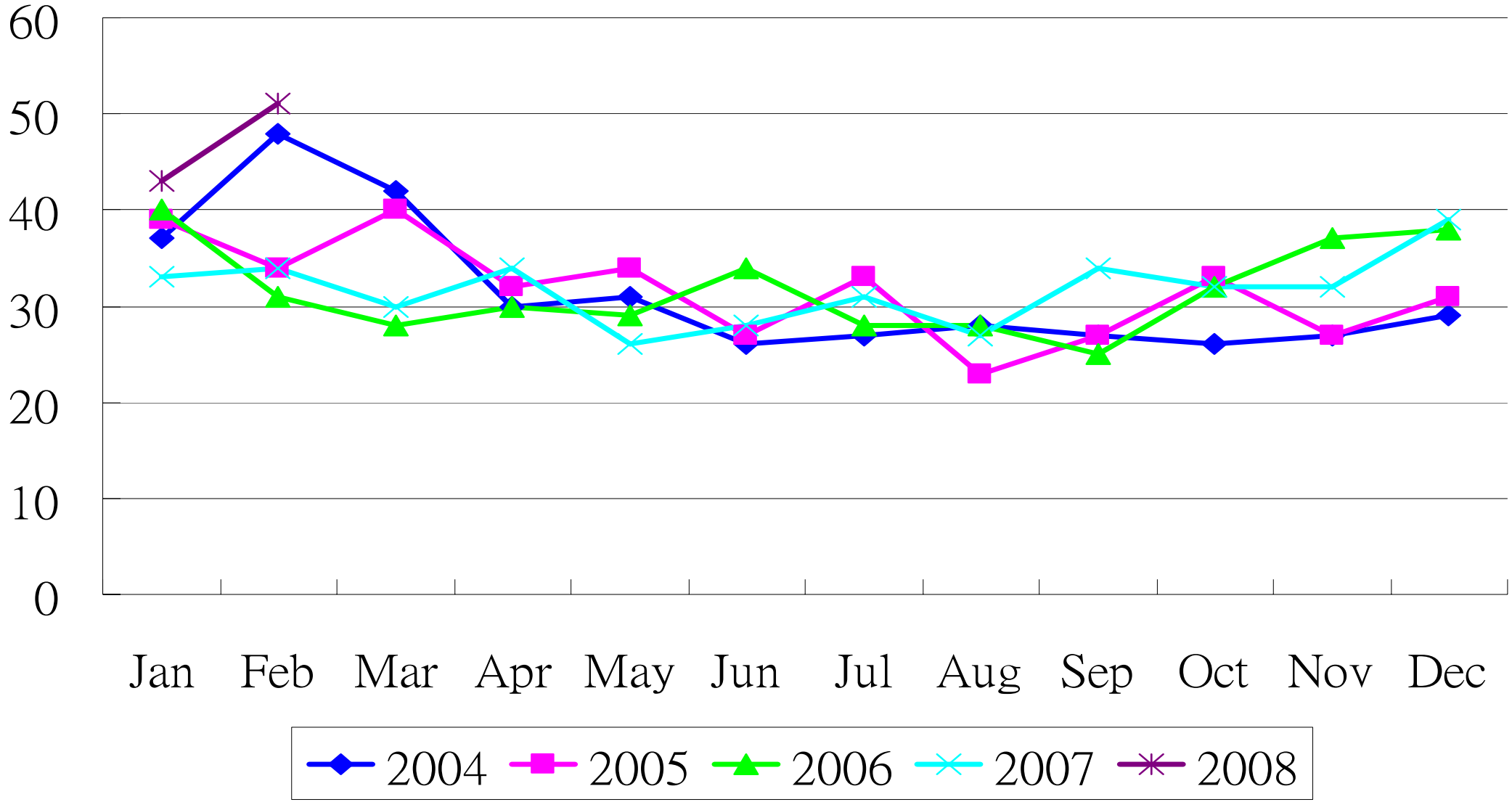
Case Assessment and Recommendations

Follow up

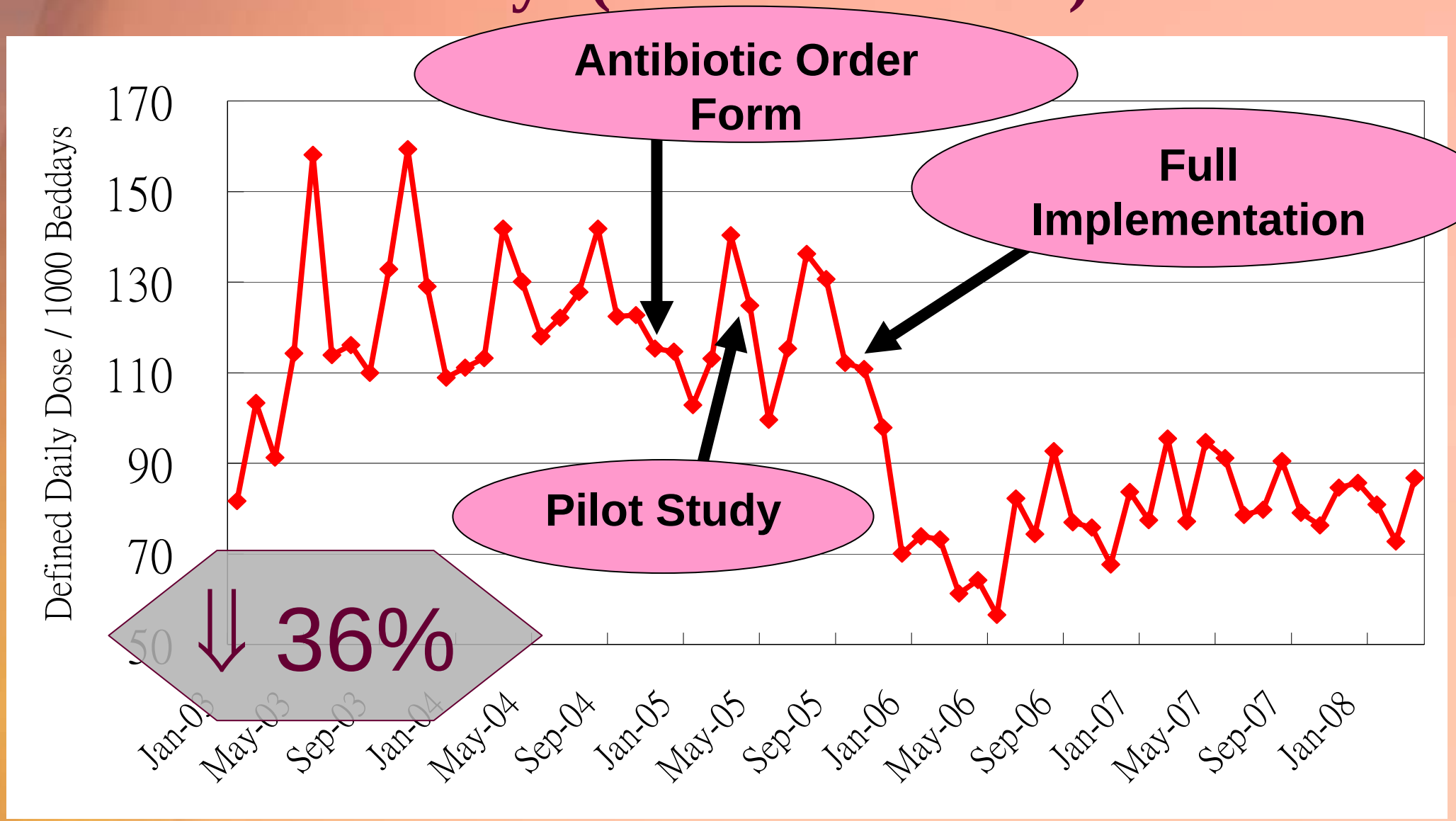
Full Implementation

- **Rate of Suboptimal Antibiotic Use = 17%**
- **Compliance Rate to Intervention = 85%**

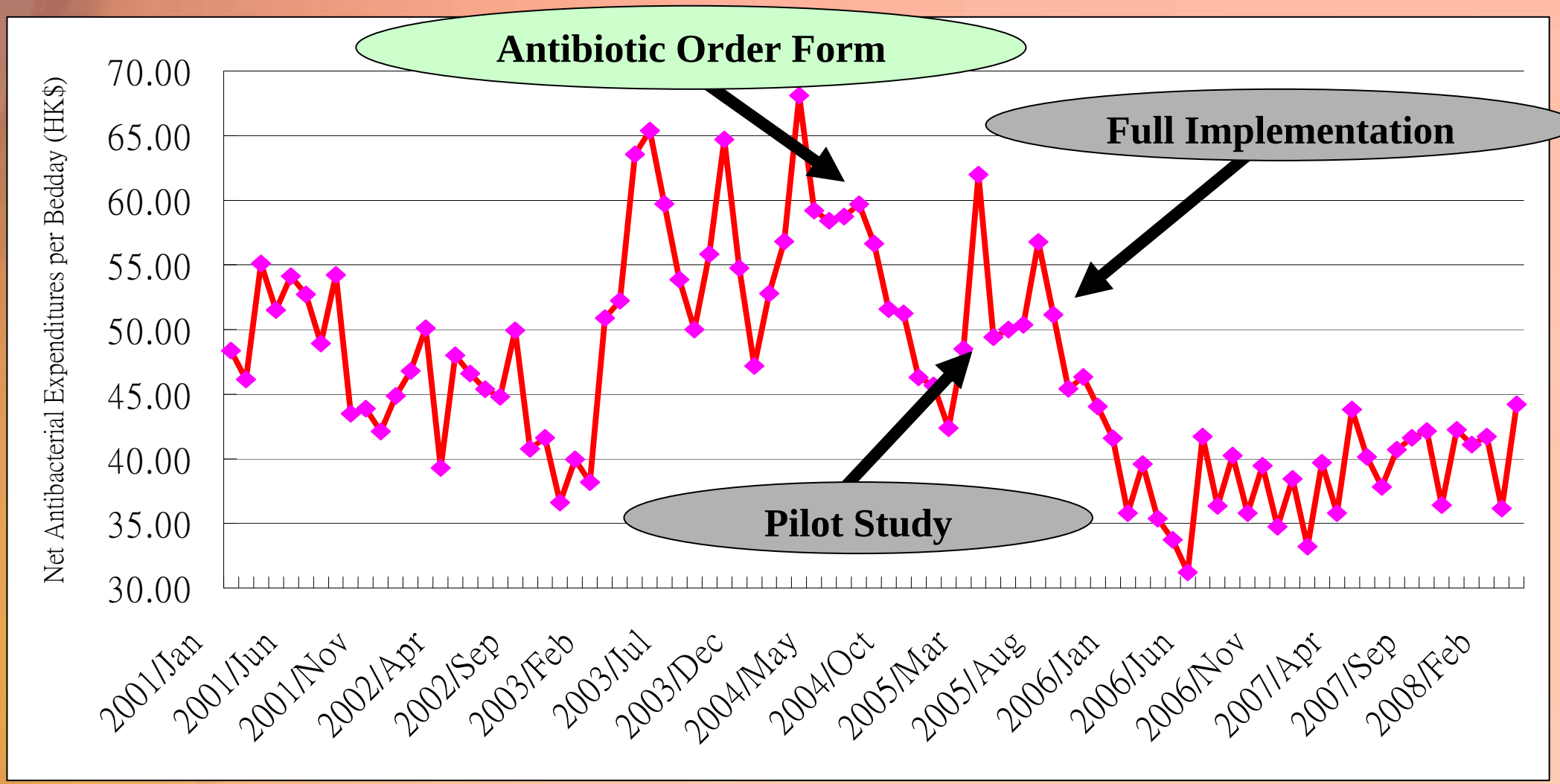
Mortality Rate (per 1000)



DDD of Broad Spectrum Antibiotics/ 1000 Beddays (2001- Mar 2008)

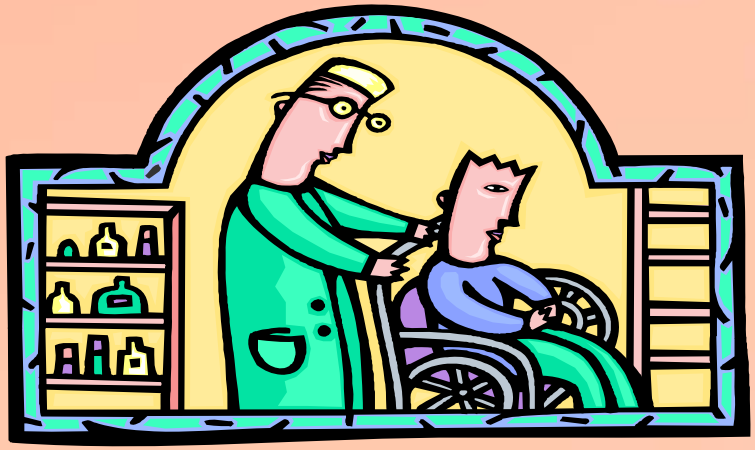


Total Antibacterial Expenditure per Bedday (2001 to Mar 2008)



Intangible Benefits

- Contain antibiotics resistance
- Improve quality of patient care
- Promote optimal antibiotic use



Tangible Benefits

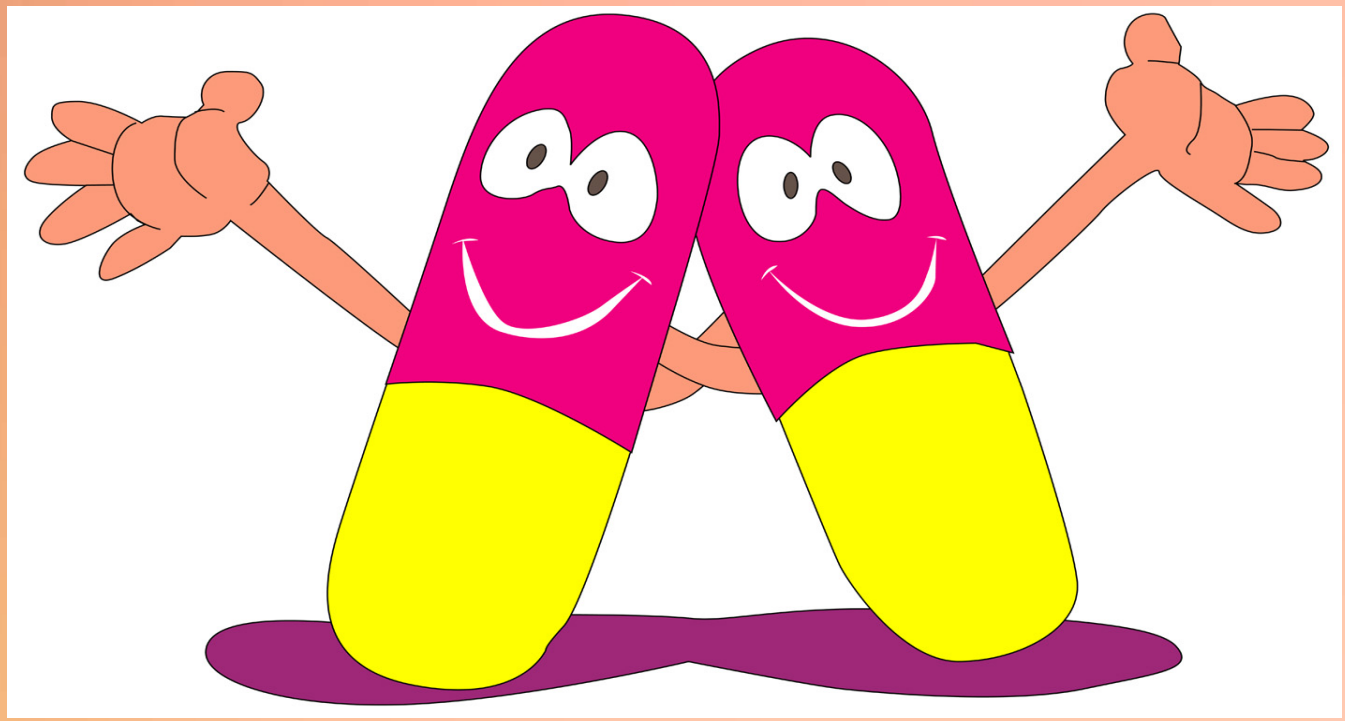
- Reduce Consumption of Targeted Antibiotics
- Reduction of Total Antibacterial Expenditure

  Cumulative Savings over

  3 years & 4 months

  = **~HK$7.8 millions**

合理使用抗生素
病人安全照顧到



Thank You Very Much

Antibiotic Order Form Reminder

Antibiotic Stewardship Programme

Please FAX the COMPLETED ANTIBIOTIC ORDER FORM & MAR to pharmacy for continuing supply of targeted antibiotics

Dear Case MO **c/o nurse i/c of _____ ward** Date:_____

According to the policy set by Antibiotic Stewardship Program, without the receipt of a completed Antibiotic Order Form, only **ONE day supply** is made for the patient

(Name:_____; HN:_____) because

- □ the Order Form is Missing
- □ Other reason: _____

□ Cefepime	□ Ceftazidime	□ IV Ciprofloxacin	□ IV Levofloxacin	□ Meropenem
□ Sulperazon	□ Tazocin	□ Teicoplanin	□ Tienam	□ Vancomycin

Dr. TL Que

Consultant Microbiologist, Chairman of Antibiotic Stewardship Team

Savings Calculations

*** First Year Reduction of Total Antibacterial Expenditure**

= [Total Antibacterial Expenditure (Nov 04-Oct 05) / Total Bedday (Nov 04–Oct 05) –

Total Antibacterial Expenditure (Nov 03-Oct 04) / Total Bedday (Nov 03–Oct 04)] X Total Bedday (Nov 04-Oct 05)

 # Second Year Reduction of Total Antibacterial Expenditure

= [Total Antibacterial Expenditure (Nov 05-Oct 06) / Total Bedday (Nov 05–Oct 06) –

Total Antibacterial Expenditure (Nov 03-Oct 04) / Total Bedday (Nov 03–Oct 04)] X Total Bedday (Nov 05-Oct 06)