Indian Association of Surgical Gastroenterology

Background

The Indian Association of Surgical Gastroenterology (IASG) decided to formulate a 'set of recommendations for antibiotic usage' in intra-abdominal infections, encountered by its members. Three working groups with defined areas to address were set up and are mentioned below:

Group A: Antibiotic use for established/suspected intra-abdominal infections

Members: Dr Adarsh Chaudhary, Past President, IASG (Group Leader), Dr V. Sitaram, Dr Puneet Dhar, Dr Sudeep Shah, Dr Rajneesh Singh

Group B: Antibiotic recommendations related to surgical prophylaxis

Members: Dr H. Ramesh, President Elect, IASG (Group Leader), Dr Ramesh Ardhanari, Dr Anil Agarwal, Dr Pradeep R., Dr Sudeep Naidu

Group C: Other important issues in Intra-abdominal infections

Members: Dr R. A. Sastry, Past President, IASG (Group Leader), Dr Sadiq Sikora, Dr Sanjay Nagral, Dr Sanjay Debakshi, Dr Sujoy Pal

An attempt was made to provide representations to both public and private sector institutions in all the groups.

These groups prepared detailed guidelines which were discussed among some members of the groups in mid-2012 and it was suggested that the detailed reports needed to be summarized. There was debate over the actual use of these guidelines and it was suggested that IASG should make an effort to collect data so that India-specific guidelines related to the antibiotic of choice in our clinical scenario may be prepared. Hence, one of the members was requested to prepare a questionnaire to gather appropriate data for this purpose. The questionnaire is available as a separate PDF.

A summary of the guidelines prepared by the three groups is provided below

Guidelines

Prophylactic antimicrobial therapy

1. A single preoperative dose of antibiotic is sufficient; there is no evidence for postoperative prophylactic antibiotic.
2. Antibiotics are repeated if the duration of operation is >4 hours or if blood loss is >1 litre (except vancomycin, aminoglycoside, fluoroquinolone).
3. Prophylactic antibiotics should be administered within 1 hour prior to incision.

1. Clean operation with or without use of prosthetic implant (hepatectomy, hydatid cyst liver without biliary communication, splenectomy, porto-systemic shunt operation)

Recommendation: Inj Cefazolin 1 g i.v. or Cefuroxime 1.5 g i.v.

2a. Clean contaminated operation (cholecystectomy laparoscopic and open, gastrojejunostomy, gastrectomy, jejunal resection anastomosis, distal pancreatectomy, pseudocyst gastrostomy, pseudocyst jejunostomy, low risk perforated peptic ulcer)

Recommendation: Inj Cefazolin 1 g i.v. or Cefuroxime 1.5 g i.v. (evidence for prophylactic antibiotic in low risk laparoscopic cholecystectomy is thin)

2b. Clean contaminated operation (operation where upper aerodigestive tract is open, including oesophageal operations or gastric outlet obstruction)

Recommendation: Inj Cefazolin 1 g i.v. + Inj Metronidazole 500 mg i.v.

3. Contaminated operation (colectomy, obstructed biliary tract, choledocholithiasis)

Recommendation: Inj Cefazolin 1 g i.v. or Cefuroxime 1.5 g i.v. + Inj Metronidazole 500 mg i.v. + Inj Gentamicin at 4-5 mg/kg body weight i.v. OR Amikacin 15 mg/ kg ideal body weight i.v. (alternative: clindamycin + metronidazole)

Appendicectomy (laparoscopic or open) for non-perforated acute appendicitis

Recommendation: Cefazolin 1 g i.v. or Cefuroxime 1.5 g i.v. + Inj Metronidazole 500 mg i.v.

4. Dirty (faecal peritonitis, anastomotic leakage)

Antibiotics are not ‘prophylactic’ here. The wound may be left open. Choice of antibiotics will depend on whether organ dysfunction is present or not. Specimens for culture and sensitivity should be taken at operation. If organ dysfunction is present ‘high end’ antibiotics will be chosen initially and ‘scaled down’ once culture/sensitivity results are available (see therapeutic antibiotics).

Therapeutic antibiotics: Suggested guidelines for surgical sepsis

1. Confirm INDICATION for antibiotic therapy (confirmed or suspected intra-abdominal infection):
    a. Septic shock—along with fluid and pressor resuscitation
    b. Stable patient with obvious source of infection—along with intervention to control this source
    c. Clinical indicators of possible infection, origin unclear—Take appropriate microbiological samples. If index of suspicion low, check if patient clinically stable enough to wait for these reports; if not start empirical therapy.
    d. If a culture is positive and patient has no features of infection—consider if it could represent colonization rather than true infection.
    e. Early trauma (<12 hours); proximal (e.g. gastroduodenal) perforation <24 hours–may not be infected if repaired, and only prophylaxis is indicated.
2. SOURCE CONTROL: Laparotomy/Laparoscopy/Percutaneous drainage. Selected stable cases with minimal contamination and no systemic features of sepsis may be suitable for management without source control.
3. Choice of ANTIMICROBIAL AGENT. Consider:
    a. Likely organisms for that site
    b. Allergies/contraindications, cost
    c. Previous antimicrobial therapy
    d. Likelihood of reaching infected site at adequate concentration, e.g. prefer cefaperazone sulbactam for contaminated biliary surgery/stented patients to extended spectrum penicillins as higher concentration in bile.
    e. Don’t use the same drug used for peri-operative antibiotic prophylaxis. Also don’t continue prophylactic drug beyond prophylactic dosage even if there is fever or leucocytosis! If the clinical impression of postoperative sepsis is strong, take appropriate cultures and start a different, appropriate therapeutic drug.
    f. Consider antifungals in tertiary sepsis or prolonged antibiotic use
    g. Anaerobic cover for sepsis of distal GI origin, and in obstructed proximal cases.

4. DRUG measures
    a. Dose: appropriate for severity, site, patient age, ideal weight, organ dysfunction
    b. Initiation: in 1 hour in septic shock after fluid resuscitation; within 8 hours if stable and no organ dysfunction.
    c. Duration: as clinically indicated. Daily review of need for antibiotics on consultant rounds.
    d. Change of drug: not in <48 hours, unless rapid clinical deterioration.
    e. Change when culture reports are available: Step down versus step up approach—former for the sickest patients—once clinical improvement occurs, a narrower spectrum can be chosen. Also shift to oral therapy when possible. Likewise in a stable patient, if not improving step up based on culture reports.
5. GENERAL measures
    a. Antibiograms for hospitals should be obtained periodically (at least 6 monthly)–can be obtained from collective positive culture reports from sterile sites (e.g. Blood, cerebrospinal fluid, needle aspirates, etc.) to identify local sensitivity patterns. Ideally this should be stratified for noscomial infections and community acquired. We must collect and collate a nationwide database of antibiograms
    b. Antibiotic stewardship should be encouraged with auditing or restricting of higher antibiotics after recorded justification to hospital pharmacy. Keeping aside a set of antibiotics for reserve use only would also be useful, e.g. use of linezolid in vancomycin sensitive organisms (for ease of oral administration!) may induce VRE and MRSA/VRSA resistant to linezolid.
    c. Antibiotic cycling: Drugs that are known to have resistance for many important and common pathogens should be discontinued in the hospital but the sensitivity should continue to be checked and once regained can be cycled again, e.g. after 3 years.
    d. In treatment failure: look for source failure AND extra-abdominal candidate sites PLUS cultures.

6. SPECIFIC DRUGS (Suggested from western guidelines, but should be gradually collated from our own prospectively collected antibiograms)

Condition	Aetiology (likely pathogens)	Antibiotics	Comments
Mild–moderate infections (community acquired) Cholangitis Peritonitis Intra-abdominal abscess	Enterobacteriaceae Enteric Streptococci Anaerobes	Cefazolin/cefuroxime/fluoro-quinolone + Metronidazole	Antibiotics should be continued until resolution of clinical signs of infection, including normalization of temperature and white cell count count; return of GI function
High risk: community acquired or nosocomial	Same/broader spectrum/resistant	Piperacillin-tazobactam/ Cefoperazone-sulbactam/Cefepime	Carbapenems or colistin may be required in nosocomial
Acute cholecystitis	Often inflammatory non-infectious; if infection, antibiotics for Enterobacteriaceae	Same as above	
Appendicitis	Enterobacteriaceae Anaerobes	Cefazolin/cefuroxime/ fluoroquinolone + Metronidazole	If operated, can be discontinued early
Amoebic liver abscess	E. histolytica	Metronidazole 800 mg i.v. tid/800 mg p.o. tid x 5 days, followed by Diloxanide furoate 500 mg p.o. tid x 10 days	US guided drainage in large abscesses, signs of imminent rupture and no response to medical treatment
Necrotizing pancreatitis	Enterobacteriaceae Enteric Streptococci	Carbapenems 3rd/4th generation cephalosporins Quinolone with metronidazole	No role for prophylaxis. Antibiotics to delay surgery >3 weeks. Change as per sensitivity of culture.

Treatment of selected specific pathogens, especially in healthcare associated infections

MRSA (Methicillin resistant *Staphylococcus aureus*): Vancomycin or Teicoplanin are drugs of choice. Linezolid for SSIs. Mupirocin nasally to eradicate carriers and 4% chlorhexidine baths/ wipes.
Fluoroquinolones, Aminoglycosides, Chloramphenicol, doxycycline not used, even if *in vitro* sensitivity.

Enterococcus
Amoxycillin, Piperacillin-Tazobactam or Vancomycin, depending on sensitivity report. If Vancomycin resistant – Linezolid

Fungal sepsis
Fluconazole for Candida albicans or for prophylaxis.
Fluconazole resistant Candida and critically ill (with species undefined)–liposomal amphotericin or echinocandin (caspofungin, micafungin, anidulafungin)

ESBL (Extended spectrum Beta lactamase producing) Klebsiella and E. coli:
Piperacillin tazobactam/cefoperazone-sulbactam or carbapenems– based on sensitivity. Other beta lactams (including cefipime, cefpirome) and aztreonam may be ineffective, even if *in vitro* shows susceptibility

NDM (Carbapenem resistence) is an emerging problem. Colistin to be added in appropriate dosage following a loading dose. ID consultation essential.

Examples of hospital antibiograms:

ANTIBIOGRAM 2011
Gram Positive Cocci
Percentage Susceptibility

Sample :All
Department :All
Isolates :All

	Staphylococcus aureus	*Beta haemolytic Streptococci*	*Coagulase negative Staphylococcus*	*Streptococcus* spp.	*Streptococcus pneumoniae*	*Enterococcus faecalis*	*Enterococcus* spp.
No of Isolates	2033	174	1458	661	35	1227	393
Penicillin G 10 units	0*	90*	14*	08*	79*	52	24*
Cloxacillin/Oxacillin 1mcg	60#		11#			85	NE
Ampicillin/amoxicillin 10mcg	*	*	*	*	*	52	24*
Ampicillin – sulbactam 10/10mcg	#		#	*	*	14	*
Amoxicillin clav 20/10mcg	#		#	*	*	50	*
Piperacillin 100mcg	*					17	*
Vancomycin 30mcg	100	98	100	99	100	99	95
Clindamycin 2mcg	01	94	65	80	98	0	NE
Teicoplanin 30mcg	100	100	100	-	-	00	98
Gentamicin 10mcg	00		00	*	*	28	SYN
Amikacin 30mcg	87		07	-	-	30	
Netilmicin 30mcg	100		60	0		20	
Tobramycin 10mcg	00		68				
Ciprofloxacin 5mcg	01	80	07			23	13
Ofloxacin 5mcg	80		68			33	
Levofloxacin 5mcg		98		98	97	33	15
Cefuroxime 30mcg (2)	*		*	*	*	0	NE
Cefoxecine 30mcg (3)	*		*	*	*	2	NE
Ceftriaxone 30mcg (3)	*	*	*	*	*	1	NE
Cefoperazone 75mcg (3)	*	*	*			0	NE
Ceftazidime 30mcg (3)	*		*			0	NE
Cefepime 30mcg (4)	*	*	*	*	*	20	NE
Chloramphenicol 30mcg	99	98	99	99	100	78	98
Co - trimoxazole 25mcg	90	85	67	70	38	NE	NE
Pip - tazobact 100/10mcg	#		#			87	*
Cefo – sulbact 75/30mcg	#	*	#	*	*	50	NE
Meropenem 10mcg	#	*	#	*	*	50	83
Tetracycline 30mcg	95	81	69	92	100	83	73
Linezolid 30mcg	100	100	100	100	100	100	100
Erythromycin 15mcg	47	70	28	89	11	11	17
Tigecycline 15mcg	00	100	100	100	00	00	00

The antibiotic with a symbol like *or # served as the class representative for all marked with the same symbol
NE – Not effective clinically.
Aminoglycosides are not effective against Enterococcus when used alone
However they exhibit synergistic effect with penicillin, Ampicillin or Vancomycin
SYN- Synergy only for G+ve

ANTIBIOGRAM 2011
Gram Negative Bacilli
Percentage Susceptibility

Sample :All
Department :All
Isolates :All

	Acinetobacter spp.	*Escherichia coli*	*Enterobacter* spp.	*Klebsiella* spp.	*Pseudomonas aeruginosa*	*Pseudomonas* spp.	*Salmonella Typhi*	*Salmonella* spp.*
No of Isolates	962	4266	766	3451	2105	28	61	36
Ampicillin/amoxicillin 10mcg		10	6				89	97
Ampi-sulbactam 10/10mcg	24	22	25	21				
Amoxicillin - clav 20/10mcg		12	6	6				
Piperacillin 100mcg	20	24	36	25	76	61		
Gentamicin 10mcg	22	51	49	42	50	55		
Amikacin 30mcg	24	92	78	80	61	72		
Netilmicin 30mcg		87	62	66	70			
Tobramycin 10mcg^	33	53	57	37	64	45		
Nalidixic acid							10^	36
Ciprofloxacin 5mcg	19	20	50	37	47	54	85	94
Ofloxacin 5mcg		24	56	43	47	56	92	94
Levofloxacin 5mcg	51	47	66	50	49	65	98	94
Cephalothin 30mcg (1)		22	12	20				
Cefuroxime 30mcg (2)		29	29	23				
Cefotaxime 30mcg (3)	25	20	20	24	0		100	100
Ceftriaxone 30mcg (3)	12	28	36	26	23		100	90
Cefoperazone 75mcg (3)		28	35	25	51	37		
Ceftazidime 30mcg (3)	16	29	38	26	57	65		
Cefepime 30mcg (4)	12					13		
Chloramphenicol 30mcg		89	70	73	NE		93	100
Co – trimoxazole 25mcg	27	35	45	36			89	100
Pip –tazobact 100/10mcg	28	80	70	66	80	67	100	97
Cefo –sulbact 75/30mcg	40	90	71	66	68	57	100	100
Meropenem 10mcg	29	95	81	86	82	75	100	100
Aztreonam 30mcg	40	60	100	70	62	79		
Tetracycline 30mcg	36	35	54	46	19	56		
Tigecycline 15mcg	69	91	60	57		0	0	
Imipenem	44	87	70	80	83	72	100	100
Ertapenem	20	77	50	72	61		100	100
Colistin 10mcg	98	94	93	95	97	100	100	100

NFGNB .038 isolates not further speciated. Hence antibiogram cannot be depicted
*Salmonella other than *Salmonella typhi*
^Fluoroquinolone susceptible strains of Salmonella that test resistant to Nalidixic acid may be associated with clinical failure or delayed response in fluoroquinolone – treated patients with extraintestinal salmonellosis.
NE Not Effective clinically.

"Other important issues in Intra-abdominal infections"

Summary

The following is a summary of Guidelines suggested concerning 'Other important issues in Intra-abdominal infections' (other than prophylactic and therapeutic usage of antibiotics) formulated as a part of the set of recommendations for prevention of intra-abdominal infections. The areas covered include

1. Aseptic techniques that are performed immediately before and during a clinical procedure
    - Hand washing
    - Using barriers (surgical attire)
    - Patient prep (preparing a patient for clinical procedures)
    - Maintaining a sterile field
    - Using safe operative technique

2. Maintaining a safe environment in the surgical/procedure area
    - Operating theatre with HVAC (Heating, Ventilation and Air Conditioning) and Laminar air flow
    - OT cleaning schedule
    - Disinfection of instruments and equipment
    - Management of biomedical waste

1. Aseptic techniques that are performed immediately before and during a clinical procedure
    - Hand washing
        - Hands must be decontaminated immediately before every episode of direct patient contact/care and after any activity or contact that potentially results in hands becoming contaminated.
        - Surgical hand wash using one of the following three modalities is recommended before donning sterile gloves when performing surgical procedures.
            - an alcohol-based hand rub with persistent activity
                - 0.5% w/v Chlorhexidine gluconate in 70% v/v Ethyl alcohol (Microshield hand rub) or
                - Propan-2-ol 45.0 g, propan-1-ol 30.0 g, mecetronium etilsulfate (Sterillium) or
            - an antimicrobial detergent hand wash
                - 4% Chlorhexidine [eg. Microshield-4]
                - 7.5% Povidone Iodine [eg. Microshield-PVP]
            - a traditional two-stage surgical hand-wash using both

- Using barriers (surgical attire)
  - All healthcare workers need to wear gloves before undertaking any sterile procedure
  - Consider wearing two pairs of sterile gloves when there is a high risk of glove perforation and the consequences of contamination may be serious.
  - Double gloving is beneficial especially when the patient has a transmissible virus and when procedures last more than 2 hours.
  - Decisions regarding the use of scrub suits should be made by each facility, after weighing the costs (purchase, replacement, laundry) and practicality (storage, availability of changing areas) against any potential benefit.
  - A waterproof apron should be worn under the gown during procedures in which large amounts of blood and other body fluids are likely
  - When wearing the mask, care should be taken to see that the nose, mouth and facial hair are well covered.
  - Masks should be changed at least every operating session and whenever moist and should never be worn around the neck.
  - Eye wear should be worn during procedures likely to generate splashes or sprays of blood and body fluids that could lead to contamination of the eyes.
  - Sturdy footwear must be worn in the operating theatre. Acceptable footwear includes rubber or leather boots or shoes. Sandals, other open shoes, and bare feet are not recommended. There is no scientific evidence to support the use of shoe covers as a means of reducing the risk of infections in patients.
  - Staff wearing non-sterile theatre wear should keep their movements in and out of the operating area to a minimum.
  - The operating team should remove hand jewellery, artificial nails and nail polish before operations.
- Patient prep (preparing a patient for clinical procedures)
  - The skin at the surgical site must be prepared immediately before incision using an antiseptic (aqueous or alcohol-based) preparation:
    - Povidone-iodine or
    - Chlorhexidine are most suitable
  - Do not use mechanical bowel preparation routinely to reduce the risk of surgical site infection
  - There is no evidence to use patient nasal decontamination with topical antimicrobial agents aimed at eliminating *Staphylococcus aureus* routinely to reduce the risk of surgical site infection
- Maintaining a sterile field
  - Mechanical irrigation of the wound and abdominal cavity with sterile saline warmed to 37^{o}C is recommended to reduce postoperative infection

- Using safe operative technique
  - Use an aseptic non-touch technique for changing or removing surgical wound dressings.
  - Use of sterile saline for wound cleansing up to 48 hours after surgery is acceptable. Patients may shower safely 48 hours after surgery.
  - Use clean tap water for wound cleansing after 48 hours if the surgical wound has separated or has been surgically opened to drain pus is permissible

2. Maintaining a safe environment in the surgical/procedure area
   - Operating theatre with HVAC (Heating, Ventilation and Air Conditioning) and Laminar air flow
     - HVAC systems should not be shut down
     - Limit the number of people who enter these areas.
     - Close all doors during all procedures. Sliding doors are preferred as movement of swinging doors creates turbulence and adds to the microbial burden.
     - All personnel who enter surgical areas should wear clean clothes, mask, a cap and foot wear
   - OT cleaning schedule
     - Before the start of the first case wipe all equipment, furniture, room lights, suction points, OR table, surgical light reflectors, other light fittings, all horizontal surfaces with 2% Bacillocid solution. This should be completed at least one hour before start of surgery.
     - After each case and at the end of the day, Spills, Biomedical waste, Linen and Gloves, Instruments and the Environment should be cleaned as recommended
   - Disinfection of instruments and equipment
     - Sterilize or disinfect based on the intended use of the item as per Spaulding's classification
     - Use of OPA rather than glutaraldehyde (Cidex) to prevent atypical mycobacterial infection. Strict adherence to concentration and time of exposure for equipment.
   - Management of Biomedical waste
     - Follow the Biomedical Wastes (Management & Handling) Rules, 1998 as contemplated under Section 6, 8 and 25 of the Environment (Protection) Act.