1st Global Forum on Bacterial Infections

Balancing Treatment Access and Antibiotic Resistance

Hands-on Session: Analyzing and Understanding Hospital-level Resistance Data

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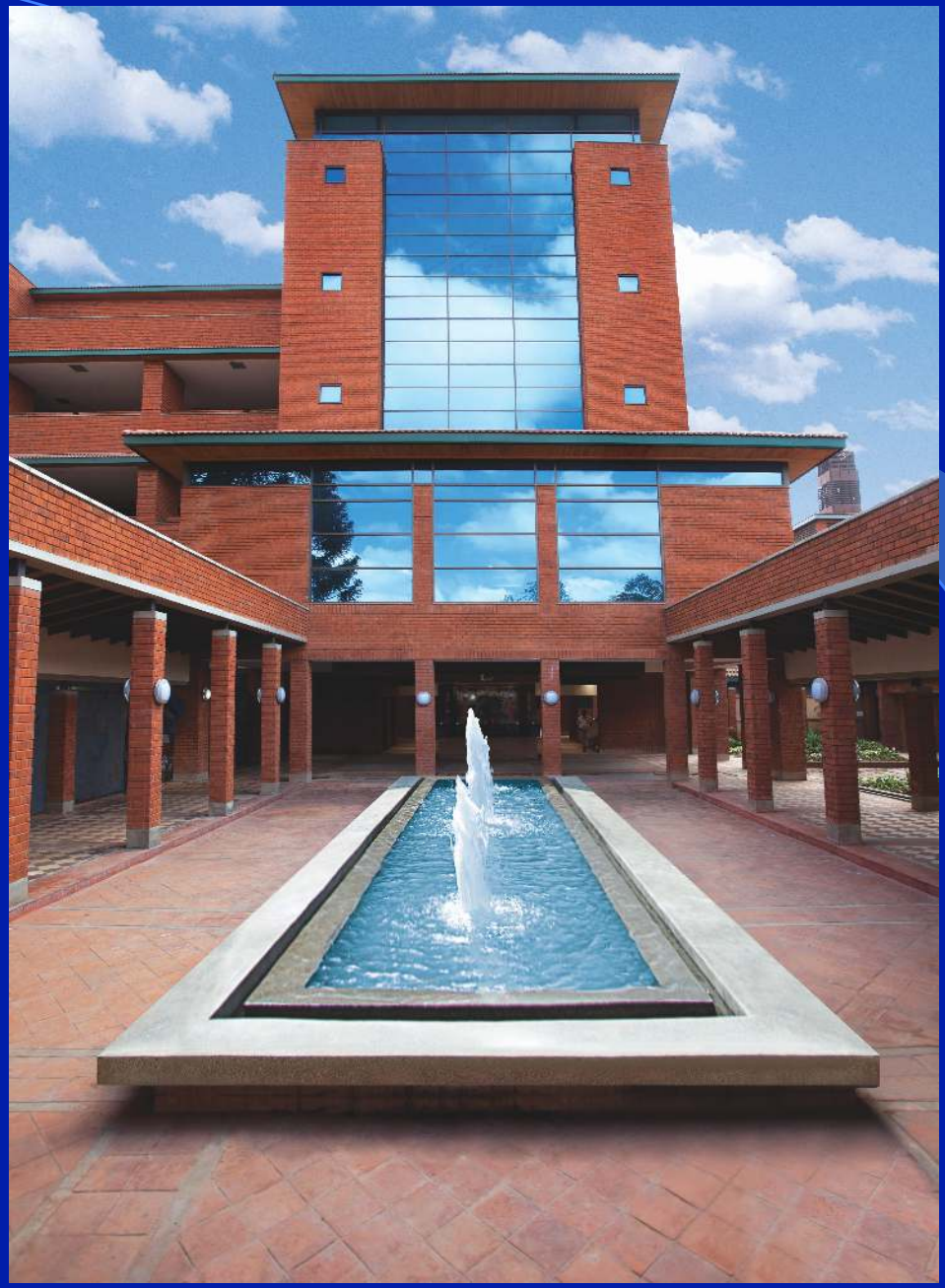
Associate Professor & Consultant Microbiologist,

The Aga Khan University Hospital

Nairobi, KENYA

Objective of this presentation

- To describe the collection, analysis and use of the cumulative bacterial identification and antimicrobial susceptibility data in The Aga Kahn University hospital Nairobi.
- To show examples of different data sets that are usually derived from this source
- Examples of different clinical applications




Aga Khan University Hospital


BACTEC 9050
BACTEC MGIT 960
BD
brother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6 9:35

- The Aga khan University Hospital Microbiology division – A well equipped modern facility
- Blood cultures – Automated Fluorogenic system Bactec 9050
- Bacterial identification by commercial API and automated Vitek Compact 2
- The unit generates about 30 - 45 bacterial susceptibility results on an average working day
- The division includes a TB culture lab

HIS and LIS are in place since 2007.

But LIS has limited capacity to store or analyze data

All bacterial identification susceptibility data

Captured on spread sheets on daily basis. Data is entered on separate sheet for each organism.

Certain organisms are grouped together- Enterobacter & Citrobacter

INVITED ARTICLE MEDICAL MICROBIOLOGY

L. Barth Reller and Melvin P. Weinstein, Section Editors

Analysis and Presentation of Cumulative Antibiograms: A New Consensus Guideline from the Clinical and Laboratory Standards Institute

Janet F. Hindler[1] and John Stelling[2]

[1]University of California Los Angeles Medical Center, Los Angeles; and [2]Brigham and Women's Hospital, Boston, Massachusetts

- Locally developed data entry and management system is used to analyze cumulative microbiological test data.
- Patient demographic information, specimen information are manually entered in LIS
- Test results are exported from Vitek compact 2 to laboratory information system. Can be down loaded into spread sheets.
- Detection of duplicate isolates is based on patients' names and identification numbers, organism identification and susceptibility patterns.
- Isolates from screening specimens excluded and analyzed as separate set of data

- TB lab data is captured separately
- Two different technologists counter check the entries for accuracy.
- Residents / consultants audit accuracy of data at random.

- Listing of identification and antibiotic susceptibility test results are generated once in two month.

- All species are presented, regardless of the number isolated.

Specific subsets tabulated such as

- Different locations of hospital (e.g. inpatient, outpatient, surgical ward, New born unit, intensive care unit),
- Specimen types (blood, urine)
- Special patient groups - Renal clinic, Chest clinic, Diabetic clinic

Other applications are

- Listings of all patients with bacteraemia,
- Daily listings of patients with resistant or highly transmissible micro-organisms
- Detection of patients with possible nosocomial infection.

- Cumulative antimicrobial susceptible data of relevant species are presented in tabular form.
- Separate tables for specific subsets if needed. graphs a to follow accumulated data over several years.
- These data are used to update empiric therapy schemes.

Data reports percent susceptible and does not include percent intermediate in the statistics.

- The data presented in separate subgroups in the report (e.g. gram positive vs. gram negative,
- inpatient vs. outpatient, and antibiotics tested on urine).
- Multidisciplinary approach - review by physician, infection control personnel and pharmacist prior to publication.

Usually clinical audits and chart reviews complement the conclusions

Repeat isolates from same patient are handled by episode and phenotype based approach.

Examples of interpretations

- Enterococcus faecium % decrease in susceptibility -Nitrofurantoin (urine) 26
- Staphylococcus, coag neg % decrease in susceptibility -Moxifloxacin 21

SALMONNELPHI/SPP.

AGE	SEX	OP/IP	SPECIMEN	ORGANISM	Pus cells	AMP	CIPRO	NALID	CEFTRI	CHLORA	COTRI
1.9yrs	m	11463	Stool	Sal spp	Nil	S	S	S	S	S	S
9yrs	?	1738 Lavin	stool	Sal spp	Nil	S	S	S	S	S	S
4.3yrs	m	12246	Stool	Sal spp	2/hpf	S	S	S	S	S	S
3.9yrs	f	12801	Stool	Sal spp	15/hpf	S	S	S	S	S	S
10yrs	f	13248	Stool	Sal spp	Nl	S	S	S	S	S	S
1.5yrs	?	1834	Stool	Sal spp	Nil	S	S	S	S	S	S
3.11	f	14686	stool	Sal spp	15/hpf	S	R	R	S	S	S
9yrs	f	26384	Blood Ctr	Sal spp		R	S		S	R	S
1day	f		Blood Ctr	Sal spp		R	S		S	S	S
7m	f	2155	Stool	Sal spp	Nil	S	S		R	S	R
1yr	m	othaya	Stool	Sal spp		R	S		S	S	
2.4 yrs	f	370 Othay	Stool	Sal spp		S	S		S	S	
7m	m	32705	Stool	Sal spp		S	S		S	S	S
3.9yrs	f	32533	Stool	Sal spp		S	S		S	S	
9yrs	m	9594	Stool	Sal spp	10 hpf	S	S	S	S	S	S
9m	m	2182	stool	sal spp	nil	S	S	S	S	R	S
14yrs	f	15053	stool	sal spp	8 hpf	S	S	S	S	S	S
1yr	m	15821	Stool	sal spp	2 hpf	S	S	S	S	S	S

Clinically significant UTI cases from data base

NO.	AGE	SEX	PYURIA	ORGANISM	DIAGNOSIS
509566	91	M	YES	ENTEROCOCCUS	CA PROSTATE
4101048	84	F	YES	CANDIDA SPP	SEPTICEMIA
000084	84	F	NO	CANDIDA SPP	TRAUMA
508294	80	F	NO	KLEB PNEUMONIA	GE
508294	80	F	NO	KLEB PNEUMONIA	HYPERTENSION
505713	79	M	NO	ENTEROCOCCUS	SEPSIS IN DM
012948	79	F	YES	PROTEUS MIRABILIS	PNEUMONIA
264966	78	M	YES	ENTEROCOCCUS	FRACTURE
369307	76	M	YES	CANDIDA ALBICANS	DM WITH SEPSIS
278738	76	F	YES	STAPH EPIDERMIDIS	UTI
505529	76	M	NO	E. COLI	URTI /RICKETS
369307	76	M	YES	CANDIDA ALBICANS	CRF/DM/CVA
510978	74	M	YES	KLEB PNEUMONIA	PERIPHERAL NEUROPATHY
506378	74	F	YES	KLEB PNEUMONIA	URETHRAL TUMOR
506655	72	M	NO	E. COLI	BPH WITH CATHETER
506530	70	M	NO	STAPH AUREUS	PUD
364827	70	M	YES	E. COLI	UTI
391608	69	F	YES	ENTEROCOCCUS	DM/CRF/UTI
381479	68	F	NO	KLEB PNEUMONIA	KNEE PROSTHESIS INFECTION
469019	67	F	NO	KLEB PNEUMONIA	UTI

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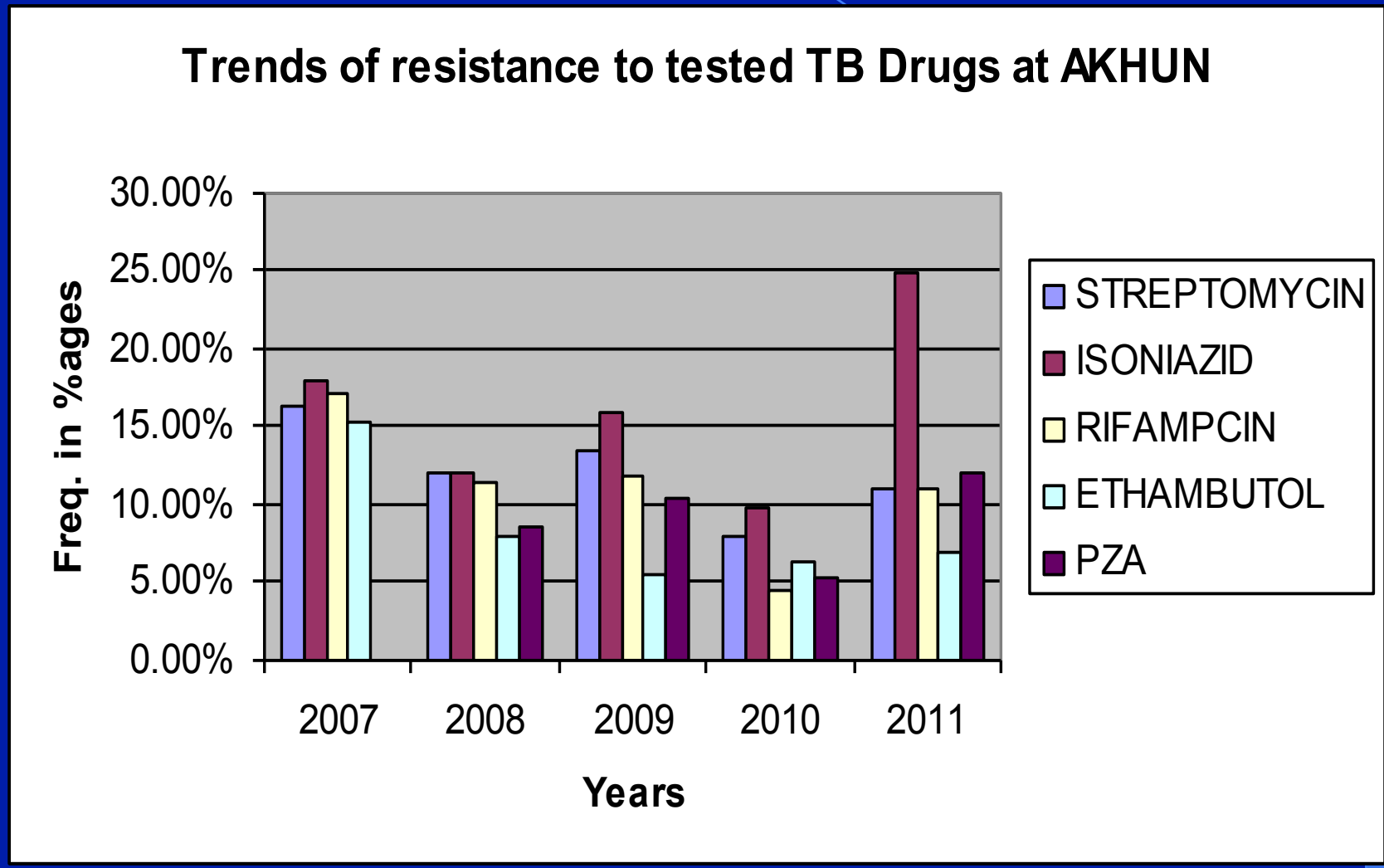
469019	67	F	NO	KLEB PNEUMONIA	UTI
511455	66	M	YES	CANDIDA SPP	SEPTICEMIA
398817	66	M	YES	ENTERIC BACILLI	UTI
504851	66	M	YES	KLEB PNEUMONIA	BPH POST TURP
511719	65		YES	PSEUDO AERUGINOSA	CVA/DM/HT
5111719	65	F	NO	CANDIDA SPP	CVA/DM/HT
429556	65	F	NO	E. COLI	DM UTI
503966	65	F	YES	E. COLI	UTI
452591	64	M	YES	STAPH EPIDERMIDIS	BPH WITH CATHETER
510168	63	M	YES	KLUYVERA	MALARIA AND UTI
378824	63	F	YES	E. COLI	SEPSIS IN DM

Colistin usage information from pharmacy

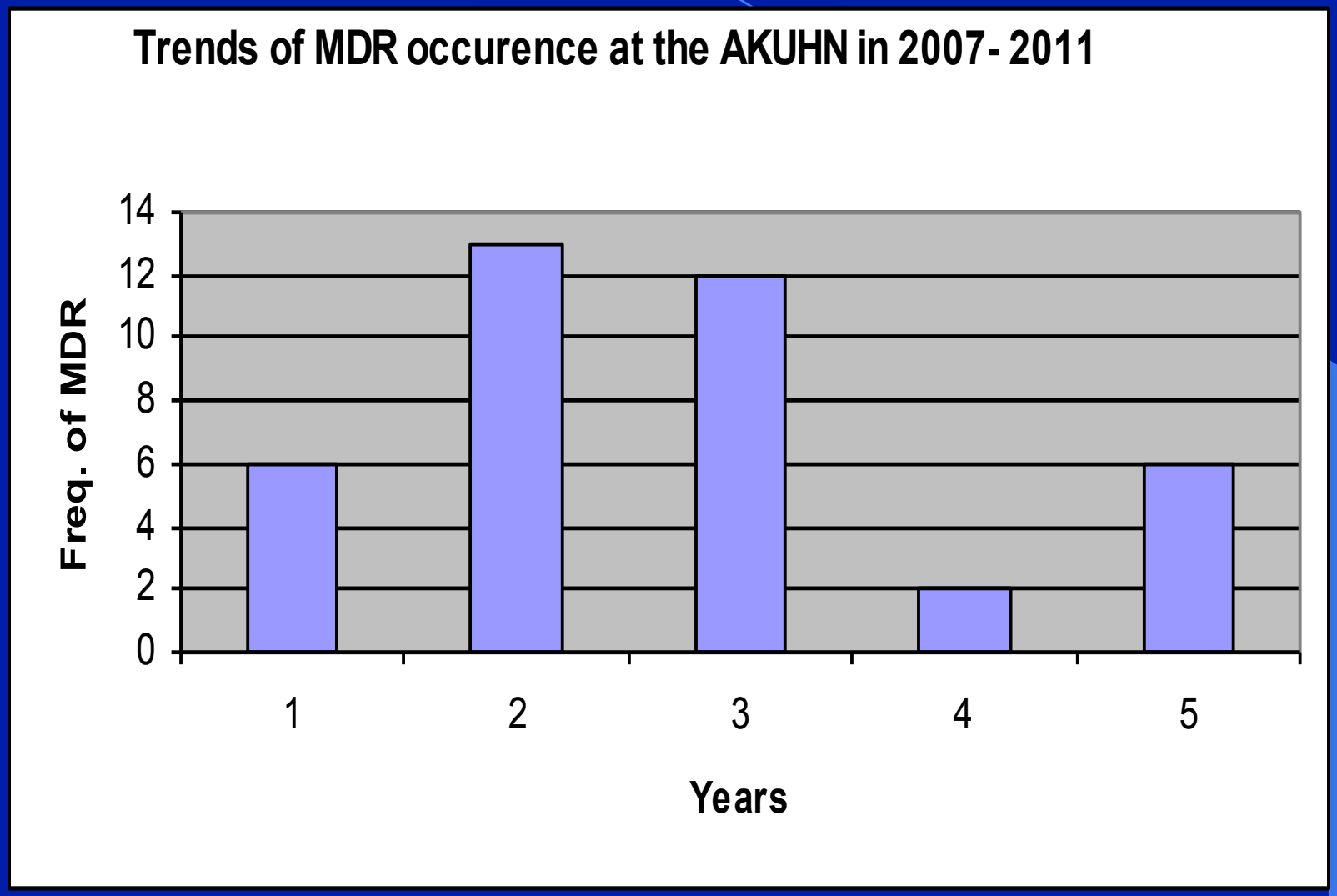
AK NUMBER	NAME	MONTH
440444	MANILAL H. SHAH	August-2008
589318	CATHERINE GAKII MUGENDI	September-2008
589244	BENSON MUGENDI MBAKA	September-2008
474564	DANIEL GAVUNA SAGINI	October-2008
511392	SHERALI HABIB KASSAM	November-2008
553033	FRED KARAMAGA	December-2008
553033	FRED KARAMAGA	January-2009
519684	SHANTILAL NEMCHAND SHAH	January-2009
602987	DELPHINE KANYANGE	February-2009
565437	ALIRAZA NANJI	March-2009
366683	ROSHANBAI VARVANI	March-2009
610649	YASMIN MERALI RAMJI	April-2009
415634	SURINDER KUMAR SHARMA	April-2009
611233	ANGELINE ACHIENG OROWE	April-2009
609899	HOPE WASERE MKUNGUSI	April-2009
414808	HASMUKH K SHAH	May-2009

- Limitations of this data collection
- It is not possible all the time to ascertain Pathogen vs. colonizer in certain specimens.
- Manual entries are checked and audited but errors may happen
- Large number of isolates from satellite clinics do not have clinical information
- Data needs lot of filtering before it can make sense – eg. Sputum vs. pneumonia, Urine vs UTI Clinical validation not possible in all specimens

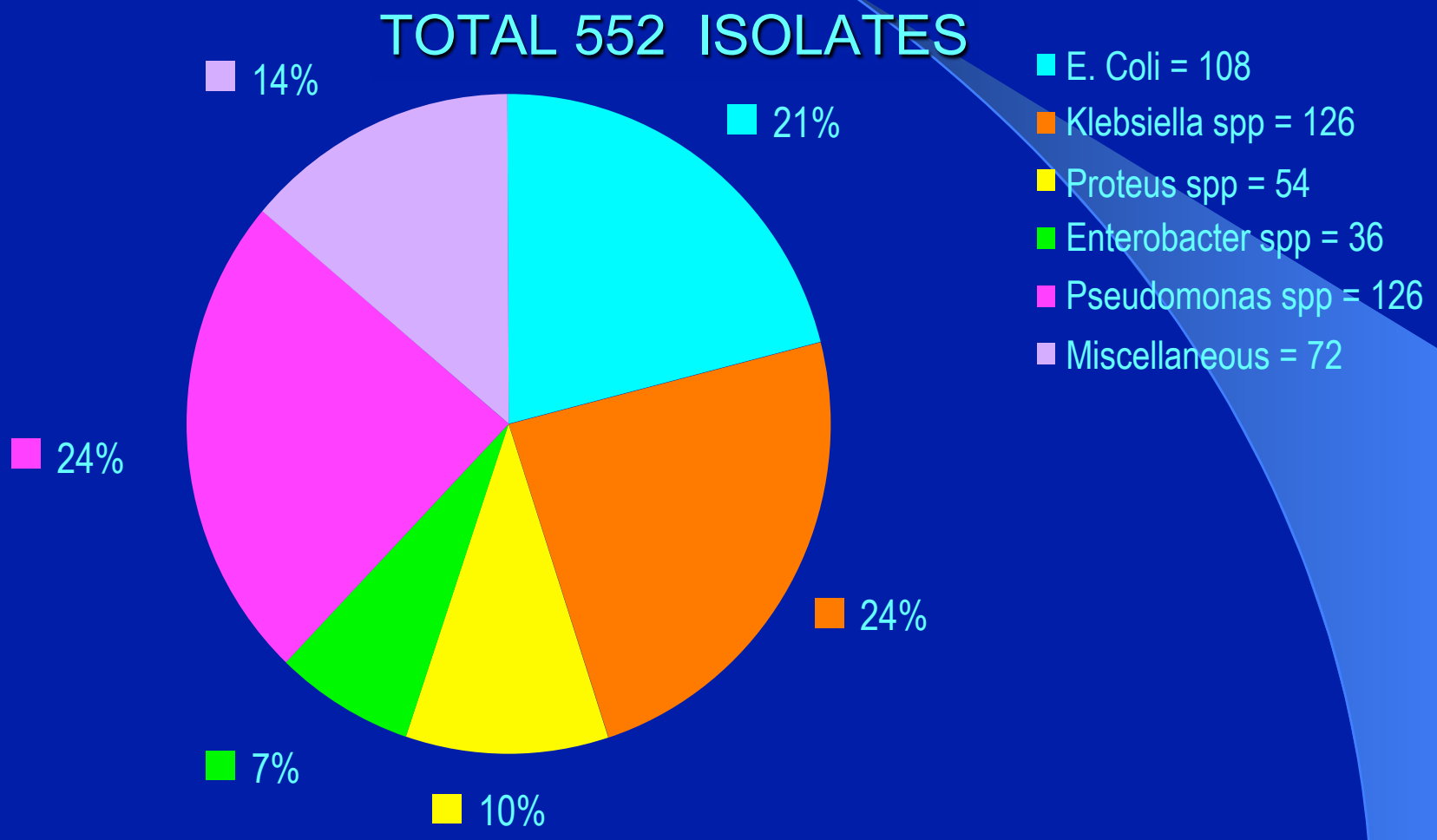
Trends of resistance to anti TB Drugs at AKHUN



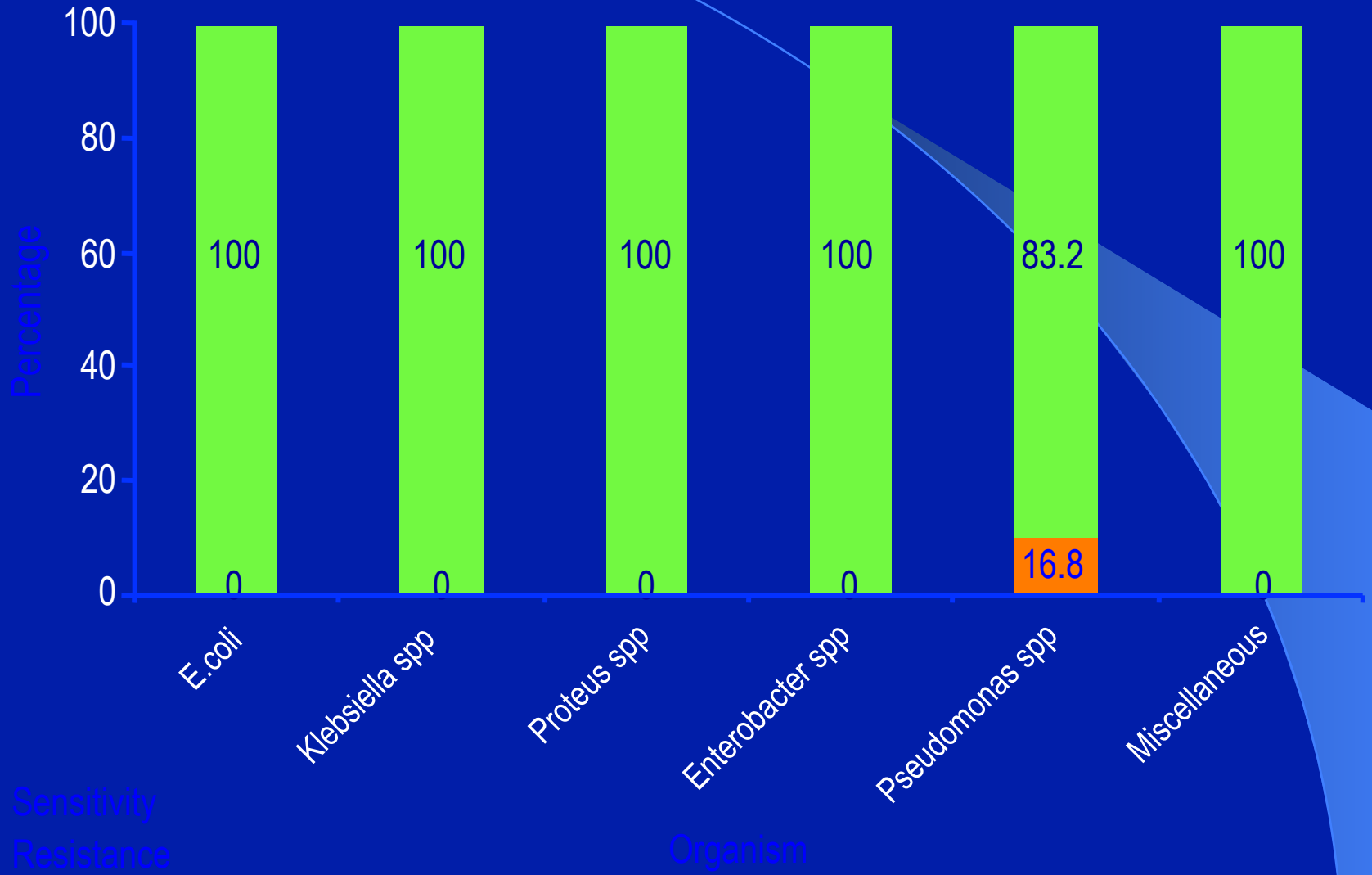
Trends of MDR TB at the AKUHN in 2007- 2011



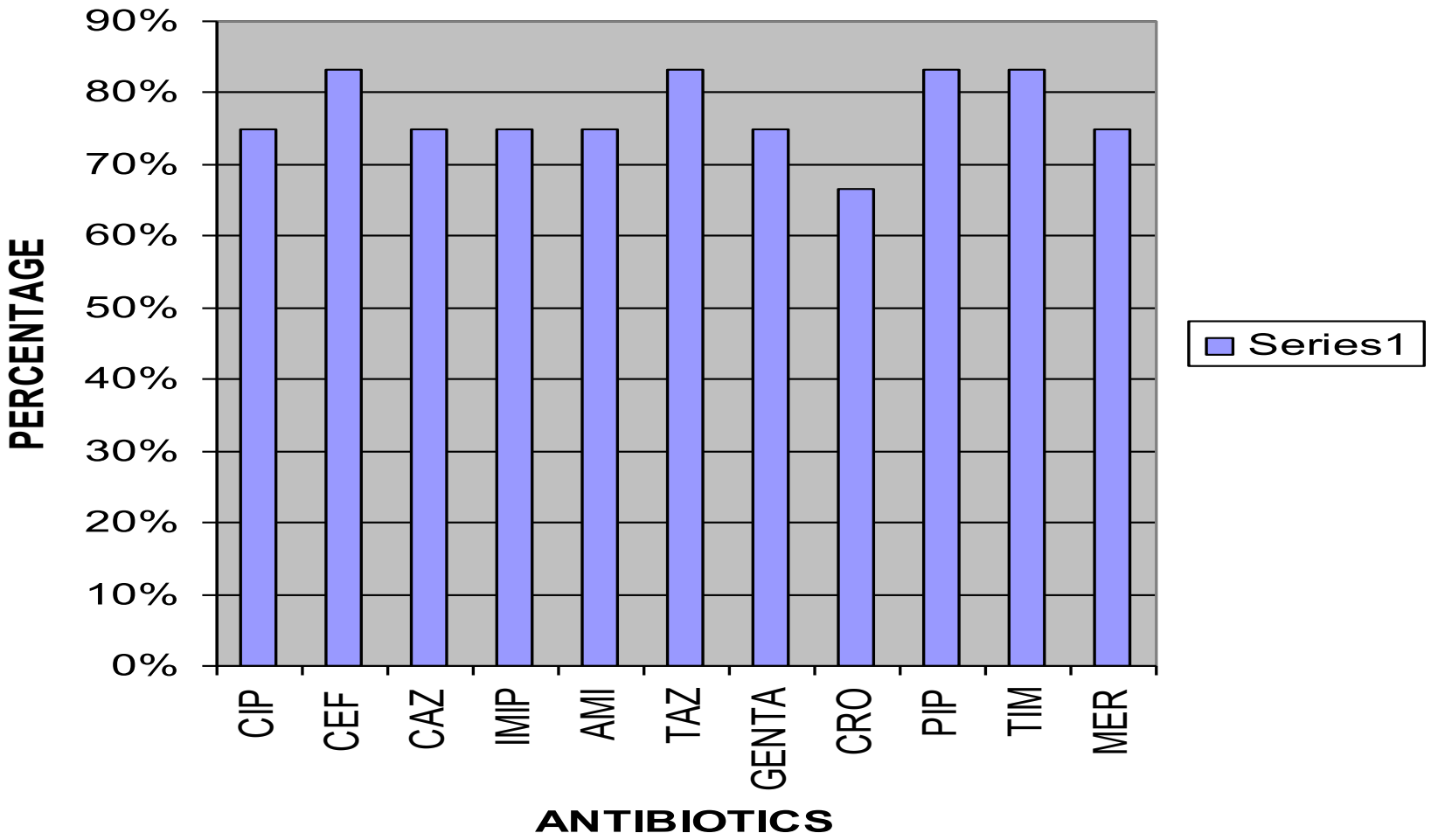
Multi-drug resistant gram negative bacilli isolated from nosocomial pneumonias during 2001 – 2003



Meropenem/Imipenem



ANALYSIS OF PSEUDOMONAS SUSCEPTIBILITY 2011



- Hospital antibiogram cannot be used alone to select the optimal empiric therapy in an individual patient-
- specific patient factors to be considered, the type and severity of infection,
- the infecting organism,
- the patient's medical history, comorbid factors
- Previous hospitalisations, past antibiotic use.

ESCHERICHIA COLI

Approximately 14% of isolates produce extended spectrum beta lactamases in 2003, 22% in 2005

	2001 960 isolates	2003 828 isolates	2004 – 2005 1158 isolates
Antibiotic	**Susceptible**	**Susceptible**	**Susceptible**
Augmentin	91%	88%	87%
Gentamicin	85%	86%	88%
Amikacin	93%	89%	90%
Chloramphenicol	67%	53%	58%
Cefuroxime	90.5%	89%	82%
Ceftazidime	96%	89%	91%
Ceftriaxone	96%	89%	91%
Cefaclor	96%	89%	82%
Cotrimoxazole	63%	50%	57%
Ciprofloxacin	93%	90%	92%
Nitrofurantoin	79%	80%	87%
Nalidixic acid	81%	75%	68%
Cefepime	-	91%	86%
Meropenem/Imipenem	-	98%	100%
Tazo/Piperacillan	-	99%	99%
Ticarcillin/Clavulanate	100%	100%	100%

MICROBIOLOGY REPORT

01/APRIL - 31/MAY 2011				
Total number of pathogens isolated		1003		
Pathogens available for susceptibility testing		964		
SITE OF THE SPECIMEN			SUMMARY OF PATHOGENS ISOLATED	
URINE	440		*Escherichia coli*	321
PUS SWABS	253		*Acinetobacter baumanii*	27
URTI-(sputum,t/aspirate, throat swab etc)	83		*Citrobacter freundii*	3
			Klebsiella oxytoca	6
STOOL	41		*Klebsiella pneumoniae*	92
BLOOD	62		*Pseudomonas aeruginosa*	31
BODY FLUIDS	25		*Salmonella cholerasuis*	1
HVS & U/SWABS	99		*Salmonella typhi*	2
			Salmonella group D	4
			Salmonella species	3
			Shigella sonnei	5
			Shigella boydi	2
			Shigella flexneri	5
			Shigella dysenteriae	3
			EPEC POOL A	4
			EPEC POOL B	5
			EPEC POOL C	3
			Proteus mirabilis	9
			Proteus vulgaris	2

Susceptibility Patterns of Body Surface Cultures Done at Aga Khan University Hospital Nairobi from June 2010 to July 2011.

Mackenzie CM, Magutu VK, Revathi G.

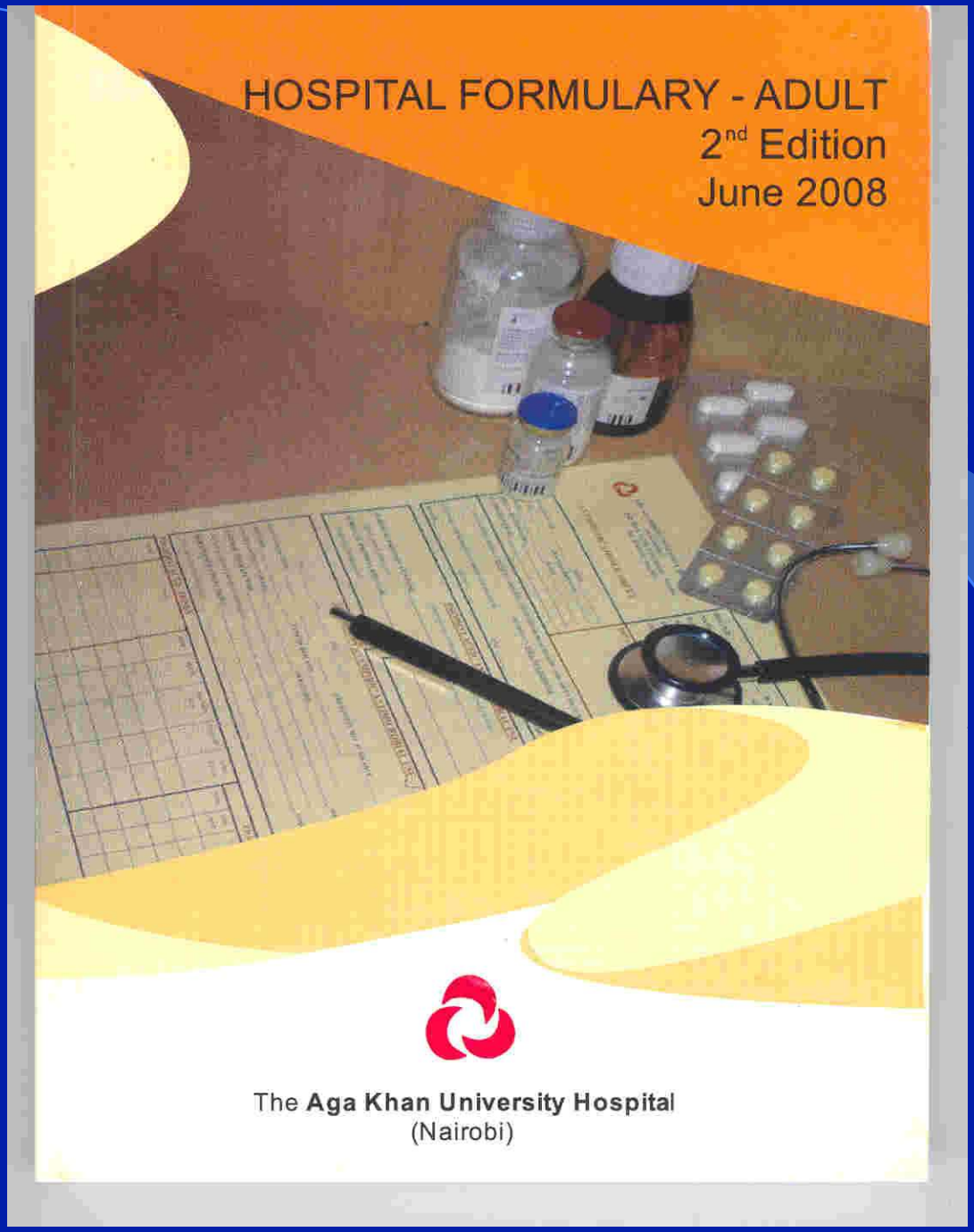
Department of Pathology, Aga Khan University Hospital, Nairobi, Kenya. catherine.mackenzi@aku.edu.

ABSTRACT

INTRODUCTION: Examination of the colonization status may be of particular value to detect epidemiologically important micro-organisms such as MRSA and multi resistant gram negative strains. A surveillance system that takes into account colonization as well as clinically indicated culture samples is a much more powerful tool for infection management and control. Routine surveillance allows early detection of outbreaks with epidemiologically important microorganisms and provides data for the appropriate empirical antimicrobial therapy. It is customary practice to culture swabs from colonization sites in all ICU admissions at AKUH, Nairobi.

ANTIBIOTIC SENSITIVITY OF GRAM NEGATIVE BACTERIA

Antibiotic	K. Pneumo n=81		E. Coli n=43		P. Aureginosa n=34		Acinetobacter n=28		Mixed Gn n=63	
Cefotaxime	32	39.5%	19	44.2%	-	-	7	25%	42	66.6%
Amoxiclav	37	45.7%	22	51.2%	-	-	2	7.2%	18	28.6%
Gentamicin	48	59.3%	29	67.4%	15	44.1%	8	28.6%	40	63.5%
Cefuroxime	45	55.6%	-	-	26	76.5%	1	3.6%	58	92.1%
Ciprofloxacin	53	65.4%	18	41.9%	16	47.1%	8	28.6%	55	87.3%
Amikacin	77	95.1%	43	100%	16	47.1%	15	53.6%	62	98.4%
Piperacillin	-	-	-	-	25	73.5%	-	-	-	-
Meropenem	-	-	-	-	20	58.8%	-	-	62	98.5%
Chloramphenical	-	-	32	74.4%	-	-	-	-	-	-
Doxycycline	-	-	12	27.9%	-	-	-	-	-	-


HOSPITAL FORMULARY - ADULT
2nd Edition
June 2008
The Aga Khan University Hospital
(Nairobi)

HOSPITAL FORMULARY - ADULT

Including:

Guidelines For Antimicrobial Use

Guidelines On Surgical Antibiotic Prophylaxis

IV Administration Policy

Pharmacy Policies And Forms

2nd Edition

June 2008

THE AGA KHAN UNIVERSITY HOSPITAL (NAIROBI)

APPENDICES

APPENDIX 1: ANTIBIOTIC GUIDELINES

INTRODUCTION

The majority of hospitalized patients receive antibiotics for therapy or prophylaxis during their inpatient stay. Most patients receive antibiotics needlessly for reasons including, inappropriate prescribing for antibiotic prophylaxis, continuation of empiric therapy despite negative cultures in a stable patient, and a lack of awareness of susceptibility patterns of common pathogens. Over prescribing not only increases the costs of health care, but may result in super infection due to antibiotic-resistant bacteria, as well as opportunistic fungi, and may increase the likelihood of an adverse drug reaction. On the other hand, not prescribing (when there is an urgent need at the bedside) may also lead to serious consequences.

The materials in this booklet constitute guidelines only and are subject to change pursuant to medical judgment relative to individual patient needs. Our antimicrobial formulary decisions are made bi-annually after thorough deliberations and consensus building with members of the Admitting Doctors, Faculty, Department of Pharmacy, and the Section of Microbiology. *In vitro* susceptibility data of the previous year are shared and emerging resistance patterns reviewed. Usage and cost data are also discussed. We aim to provide the most effective and cost-effective antimicrobial agents to our patients. This booklet does not contain specific guidelines for treatment of human immunodeficiency virus (HIV) infection and prophylaxis against opportunistic microorganisms is not included.

Preparing and continually updating such guidelines is a tremendous challenge. This is the first edition and the continual help, encouragement, constructive criticism, suggestions and advice we received has been invaluable. In this respect we would like to send our sincere gratitude and appreciation to all those people who have helped in the preparation of these guidelines from the members of the Pharmacy and Therapeutics Committee to the Clinical Departments and Specialist Consultants.

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