

Hospital Infection Control - II

Principles and Practice



Dr. Vikas Manchanda
Quality Manager
Secretary, HICC
HOD Microbiology, CNBC



In last presentation we discussed...

- Definitions of HAIs
- Designing a HIC program
- Role & duties of HICC, ICT, ICO and ICN
- Biomedical Waste Management
- Hand Hygiene
- Standard Precautions
- Employee Health
- Management of Sharps Injury
- Surveillance – Active and Passive, Targeted surveillance
- Disinfection and Sterilization
- Care of Systems and Devices
- Spill management
- Housekeeping
- Isolation Policy
- Care of Ambulance
- Monitoring the HIC program

In this presentation we will discuss...

- Engineering controls
- Laundry and Linen Management
- CSSD
- Kitchen & Food Safety
- Investigation of an outbreak
- Antimicrobial stewardship program

Engineering controls - OT

OTs -divided into 2 groups

- **Superspeciality OT:**
 - Includes OTs for Neurosciences, Orthopedics (Joint Replacement), Cardiothoracic and Transplant Surgery (Renal, Liver etc)
- **General OT:**
 - Includes Ophthalmology and all other basic surgical disciplines. District hospital OTs and FRU OT would fall under this category

Following basic assumptions for OTs

- **OT Size:** Standard OT size of 20' x 20' x 10' (Ht. below the false ceiling level is considered)
- **Occupancy:** Standard occupancy of 5-8 persons at any given point of time inside the OT is considered
- **Equipment Load:** Standard equipment load of 5-7 kW considered per OT
- **Ambient temperature & humidity** at each location to be considered while designing the system

REQUIREMENTS – Super-specialty OT

- Air Changes Per Hour:
 - Minimum total air changes should be 30 with 5 fresh air component /30ACH
 - If HCO chooses to have 100% fresh air system than appropriate energy saving devices like Heat Recovery Wheel, Run around Pipes etc should be installed



...REQUIREMENTS – Super-specialty OT

- Air Velocity

- The vertical down flow of air coming out of the diffusers should be able to carry bacteria carrying particle load away from the operating table.
- The airflow needs to be **unidirectional and downwards** on the OT table.
- The air velocity recommended as per the international and national guidelines is **90-120 FPM at the Grille/Diffuser level**.

- Positive Pressure:
 - The minimum positive pressure recommended is 15 Pascal (0.05 inches of water) as per ISO 14644 Clean Room Standard
- Air handling in the OT including air Quality
 - Air is supplied through Terminal HEPA filters in the ceiling. The minimum size of the filtration area should be 8' x 6' to cover the entire OT table and surgical team.

- The air quality at the supply i.e. at grille level
 - should be Class 100/ ISO Class 5 (at rest condition).
 - Class 100 means a cubic foot of air must have no more than 100 particles measuring 0.5 microns or larger
- Temperature and Humidity:
 - The temperature should be maintained at 21 ± 3 Deg C inside the OT all the time with corresponding relative humidity between 40 to 60% though the ideal Rh is considered to be 55%.
 - Appropriate devices to monitor and display these conditions inside the OT may be installed

- **Air Filtration:** The AHU must be an air purification unit and air filtration unit.
 - There must be two sets of washable flange type **pre filters** of **capacity 10 microns and 5 microns** with aluminum/ SS 304 frame within the AHU.
 - The necessary service panels to be provided for servicing the filters, motors & blowers.
 - **HEPA filters of efficiency 99.97% down to 0.3 microns or higher efficiency** are to be provided in the OT and not in the AHU.

General OT

- Air Change Per Hour:
 - Minimum total air changes should be 25
 - Fresh air component of the air change is required to be minimum 4 air changes out of total minimum 25 air changes
- Air Velocity:
 - The vertical down flow of air coming out of the diffusers should be able to carry bacteria carrying particle load away from the operating table
 - The airflow needs to be unidirectional and downwards on the OT table

- **Positive Pressure:**
 - The minimum positive pressure recommended is 15 Pascal (0.05 inches of water)
 - ISO 14644 Clean Room Standard
- **Air handling in the OT including Air Quantity:**
 - Air is supplied through HEPA filters in the AHU
 - The minimum size of the air supply area should be 6' x 4' to cover the entire OT table and surgical team
 - The air quality at the supply i.e. at grille level should be Class 1000/ ISO Class 6 (at rest condition). Class 1000 means a cubic foot of air must have no more than 1000 particles measuring 0.5 microns or larger

Validation and maintenance

- **Validation** (as per ISO 14664 standards) necessarily include:
 - Temperature and Humidity check
 - Air particulate count
 - Air Change Rate Calculation
 - Air velocity at outlet of terminal filtration unit / filters
 - Pressure Differential levels of the OT wrt ambient / adjoining areas
 - Validation of HEPA Filters by appropriate tests like DOP etc
- **Maintenance:**
 - Cleaning of pre filters at the interval of 15 days



LAUNDRY AND LINEN MANAGEMENT

- Categories of Linen
 - ***Dirty Linen*** (*Used linen, but not visibly soiled with blood or blood tinged body secretions*)
 - ***Soiled Linen*** (*Known, or potentially, infected/infested linen*)

Handling and storage of used linen

- Transporting used linen from ward / department to pick-up point
- Transporting used linen from the pick-up point to the laundry



Infection control issues in the laundry

- Defining workflow
- Disinfection of used (soiled) linen
- Spillage of contaminated linen
- Disinfection of heat-labile linen (Blanket)



CSSD

- **Monitoring protocol of CSSD :**
 - Steam Sterilisation
 - ***Temperature, Pressure and time*** of each cycle is recorded is followed according to manufacturer's recommendations.

...CSSD

- Various *quality indicators* are used to check the efficacy of sterilization:
 - **Exposure control:** Autoclave indicators tape is pasted on all packs to be kept in autoclave
 - **Load Control:** Rapid Biological indicators are used once a week in both autoclave machines in first load. This indicator gives us rapid results, i.e. positive result in one hour and negative result in 3 hours. If result is positive means sterilization is not adequate that whole load is recalled & re autoclaved.
 - **Pack control:** Class 5 chemical integrator - It is used in every pack.
 - **Equipment control:** Bowie-dick test pack - It is used once daily in machines.

- **Glutaraldehyde monitoring Strips:** this is to check glutaraldehyde efficacy. Used once in a week.
- ***Air cultures*** are taken once in a month
- ***Wet pack*** is not accepted as sterile. These are repacked and resterilized (even if the indicators show the appropriate changes).

...CSSD

- There are ***different trolleys*** for carrying sterile and unsterile instruments White & Red respectively.
- No person is allowed to enter in sterile room without ***Personal Protective Equipments (PPE)*** (i.e. Cap, mask, gown, & slippers etc.)

- Recall policy:
 - ***Actions to be taken if any monitoring indicators fail:***
 - CSSD supervisor are informed immediately.
 - CSSD personnel should try and discover the cause of the failure and arrange for corrective action.
 - The item are reprocessed and then supplied after confirmation of sterility.

...CSSD

- Record keeping:
 - Entry of all the items made in CSSD receipt register including date, time, type of instruments in the pack, name of department, procedure used for, case infected not, name and signature of person receiving the items.
 - Inventory of sterile packs is checked so that they are not distributed directly to the user department.
 - Record of all the indicators tests and culture report is kept.

CSSD

- HLD
- Reuse of SUD



FOOD SAFETY

- **Basic Principles** (Hygiene, Cleanliness, Workflow)
 - Kitchens
 - Food trolleys
 - Refrigerator and Freezer Use
 - Food handlers

...Screening of Kitchen Workers

- Kitchen Workers must be screened for
 - Typhoid carriage
 - Nasal MRSA carriage
 - Stool parasite examination
- Surveillance conducted biannually
 - Surveillance is also done after worker rejoins duty after period of leave more than two weeks.
- Records are maintained by in charge of the department.

Investigation of an Outbreak

- Steps to be taken for investigation of an outbreak
 - Immediate control measures
 - Microbiological Study
 - Specific control measures
 - Evaluation of efficacy of control measures

... Outbreak Investigation

- Step 2
 - **Notify** and involve the appropriate departments, personnel and the hospital administration.
- Step 3
 - **Search additional cases** by examining the clinical and microbiological records and by active surveillance by ICN.
 - Develop **line listings** for every case, patient details, place, time of occurrence and infection details.

... Outbreak Investigation

- Develop an **epidemic curve** based on place and time of occurrence, analyze the data, identify the common features of the cases e.g. age, sex, exposure to various risk factors, underlying diseases etc.
- Based on literature search and the features common to the cases, **formulate a hypothesis** about suspected causes of the outbreak.

... Outbreak Investigation

➤ Conduct **microbiological investigations**

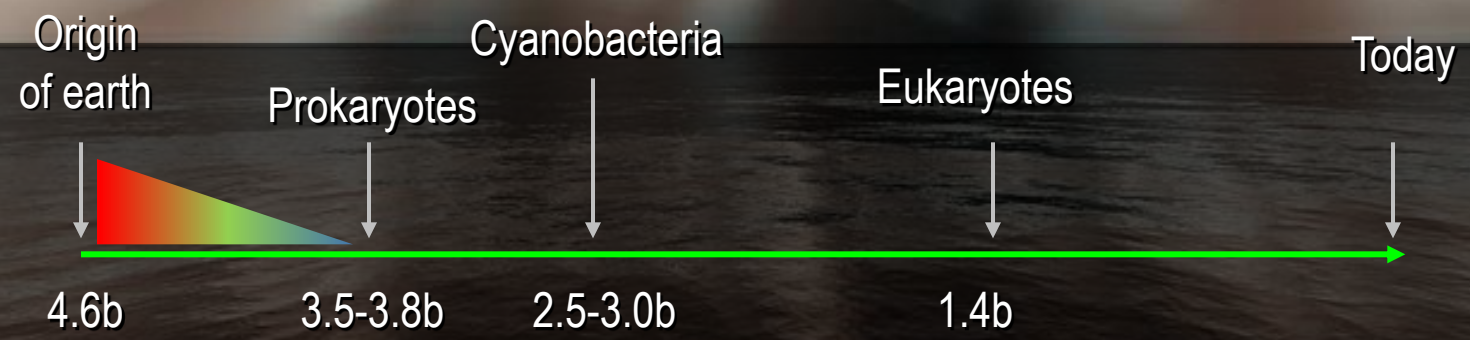
- (a) microbial culture of cases, carriers and environments
- (b) epidemiological typing of the isolates to identify clonal relatedness.

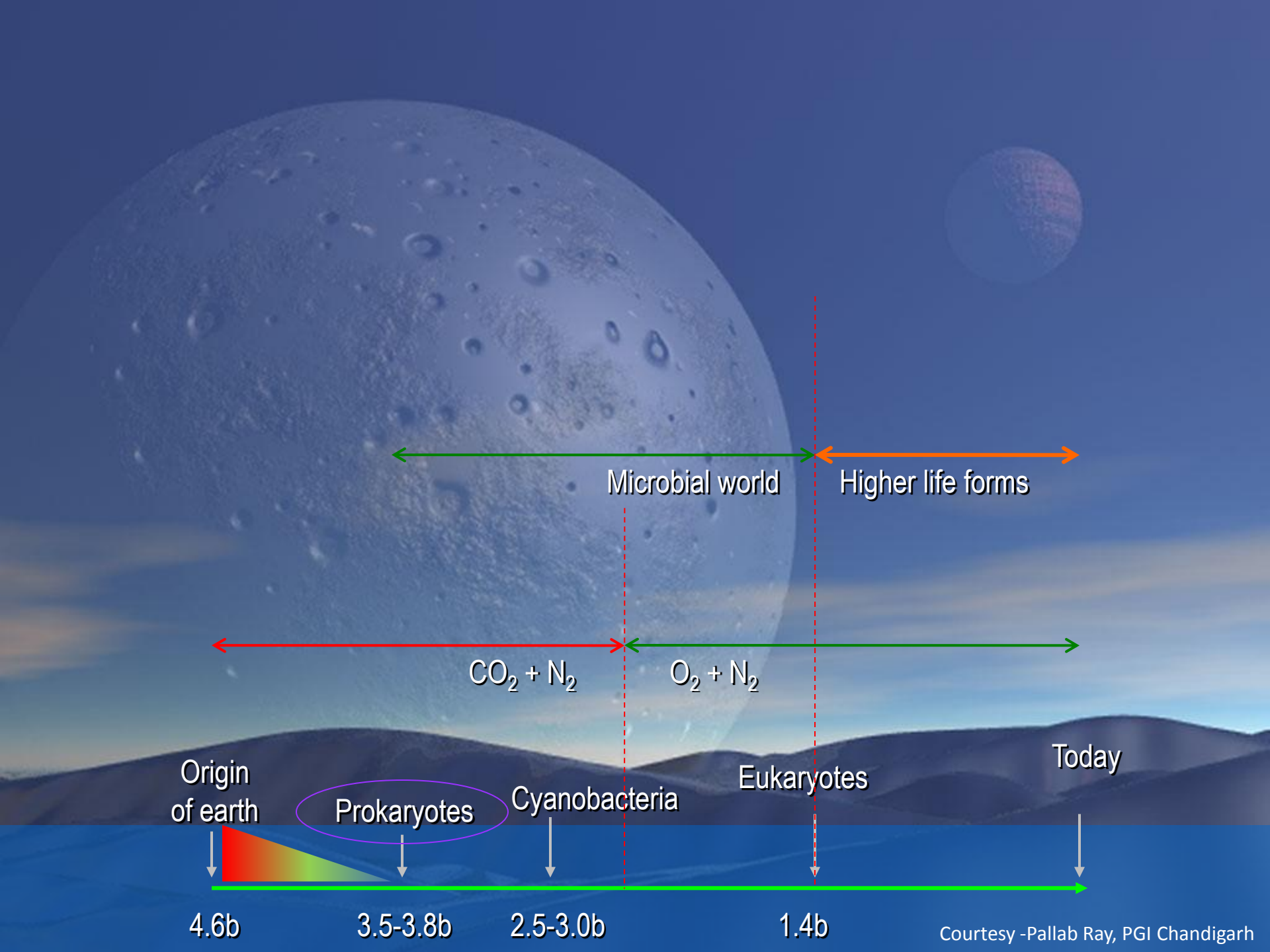
➤ **Test the hypothesis** by reviewing additional cases in a case control study, cohort study, and microbiological study

... Outbreak Investigation

- Step 4
 - *Implement specific control measures* as soon as the cause of outbreak is identified.
 - *Monitor* for further cases and effectiveness of control measures.
 - *Prepare a report* for presentation to the HICC, departments involved in the outbreak and administration.

Evolution of life





Founders of antibiotic era



Alexander Fleming



Howard Florey



Ernst Chain

Antibiotics: Roadway



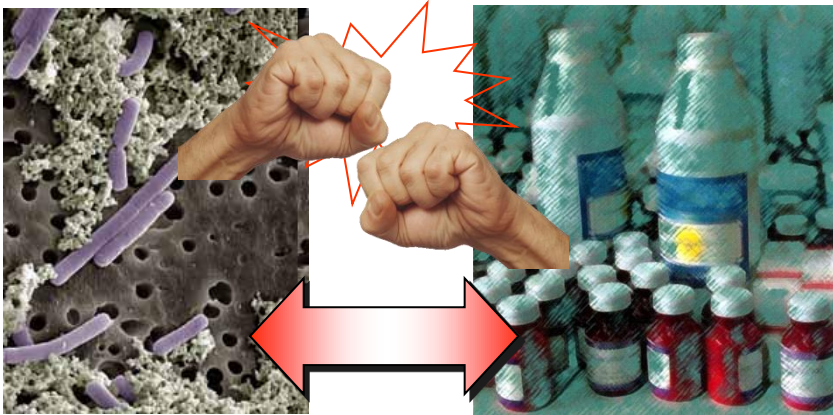
Recent Years...

- Recently licensed iv antibiotics

Drug	Yr of US approval	Ext Gm+ efficacy	Ext Gm- efficacy
Quinu-dalfo	1999	+	-
Linezolid	2000	+	-
Moxiflox	2001	-	±
Ertapenem	2001	-	+
Daptomycin	2003	+	-
Tigecycline	2005	+	-
Doripenem	2007	-	+

Of 506 new drugs in development 5 are antibiotics

The eternal battle



Bugs vs Bottle



Antibiotics

- Essential *Rx* for serious infections and are one of the most important and valuable discoveries of modern medicine
- Largest therapeutic group; 15-30% of total drug expenditure
- Antibiotics (& vaccines, ORS, contraceptives) most potential effect on mortality/ morbidity
- CDC: 150 million prescriptions yearly; 50 million unnecessary
- >90% hospitalized on antibiotics;
>70% are unnecessary / inappropriate

Reasons for Irrational Prescribing

- Training deficiencies
- Diagnostic uncertainties
- Formularies not available or not used
- Fear of poor patient outcome and need for self reassurance
- Fear of litigation
- Dispensing prescribers
- Microbiological information not available or not used
- Patient demand
- Economic incentives
- Pharmaceutical manufacturers' influence

- Jawetz (1956), problems associated with:
 - Attractiveness of new antibiotics to physicians
 - Exaggerated claims by pharmaceutical industry
 - Impact of promotion by drug companies on medical practice.

Philosophy of antimicrobial use

- Understand constraints under which physicians work
- Pressure from patients for antibiotics
- Time constraints
- Economics: Cost of diagnostic tests
- Inadequate knowledge about diagnostic tests
- To show off knowledge in latest developments
- Fear of litigation
- Malpractice
- Easy solutions provided by pharmaceutical campaigns
- Lack of education
 - Prescriber
 - Patient

Goal of antimicrobial stewardship

- To **optimize** clinical outcome by **minimizing** the morbidity and mortality due to antimicrobial-resistant infections in cost effective manner
- To **minimize** the unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms and the emergence of resistance - **preserve** the effectiveness of antimicrobial agents in the treatment
- To **prevent HAIs**

Specific objectives

- To ensure:
 - Antibiotic Guidelines are reviewed annually and kept up-to-date
- To monitor
 - Use of antibiotics and its effects on HAIs
 - Adherence to the Drug Formulary Antibiotic Guidelines
 - Provision of education on antibiotic prescribing to all clinical staff
 - Effectiveness of targeted action plans based on feedback (on prescription data and HAI surveillance data)

Initiation of program

- Convincing administration of the importance of antimicrobial stewardship
- Sensitisation of Physicians - they needed to be reassured the program is not an effort to regulate how they practice medicine
- Provide physicians with evidence based data and to make the process as efficient as possible

Antibiotic committee/ working group

- Formation of a Hospital Antibiotic Committee / Antibiotics Working Group
 - Official committee: responsibility
 - Formulation and supervision of an antibiotic policy
 - This might be a subcommittee of:
 - Hospital Drugs and Therapeutics Committee (DTC)
 - Hospital Infection Control Committee (HICC)

Antibiotic management team (AMT)

- **Multi disciplinary**
 - 6-10 expertise and experience in the subject
 - One with skills to conduct literature and systematic reviews
 - Input from all stakeholders
 - “**Ownership**” of guidelines
- Experts in:
 - Antimicrobial chemotherapy
 - Infectious diseases
 - Internal medicine
 - Surgery
 - Paediatrics
 - Clinical microbiology
 - Pharmacology
 - Hospital pharmacy



Policy should be acceptable to every one

Functions of the Committee

- To **consult with clinical staff** to get **agreement** on antibiotic usage in different specialities
- To establish an **antibiotic formulary**, to prevent use of some drugs and restrict use of others
- To formulate **guidelines** for antibiotic **prescribing**, including
 - Indications for
 - Prophylaxis
 - Therapy of infection
 - Optimum:
 - Dosages
 - Timings
 - Duration of therapy
 - Policies for minimising the risks of toxicity

Important considerations for antibiotic policy

Due considerations to:

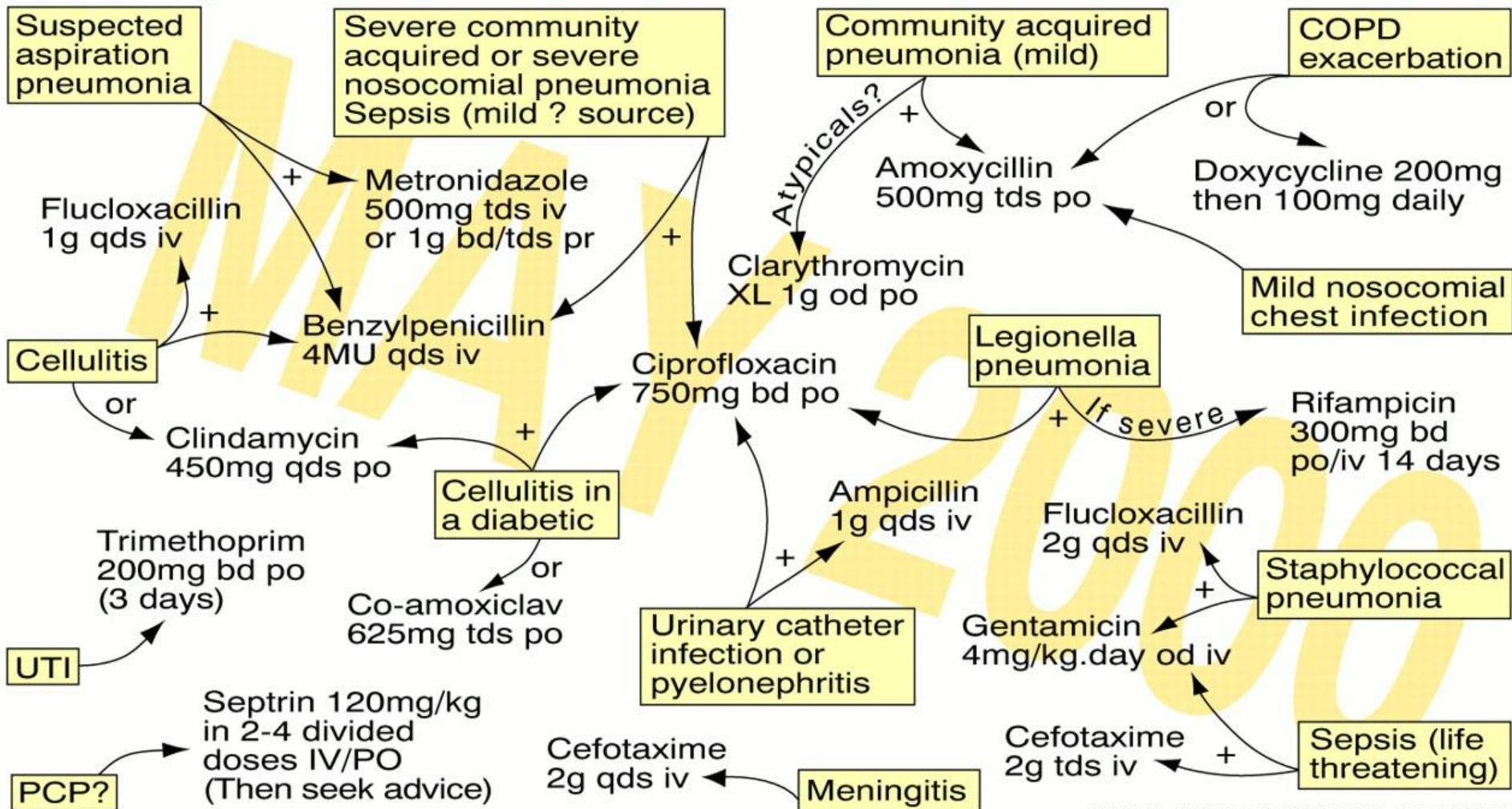
- Spectrum of antibiotic activity
- Pharmacokinetics/ Pharmacodynamics (PK/PD)
- Adverse effects
- Potency to select resistance
- Cost
- Special needs of individual patient groups

Guidelines

- Be drawn up after wide consultation and agreement
- Be simple, clear and short, ideally published in a small booklet to be carried in a pocket
- Be provided to **all newly appointed** doctors / nurses and **readily available** in the hospital, wards

Should not be this complex

Use oral antibiotics for 5-7 days unless otherwise stated.



Important components of antibiotic policy

Must set the levels for prescribing antibiotics:

- **First choice antibiotics:** Can be prescribed by all doctors
- **Restricted choice antibiotics:**
 - Rx of MDR pathogens, poly microbial infections
 - Only after permission from HOD or AMT representative
- **Reserve antibiotics:**
 - Rx of life threatening infections, Drugs known to select resistance
 - Only after permission from AMT member

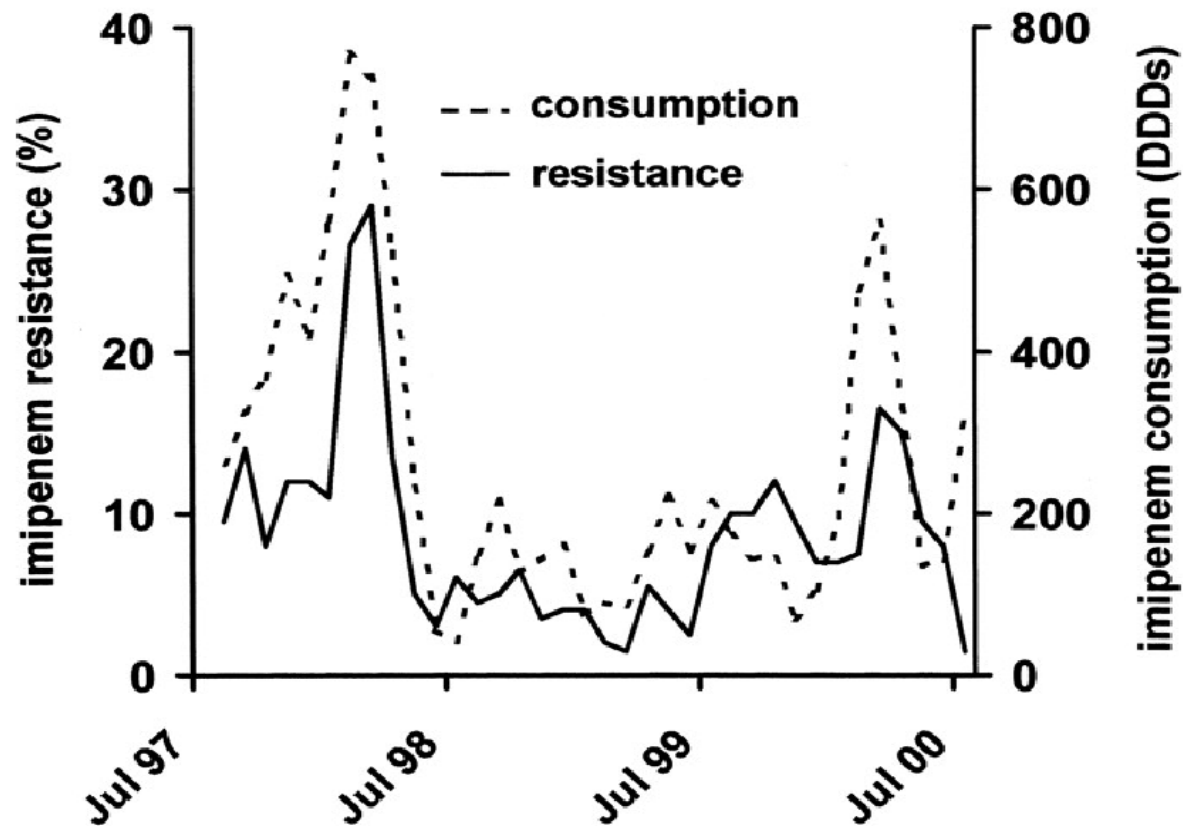
Principles of prophylactic use

- Procedure for which antibiotic are needed
 - Posted in Operation theatre
- Optimal agents, dosage, timing, route and duration of administration
 - Adequate antibiotic concentrations at the time of bacterial contamination
- Prophylaxis in clean - contaminated procedures
 - Given for a short duration, free of side effects and relatively cheap
- Antibiotics selected for prophylaxis should not
 - be used therapeutically
 - lead to emergence of microbial resistance

Antimicrobial Use and Resistance

- Changes in use parallel changes in resistance
- Resistance higher in **HAIs**
- Patients with resistant infections more likely to have received **prior antimicrobials**
- **Hospital areas** of highest resistance associated with highest antimicrobial use
- Increased **duration of therapy** increase likeliness of colonization with resistant organisms

Correlation: Use and Resistance



Contribution of Micro lab

- Reporting:
 - Reports of antibiotic susceptibility based on the drugs available in the agreed formulary
 - Restricted reporting - to encourage better prescribing
 - Reports should also indicate where organisms are invariably resistant (e.g., methicillin-resistant *S. aureus* are resistant to all beta-lactams)
- Data Management:
 - Regular release of antibiograms
 - AMR surveillance – unusual resistance, suspected outbreaks

Microbiology laboratory

- Advance in diagnostics

- Periodic review of MICs or zone diameters in DD techniques
 - detect early trends of emerging resistance, within “susceptibility” cut-offs.
- D test for inducible clinda- R for *S. aureus*
- Quick screenings for ESBL, AmpC, KPC, MBLs
- HLAR tests
- ID and mol. epidem. investigation of local outbreaks of infection

- Molecular diagnostics

- Identification of difficult-to-culture pathogens
- Avoids need for extended courses of broad-spectrum empirical therapy
- Resistance surveillance

Contribution of Micro lab

- When no local microbiology laboratory exists
 - policy should be based upon a basic formulary, if possible established after consultation with regional or national groups
 - priority should be given to examination of samples from nosocomial, life-threatening cases
 - arrangements should be made for microbiology tests with a referral hospital

Computer-assisted management programs

- Provides unique opportunity for:
 - Instantaneous feedback
 - Education
 - Alteration in prescription patterns
- Computerized decision-support softwares:
 - Linked to patients records
 - Presents epidemiologic information
 - Warnings
 - Assists in the selection of anti-infective

Behaviour counselling

- Strategies to alter prescribing behaviour
 - Persuasive and educational programmes
 - Peer review meetings
 - Drug bulletins
 - Lectures
 - Guidelines
 - Feedback based on drug audits
 - Professional advice of specialists
 - Microbiologists
 - Pharmacologists
 - Pharmacists
 - Restrictive methods
 - Prior approval of ID specialists
 - Automatic stop orders

Outcome evaluation

- Clinical outcome

- Significant decrease in incidence of:
 - Enterococcal bacteremia
 - Gram-negative bacteremia
 - MRSA infection/ colonization
 - *Acinetobacter* infection/ colonization
- Improved cure rate, decreased failure rate, decreased colonization rate, decreased resistance in hospital pathogens

- Institutional outcome

- Cost for antibiotics budget decreased in a year

What is a Care Bundle?

Quality Improvement Tool that is simple to apply:

- Consists of 4-6 key elements
- Evidence based (best) practice
- All or none approach
- All elements crucial: if one element left out process likely to fail
- Elements must be rigorous with straightforward Yes/No answers
- All measurable in one time and space

Proposed antimicrobial care bundle - six elements

On initiation of prescription:

1. **Clinical rationale** for initiation
2. Appropriate specimens sent for **microbiology** culture and sensitivity
3. Adherence to **local prescribing guidelines**
4. Additional clinical **interventions** to manage infection (e.g. remove indwelling device, surgical procedure)

On continuation of prescription:

5. Daily review based on clinical response and laboratory results regards:
 - De-escalation of treatment
 - Intravenous → Oral switch
 - Stopping antimicrobials
6. Correct performance of therapeutic drug monitoring

Controversies and challenges in antimicrobial policy

- Infection control policies failing ?
- Antibiotic use
- Antibiotic use as a cause of Hospital infection
- Antibiotic stewardship

Infection control policies failing ?

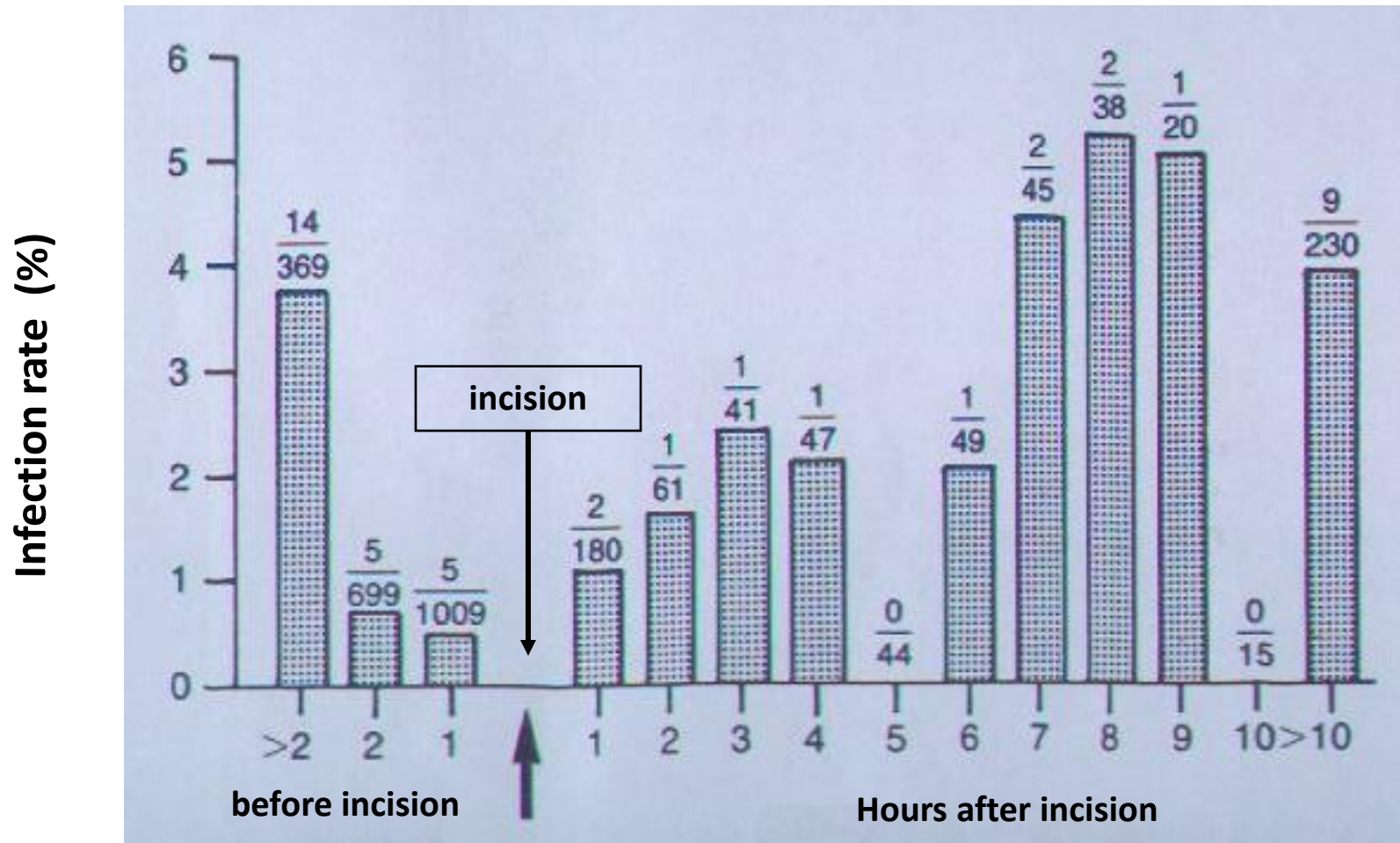
- Earlier literature cited hand hygiene adherence rates of 10-40% are considered normal
 - remaining % - antibiotic negated for asepsis and cleanliness ?
- Now increasing we call for “*zero tolerance*” in failure to adhere to hand hygiene and other infection control policies
- Even if “*Standard precautions*” are successfully implemented
 - *MRSA can be contained by*
 - » *active surveillance culture*
 - » *admission culture*
 - » *Isolation*
 - » *decolonization and decontamination*

Antimicrobial Stewardship Program CNBC Experience

Goal

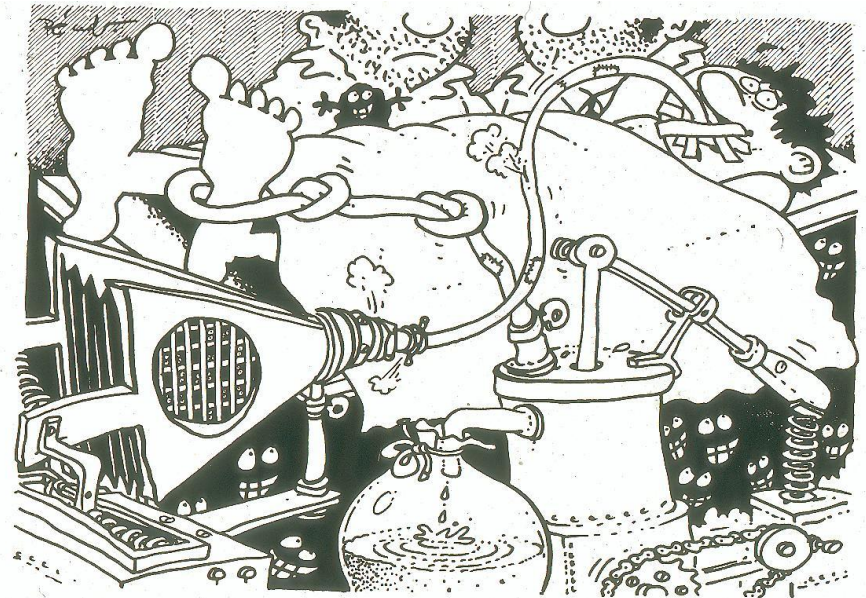
- Monitor and provide feedback on occurrence of AMR **Regular release of antibiograms**
- Optimize choice and duration of empiric antimicrobial therapy **Formulate antibiotic policy**
- Optimize perioperative antimicrobial prophylaxis
- Monitoring of adherence to the program **Prescription auditing**

Timing of Perioperative Antibiotic Prophylaxis and Risk of Infection



Common **Misconceptions** in Surgical Prophylaxis

- Broad-spectrum is better
- Longer antibiotic prophylaxis is better
- Prophylaxis should be continued until all “tubes” are out



Ils sont PARTOUT ces microbes



Regular Release of Antibiograms

One of the most important activities performed by a clinical microbiology laboratory is the reporting of cumulative and ongoing summaries of institutional patterns of antimicrobial susceptibilities, which are called "antibiograms." In addition to their critical role in monitoring patterns of antimicrobial resistance, antibiograms are vital for making informed decisions about empirical antibiotic therapy.

It gives us immense pleasure to announce that we are finally through with the much needed process of placement of antibiotic policy at our hospital. This data helps us to identify the problem statement and thus making its way to rational use of antibiotics in our hospital and nearby area. Our hospital will probably be the first Delhi government hospital to publish microbiology newsletter with analysis and presentation of cumulative antimicrobial susceptibility data (antibiograms).

An ideal antibiogram should have many components including (1) reporting of unit-specific susceptibilities, (2) exclusion of duplicate isolates, (3) reporting of temporal trends in susceptibilities, and (4) reporting of susceptibility results separately for different anatomical sites of culture (e.g., blood, urine, and non-urine). However, all the features could not be included at this point of time due to practical reasons. Many short comings that came to light while preparing data for this issue has been rectified and will be reflected in subsequent issues. For example, separating data of ICU from non-ICU patients for more effective implementation of antibiotic policy. Unit-specific susceptibility data may also permit more focused and prompt identification of changes in resistance patterns.

This newsletter will be published on half yearly basis and we are looking forward to have effective antibiotic policy for our hospital which will help our government to contain funds in terms of antibiotic usage, help our patients who will be saved from receiving undesired antibiotics with decreasing hospital days and help our society in containment of emergence of drug resistance among various bugs in the community.

Achievements of Clinical Microbiology Division in last one year

- Successfully completed one year of External Quality Assurance Program in Microbiology run by IAMM from CMC Vellore.
- Rapid blood culture (Bactec 9050) has been installed and is being used for samples from ICU and emergency and other needful patients.
- Successfully running DOTS center exclusively for pediatric patients.
- Integrated counselling & testing center site has been approved and will be starting soon for proper counseling and diagnosis of suspected HIV patients.
- Microbiology division has been selected as sentinel surveillance laboratory for dengue fever diagnosis.
- Two MSc students worked on ESBLs & MBLs and completed their summer projects in clinical microbiology.

Salient features of the released antibiograms:

- Yield for blood cultures in OPD and in-patients is similar and varies between 9-11%.
- *S. aureus* is most common cause of bacteremia among gram-positive isolates.
- Among gram-negative bacteria, *S. typhi* and *P. aeruginosa* are the most common causes of bacteremia among outpatients and in-patients respectively.
- There is high incidence of fluoroquinolone resistance among *S. typhi* isolates. However none of the *S. typhi* isolate revealed multi-drug resistance (MDRST).
- High occurrence of ESBLs in community isolates causing bacteremia is cause of concern.
- *E. coli* and *Enterococcus spp.* are the most common

Inside

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From Editor's Desk

It gives me immense pleasure to release the 2nd edition of clinical microbiology newsletter. I hope this will guide our clinicians to use appropriate antibiotics. Uniqueness of this newsletter is an exclusive pediatric data which is not available in most of the newsletters released from Delhi state and India.

We have tried to overcome some gaps that were left in the previous edition. Susceptibility data, in contrast to resistant profile has been presented in the current edition. The change has been adopted in keeping with the CLSI guidelines for presentation of antibiograms. In addition, this time susceptibility data has been analysed in at least two different formats. First, the susceptibility profiles of different bacterial species with their sample distribution and site of isolation from various patient care areas. Secondly, presentation of cumulative susceptibility data for important bacterial species.

The methodology of data compiling antibiotic susceptibility data included data entry into WHONET software followed by software analysis for non-repeat isolates.

CLSI recommendations of not presenting data for isolates less than 10 in number, however, has not been followed for few critical isolates. (e.g. *Neisseria meningitidis* and *Streptococcus pneumoniae*). Therefore, susceptibility data for these isolates must be interpreted with utmost care as this data may not be representative data for such isolates but is epidemiologically important.

In this newsletter, data from serology laboratory has also been included. Data from our ICTC and DOTS centers apprise us about the HIV and tuberculosis situation in patients visiting our hospital. Your critical comments and suggestions will help us to improve upon the data and can be kindly sent to microcnbc@gmail.com

Dr. Vikas Manchanda
Head of Department

Clinical Microbiology & Infectious Diseases Division

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Activities and achievements of Microbiology & Infectious Diseases Division, CNBC in last one year

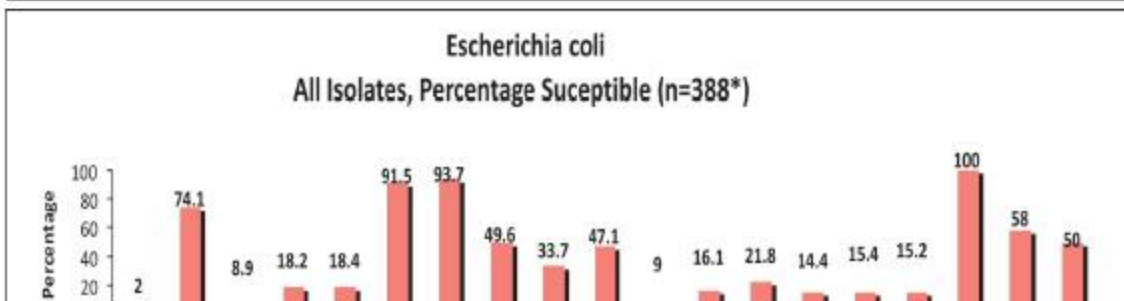
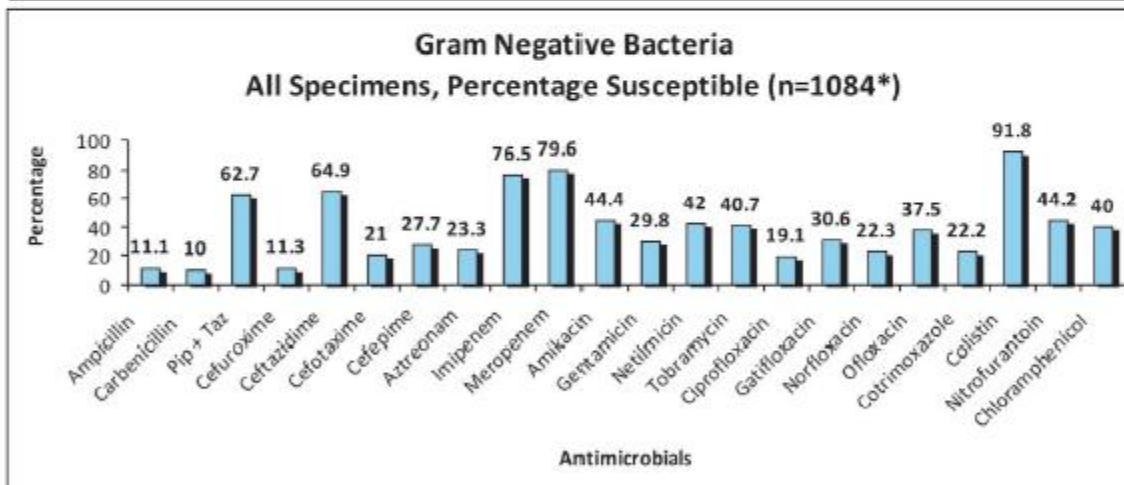
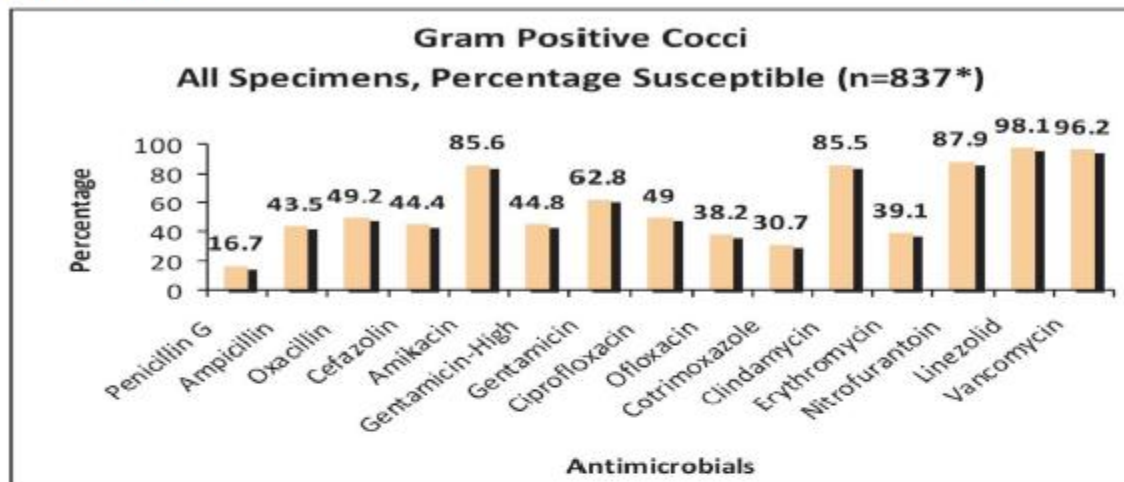
- Joining of two senior residents Dr. Rajan Chopra and Dr. Swastika Agarwal to the department.
- Completion of summer training project by 3rd MSc student
- Starting of research projects on "Neonatal Sepsis" and "Pediatric pneumonias in ICUs"
- Holding CME program on "Laboratory safety and quality control in microbiology" during 3rd meeting of IAMM Delhi Chapter (Accredited to Delhi Medical Council)
- Successful completion of EQAS cycle for 3rd consecutive year
- Starting of linked ART center
- Installation of new machines including:
 - ♦ COBAS Amplicore
 - ♦ Real Time PCR (Light cycler 480)
 - ♦ Magna Pure compact automated nucleic extraction system
 - ♦ Freeze dryer System

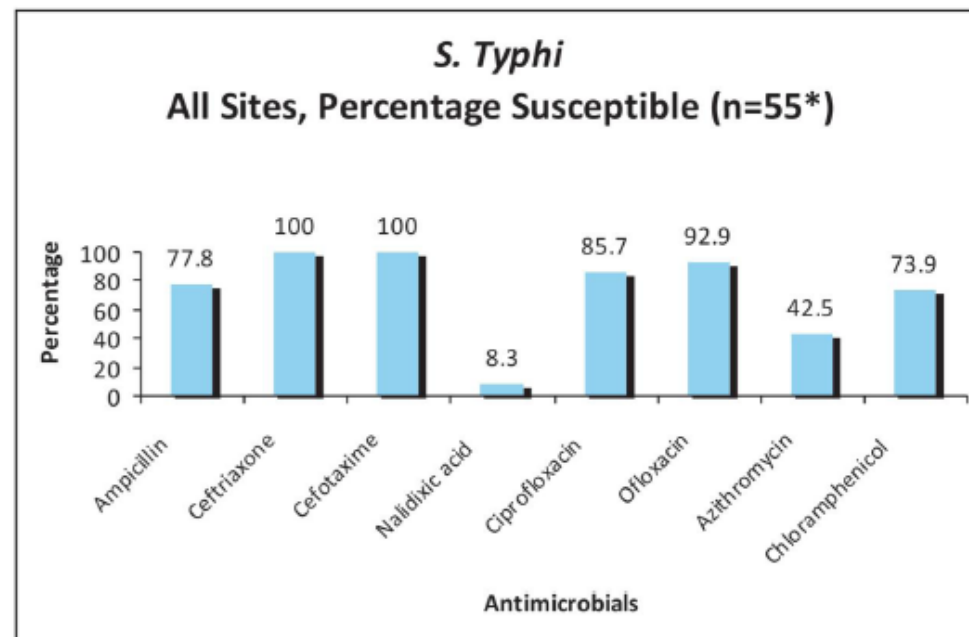
Salient Features of the antibiograms

- Occurrence of MRSA is 30% among all isolates of *S. aureus*.
- Less than 50% of both gram negative bacteria as well as gram positive cocci are susceptible to fluoroquinolones like ciprofloxacin and ofloxacin.
- Susceptibility to penem group (Imipenem and Meropenem) has alarmingly decreased from >95% last year to ~75% this year.
- We also confirm presence of MBL and KPC among the clinical isolates in children.
- Susceptibility to Colistin in *Acinetobacter* spp. was 100%, although in *Pseudomonas* spp. it has decreased to 90%.
- **S. Typhi**
 - ♦ High prevalence of nalidixic acid resistant *S. Typhi* (NARST) indicates high chances of ciprofloxacin therapy failure if used despite its high in vitro susceptibility.
 - ♦ All isolates were found susceptible to cefotaxime and ceftriaxone.

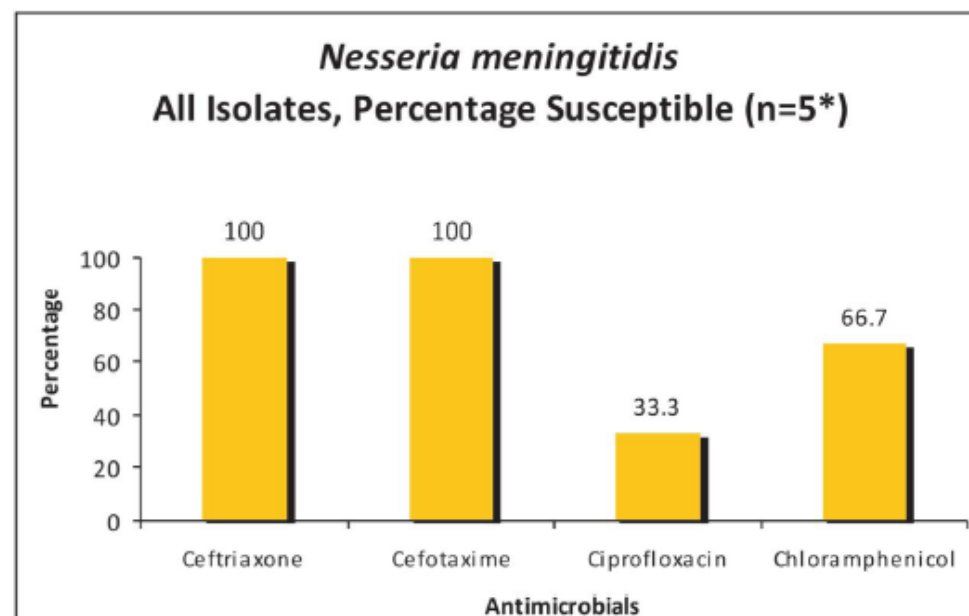
CHACHA NEHRU BAL CHIKITSALAYA

Antibiograms





All susceptibility testing was done by E-test



Out-Patient Units

TOTAL SAMPLES	783	%
POSITIVES	83	10.6%
MIXED GROWTHS	49	6.3%
NO GROWTHS	651	83.1%

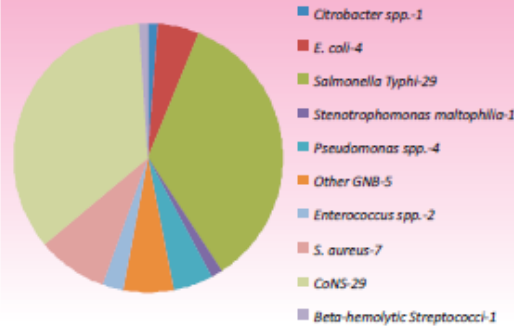
Non-ICU Inpatient Units

TOTAL SAMPLES	3371	%
POSITIVES	563	17%
MIXED GROWTHS	420	12%
NO GROWTHS	2388	71%

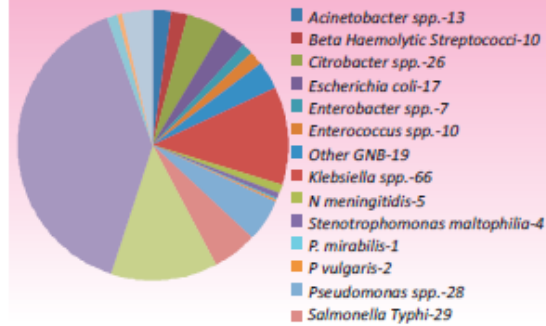
Intensive Care Units

TOTAL SAMPLES	584	%
POSITIVES	87	15%
MIXED GROWTHS	12	2%
NO GROWTHS	485	83%

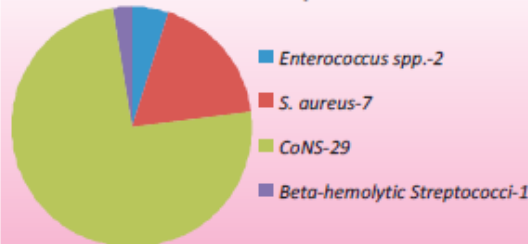
All Blood Isolates - Outpatients



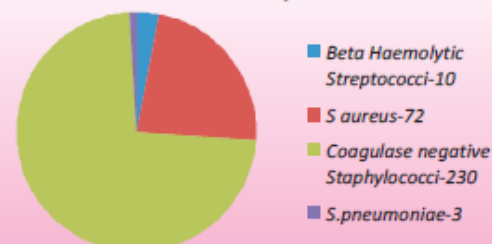
All Blood Isolates - Inpatients



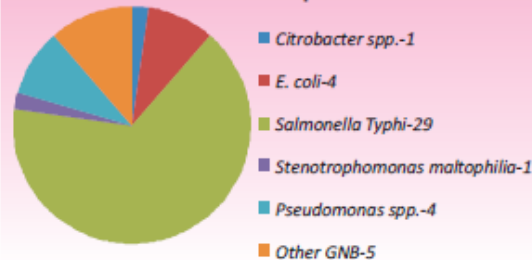
Gram Positive Bacteria Isolated in Blood - Outpatients



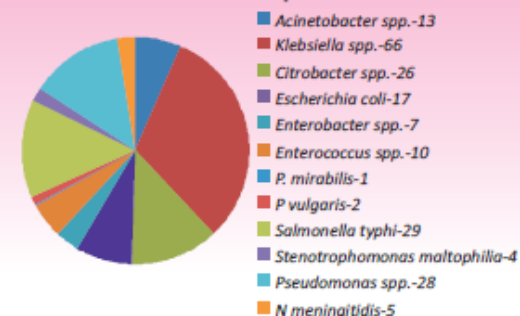
Gram Positive Bacteria Isolated in Blood - Inpatients



Gram Negative Bacteria Isolated in Blood - Outpatients



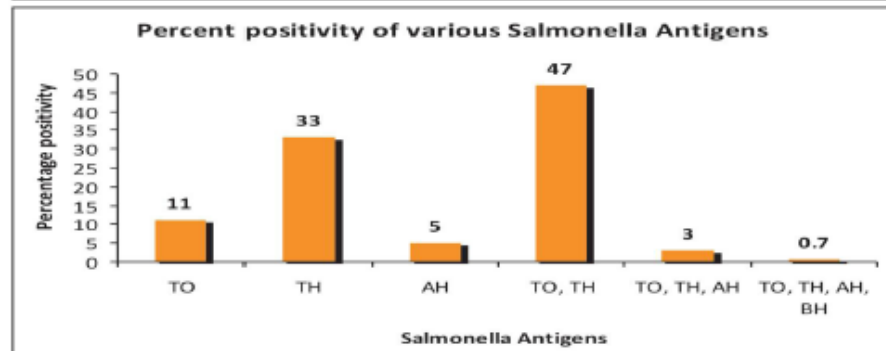
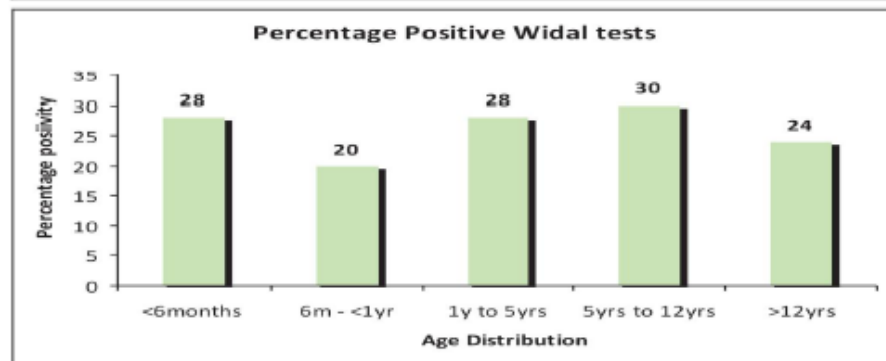
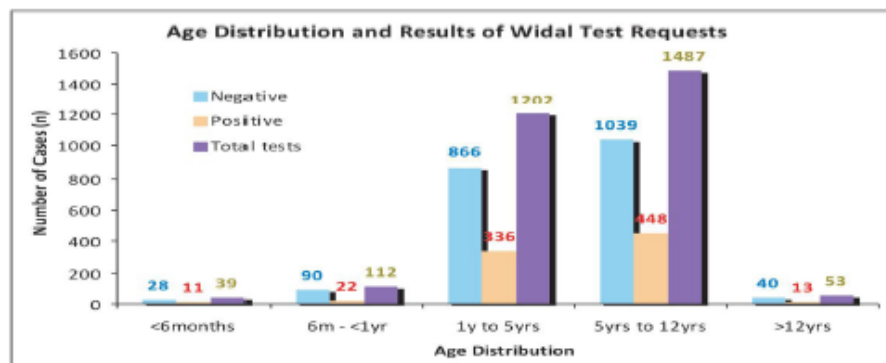
Gram Negative Bacteria Isolated in Blood - Inpatients



Widal Test

Results from our laboratory shows that in Widal test the antibodies titers were raised (28%) in children between 1-5 yr age group (raised levels means $\geq 1/160$). Among these patients with raised titers ~ 86% of patients had raised titers for Salmonella Typhi H and O/H alone or TO antigen alone. About 5% patients had antibodies raised against Salmonella Paratyphi AH antigen

Interesting finding was raised antibody titers against Salmonella antigens in children below 6months of age Almost 25% of total tested samples in this age group showed raised titer (raised levels means $\geq 1/160$). These findings suggest that Salmonella infections are endemic in this part of Delhi. Occurrence of percentage of samples with increased titres was more or less similar in different age groups of children.



Antibiotic policy

- Has been formalised in consultation with respective departmental heads and microbiologists

2008

CHACHA NEHRU BAL CHIKITSALAYA

(Affiliated to Maulana Azad Medical College)

Surveillance and Infection Control Division

Hospital Infection Control Committee

[ANTIBIOTIC POLICY]

To promote rational use of antibiotics.

← Separate for OPD, in-patient units and ICU wise

**Inpatients,
Pneumonia**

Syndrome
based

- Amoxicillin is first choice for oral antibiotic therapy in children under the age of 5 years because it is effective against the majority of pathogens which cause CAP in this group, is well tolerated, and cheap. Alternatives are co-amoxiclav, cefaclor, erythromycin, clarithromycin and azithromycin.
- Because mycoplasma pneumonia is more prevalent in older children, macrolide antibiotics may be used as first line empirical treatment in children aged 5 and above.
- Macrolide antibiotics should be used if either mycoplasma or chlamydia pneumonia is suspected.
- Amoxicillin should be used as first line treatment at any age if *S. pneumoniae* is thought to be the likely pathogen.
- If *S. aureus* is thought the likely pathogen, a macrolide or cloxacillin is appropriate.
- Although there appears to be no difference in response to conventional antibiotic treatment in children with penicillin resistant *S. pneumoniae*, the data are limited and the majority of children in these studies were not treated with oral β -lactam agents alone.

Age	1 st Line	2 nd Line	3 rd Line
1-3 Month	Ampicillin - (100 mg/kg /d IV, IM, 6-8hrly)	Cefotaxime- (150mg/kg/d q 6-8hr IV) + Amikacin- (7.5 -10mg/kg q 8-12 hr IV, IM)	Piperacillin + Tazobactam (300-400 mg/kg/d q 6-8 hr IV, IM) / Vancomycin (45 mg/kg/d q 8 hrs, IV)
3m - 3yr	Ampicillin + Chloramphenicol - (50 mg/kg /d q 12hr IV)	Cefotaxime / Ceftriaxone (50-75mg/kg q 12hrly)	Piperacillin + Tazobactam / Vancomycin
>3yr	Ampicillin- (100-200 mg/kg/d q 6hr IV) + Chloramphenicol - (50-75 mg/kg/d q 6-8 hr IV)	Cefotaxime / Ceftriaxone- (50 – 75mg / kg 12hrly)	Piperacillin + Tazobactam / Vancomycin- (45-60 mg/kg/d q 8-12hr IV)
		Amoxy- Clavulanate (I / V, Oral) - (20-45 mg/kg/d q 8-12hr) Cloxacillin (75-100 mg /kg/d q 6-8 hr IV)	Meropenem - (60 mg/kg/d q 8hr IV)

Daily appraisal form



CHACHA NEHRU BAL CHIKITSALAYA

(Affiliated to Maulana Azad Medical College)

Govt. of NCT Delhi

Geeta Colony

Delhi - 110031

Surveillance and Infection Control Division

Daily appraisal form

Date:

Hospital Unit Name: ICU/Ward_____

Total No. of bed strength:

Total no. of patients:

Number of patients with one or more central lines:

Number of patients with a urinary catheter:

Number of patients on a ventilator:



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Daily appraisal form (NICU)

Date:

Total No. of bed strength:

Total No. of beds occupied:

≤750 gm				751-1000gm				1001-1500gm				1501-2500gm				>2500gm			
Pts	U/C	CL	VNT	Pts	U/C	CL	VNT	Pts	U/C	CL	VNT	Pts	U/C	CL	VNT	Pts	U/C	CL	VNT

If infant has both a U/C and CL, count as U/C infant only for the day

Pts=number of infants,

U/C=number of infants with **u**mbilical catheter

CL=number of infants with 1 or more **c**entral lines

VNT=number of infants on a **v**entilator

Antimicrobial use and Resistance(AUR)

Pharmacy Data - Daily Report Form



Facility I.D.:

Location Code:

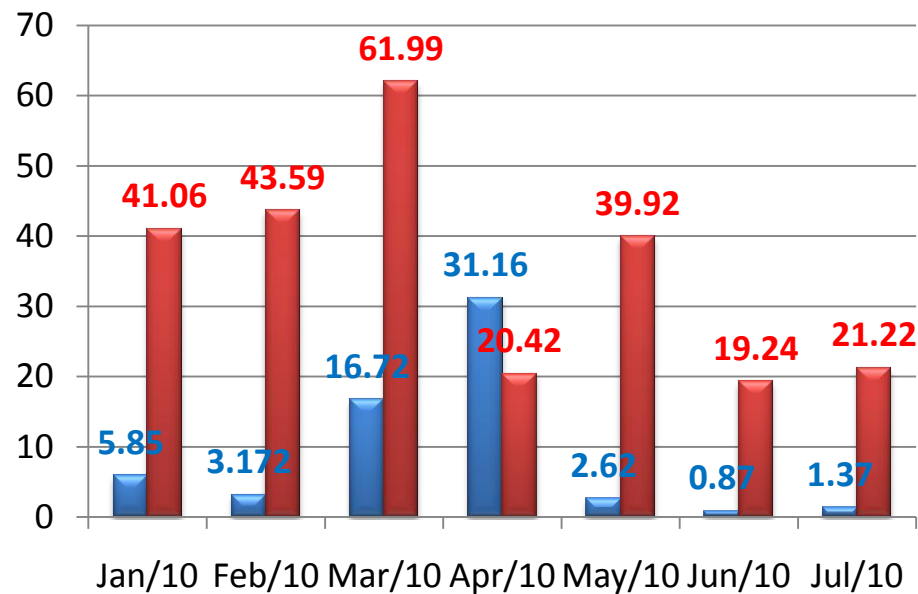
Patient Days:

Parenteral Antibiotics			
Antibiotics	Quantity Used		Antibiotics
Amikacin	g		Gentamicin
Ampicillin	g		Imipenem
Ampicillin**/Clavulanate	g		Levofloxacin
Ampicillin**/ Sulbactam	g		Linezolid
Azithromycin	g		Meropenem
Azetreonam	g		Metronidazole
Cefamandole	g		Nafcillin
Cefepime	g		Ofloxacin
Cefmetazole	g		Cloxacillin
Cefotaxime	g		Penicillin G
Cefoxitin	g		Pen. G Benzathine
Ceftazidime	g		Procaine Pen G
Ceftizoxime	g		Piperacillin
Cefttriaxone	g		Piperacillin**/ Tazobactam
Cefuroxime	g		Quinuprstin**/ Dalfopristin
Cephalothin	g		Ticarcillin
Chloramphenicol	g		Ticarcillin**/ Clavulanic Acid
Ciprofloxacin	g		Tobramycin
Daptomycin	g		Vancomycin
Ertapenem	g		
Others			
Oral Antibiotics			
Antibiotics	Quantity Used		Antibiotics
Amoxicillin	g		Gatifloxacin
Amoxicillin**/ Clavulanic Acid	g		Levofloxacin
Ampicillin	g		Linezolid
Azithromycin	g		Lomefloxacin
Cefaclor	g		Metronidazole
Cefadroxil	g		Moxifloxacin
Cefixime	g		Norfloxacin
Cefprozil	g		Ofloxacin
Cephalexin	g		Penicillin V

Monitoring of use of antimicrobials

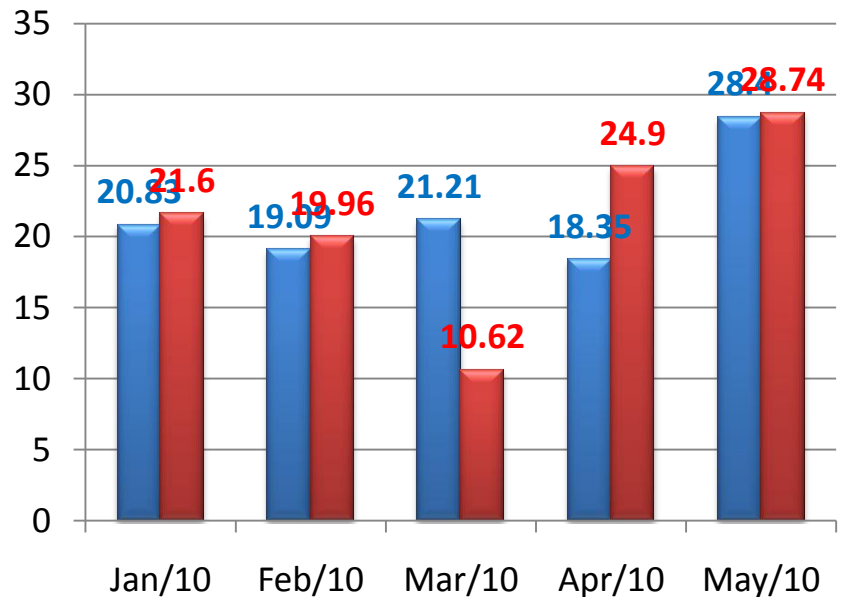
DDD OF AMPICILLIN

■ ICU ■ WARD



DDD OF MEROPENEM

■ ICU ■ WARD



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Geeta Colony

Delhi - 110031

Surveillance and Infection Control Division

CNEC-30

Irrational Use of Antibiotic Assessment Form

Form No. _____

WARD: _____

DATE: _____

Name: _____

CR No. _____

Age: _____

Sex: _____

Weight: _____

Date of Admission: _____

Diagnosis: _____

PATIENT EXPOSURE:

Surgical operation/procedure: _____

I/V line: _____

Foley's catheter: _____

Mechanical Ventilator: _____

Any other invasive procedure: _____

ANTIBIOTIC THERAPY

	Name of antibiotic	Dose of antibiotic	Start Date	End Date	Duration of therapy
1.	_____	_____	_____	_____	_____ days/weeks
2.	_____	_____	_____	_____	_____ days/weeks
3.	_____	_____	_____	_____	_____ days/weeks
4.	_____	_____	_____	_____	_____ days/weeks
5.	_____	_____	_____	_____	_____ days/weeks
6.	_____	_____	_____	_____	_____ days/weeks

IRRATIONAL USE OF ANTIBIOTICS

	Name of Antibiotic	Dose	Start Date	End Date	Justification of Antibiotic Rx by Physician	Irrationality
1.	_____	_____	_____	_____	_____	_____
2.	_____	_____	_____	_____	_____	_____
3.	_____	_____	_____	_____	_____	_____
4.	_____	_____	_____	_____	_____	_____

MICROBIOLOGY REPORT (if any): _____

REMARKS: _____

Name of Doctor _____

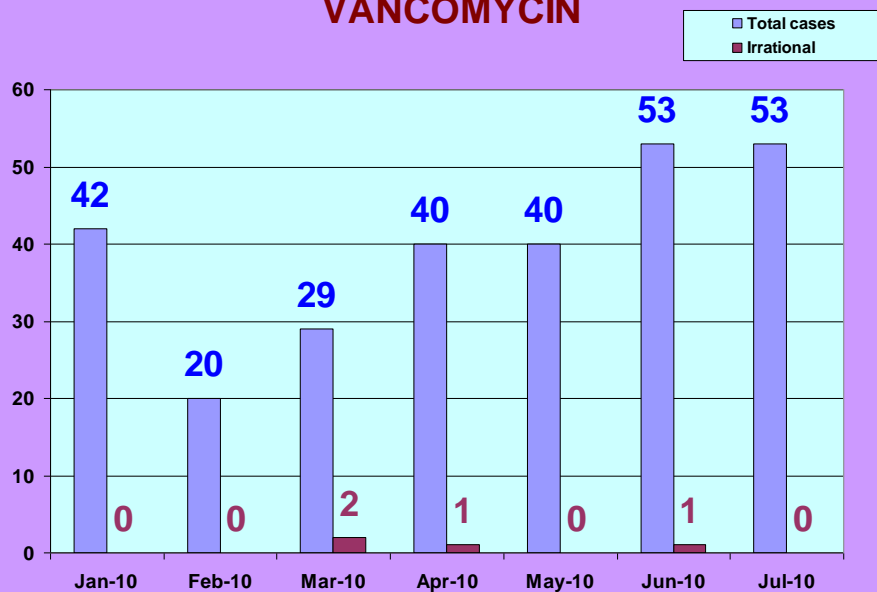
Signature of Doctor _____

Prepared by:

Hospital Infection Control Committee,
Chacha Nehru Bal Chikitsalaya, Govt. of NCT of Delhi

Monitoring irrational use of antibiotics

VANCOMYCIN



MEROPENEM

