Child India

Monthly e-Newsletter of Indian Academy of Pediatrics

January
2023

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CONTENT

Editor's Note

Dear friends,

New year greetings to you all through the 1st issue of Child India for 2023.

On behalf of all of you we congratulate Dr Remeh Kumar and Team IAP 2022 for all the good work done and wish IAP President 2023, Dr Upendra Kinjawadekar and his team - HSG Dr Vineet Saxena, OB and EB 2023 who have together, under the able leadership of our energetic IAP President, started work in full earnest to ensure that the IAP flag flies high. We also congratulate Dr Basavaraj GV IAP President Elect and wish him the very best.

We are proud of our IAP stalwarts who have been honoured with Padma Awards this year for the service they have rendered over the years for the children of our country and the world over.

Dr Dilip Mahalanabis is awarded the Padma Vibhushan, the second highest civilian award, posthumously for his work on ORS - He kept large drums of ORS by his side for family members to administer to patients with diarrhoea; this intervention brought cholera fatality among the 1971 Bangladesh war refugees down from 30 percent to 4 percent.

Prof Dr IC Verma (Genetics), Dr Hanumantha Rao (Developmental Pediatrics) and Dr Nalini P (her dedication to helping people with hemophilia) were honoured with Padma Shree. IAP OB, thanks to our President Dr Upendra and HSG Dr Vineet Saxena, organised a zoom meeting to felicitate our heroes and we were blessed by their presence, their passionate address and their messages to IAP members.

This issue of Child India focuses on IAP Drug Formulary (IAP DF) recommendations for administration of drugs in children. IAP DF, only the 2nd exclusively pediatric drug formulary in the world, with its mobile app, desktop version, pocket dose book (7th edition) and textbook, is a wholesome product with recommendations for drug treatment of all illnesses contributed by experts from the respective IAP Sub Chapters and drug monographs of 626 medications used in neonates, children and adolescents. The 6th hard copy edition of the IAP DF (IAP DF 2024) is in the process of being formulated for release at Pedicon 2024 in Kochi. All IAP members could avail of 1 free IAP DF mob app key on registration at the website www.iapdrugfomulary.com.

Wishing all dear friends a Happy 2023.

Dr Jeeson C Unni
Editor-in-Chief

President's Address

Dear friends,

Wishing you and your family a very happy and healthy 2023! The first issue of Child India this year is on ADMINISTERING DRUGS IN PEDIATRICS. Writing a correct prescription is least time consuming after a thorough clinical examination and performing relevant investigations. But explaining the parents of dos and don'ts while administrating the medicine to the sick child is a daunting task, not because it is time consuming but we are also worried about parents' level of understanding the differences in different preparations. E.g., paracetamol one of the commonly prescribed medicines comes in 100mg/ml drops to 500mg/5ml syrups form. What would happen that instead of 0.5 ml drops parents give 5 ml of 500mg syrup to an infant? Such errors are definitely not uncommon.

Preventive and curative medicines for asthma need much more explanation if we really want good compliance for them. Giving medicines with food/before food, preparing dry powder antibiotic preparations into fresh solutions, intranasal or ophthalmic drops have their own challenges. Even in a hospital setting IV/IM/SC injections, blood products etc. definitely need careful attention by the doctors as well as nursing staff.

One of the key components of IAP action plan 23 is releasing Good Practices guidelines. I'm very happy that our senior SZ VP Dr Jeeson Unni has already started with it by incorporating it in the first issue of Child India.

My most sincere thanks to the Editorial team of Child India led by Dr Jeeson Unni for putting so much efforts in bringing out this wonderful periodical which has become immensely popular amongst all our members.

Do send your feedback and valuable suggestions

Happy reading

Dr Upendra Kinjawadekar
National President 2023
Indian Academy of Pediatrics

Secretary's Message

Dear Friends,

"No one can whistle a symphony. It takes a whole orchestra to play it."

January is the month of planning activities to be implemented in the year 2023. I am extremely happy to inform you that this month had a pleasant start with the Office Bearers Meeting held on 8th January 2023 at CIAP office. All Office Bearers were warmly welcomed at CIAP Office by HSG Dr Vineet Saxena.

Also, on the 15th and 16th of January 2023, we held a meeting of the Executive Board for 2023. Various activities for the health and welfare of the child were discussed in this meeting, and some decisions have been taken in this regard. I thank all Office bearers and Executive Board members for their active participation and fruitful discussion in the best interest of child health. We have also successfully conducted meeting of Indian College of Pediatrics, UG & PG Quiz Committee, ECD Committee in the month of January 2023.

As you all know, our Iconic 60th Pedicon and 30th IPA Congress 2023 is barely a month away, and all our various committee members are enthusiastically on the responsibility shouldered to them for this event. We appreciate the spirit of each team member. The teamwork displayed by them is exemplary and commendable. We appreciate the performance of all our team and are sure that their active participation will make this mega event a great success.

Along with this, Indian Academy of Paediatrics conducted workshops on the following modules under the Presidential Action Plan 2023. 2 of Demystifying Allergic Disorders (DAD) & 2 of Perinatology - Caring both ends of the Cord.

Regarding the ECD, A total of 117 workshops of ECD have been done to date and 4 workshops of ECD in January 2023. This month total of 87 Basic NRP and 7 Advanced NRP provider courses have been successfully conducted.

Have a wonderful Republic Day. Celebrate the day by educating your children on the history of Indian independence and our national heroes.

On behalf of IAP, I urge you to organize various activities in the best interest of the health and welfare of the country's children.

Long Live IAP, Jai IAP

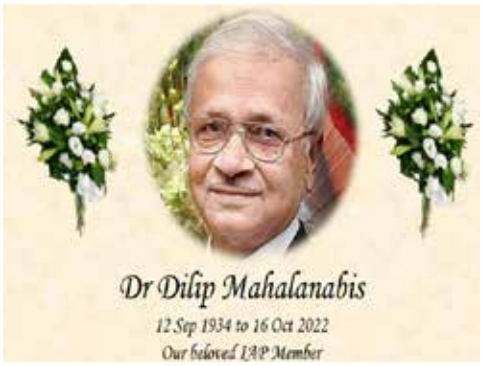
In service of Academy,

Dr Vineet Saxena
Hon. Secretary General 2022 & 23

Congratulations to "PADMA" Awardees

PADMA VIBHUSHAN POST HUMOUS 2023

DR DILIP MAHALANABIS



Dr Dilip Mahalanabis, an illustrious Indian Scientist, compassionate doctor and a humble and kind human being who saved millions of lives thought ORS. He was a medical graduate from CMC and joined in the Department of Pediatrics in 1958.

PADMASHRI 2023

DR I C VERMA

Dr. I. C. Verma, FRCP (Lond), FAAP (USA), FAMS (India), FIAP (India)

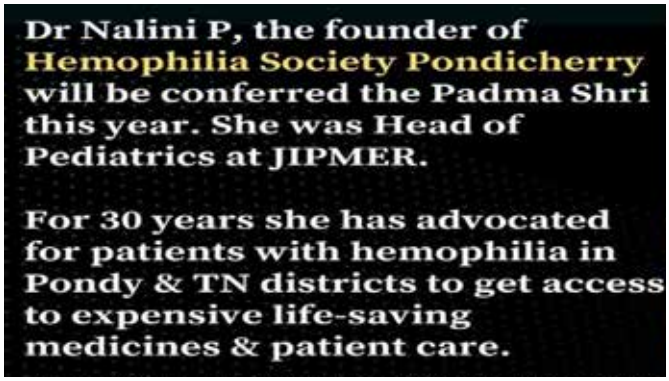
Professor and Senior Consultant Adviser, Institute of Medical Genetics and Genomics,
Sir Ganga Ram Hospital, Rajender Nagar, New Delhi.

DR. P. HANUMANTHA RAO

Dr. P. Hanumantha Rao, M.D. (Ped), Ph.D (Psychology), CPM. F.I.C.A. (USA), F.I.A. M.S., D.N., F.I.A.P., F.I.M.S.A., F.I.C.G.P.

Specialist in: Developmental Pediatrics, Rehabilitation Medicine & Psychology

DR.P.NALINI



President's Engagements

President's Engagements

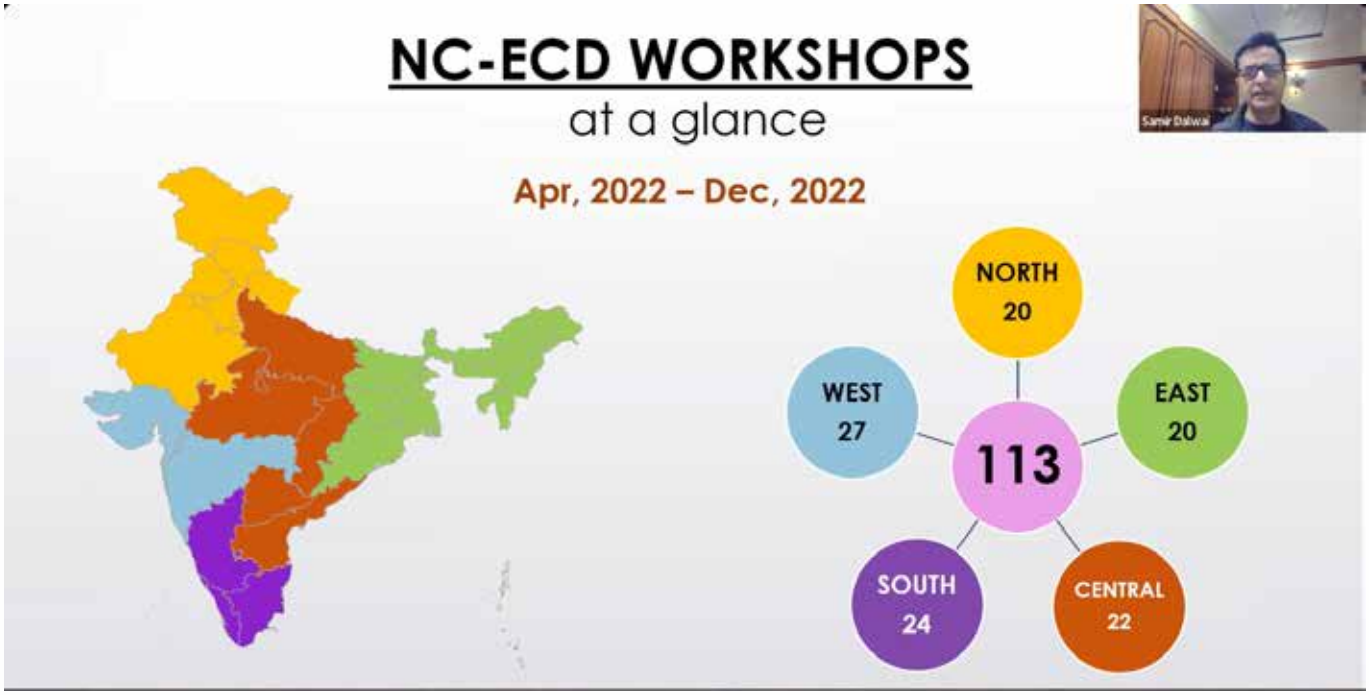
First Ex Board meeting (Online)

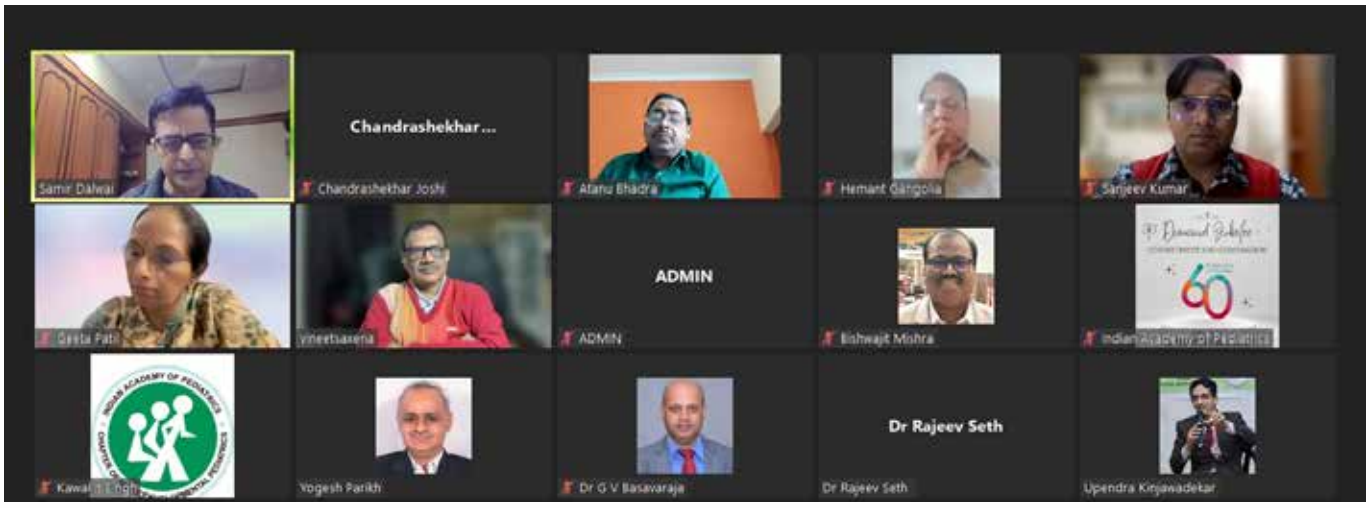
First IAP 2023 OB meeting at IAP House, Mumbai on Jan 8th 2023

First IAP 2023 OB meeting at IAP House, Mumbai on Jan 8th 2023

ICP Meeting

ECD Review Meeting





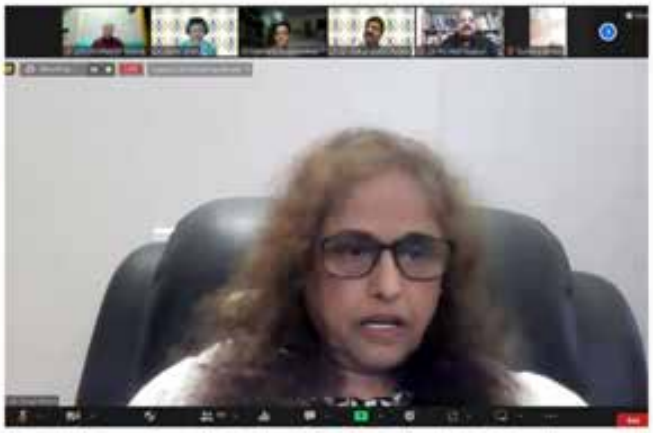
President's Engagements

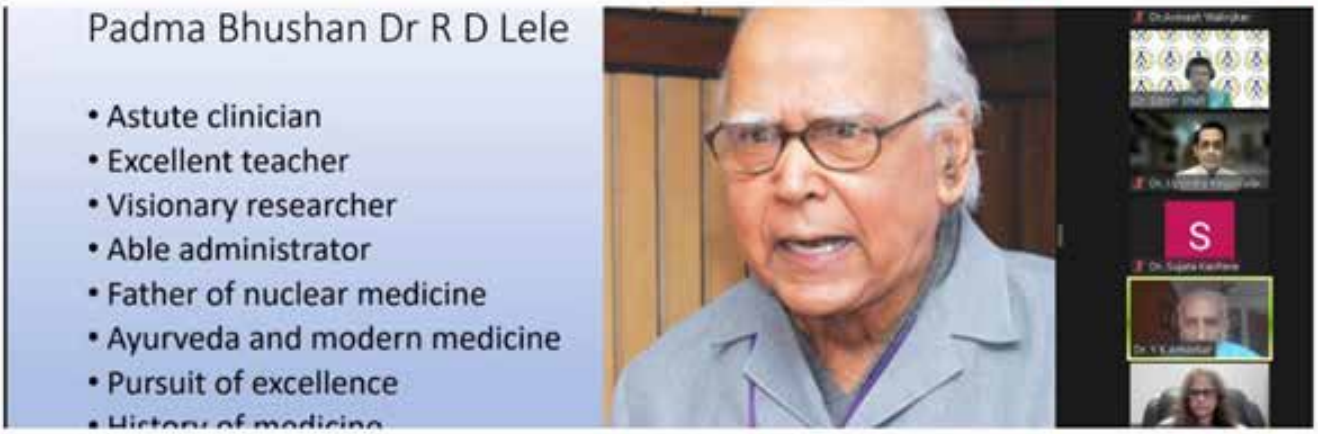
Attended the inauguration as well as participated in the scientific sessions of the ever popular and in demand flexible bronchoscopy workshop at KKCTH Chennai. Amazing commitment and dedication of Dr L Subramanyam, Dr Vijaysekaran Sir, medical director of the institute Dr Ramesh and Dr Janani Sankar makes this week long training workshop the most sought after in the country.

President's Engagements

Latur IAP organised Marpcon on 21/22 Jan which was immensely successful conference attended which had very well designed scientific program and was well attended by over 600 delegates Dr Ashok Aradwad, Dr Sandipan Sabde, Dr Shivprasad Mundade, Dr Jiten Jaiswal, Dr Nitin Yellikar under the able guidance of Dr Girish Maindarkar put up a memorable experience for everyone

President's Engagements





On 22nd it was indeed a divine pleasure listening to Dr YK Amdekar Sir delivering Padmabhushan Dr RD Lele Oration! I'm sure all of you experienced it

President's Engagements

Snippets from IAP Drug Formulary

ADMINISTERING DRUGS IN PEDIATRICS

Children need different types of formulations as compared to adults. Similarly, the way oral drugs can be administered in adults is quite different from that in children. Even, the pediatric population does not represent a homogeneous population. Infants require drops, while young children require liquids and dispersible tablets and adolescents can be expected to take tablets and capsules. Much more care is required to be taken while administering intravenous (IV) fluids to neonates and infants, as they require smaller volumes of fluids to be given over longer durations.

Issues regarding medications for children 1:

1. Administering oral liquid medications to infants and young children is a challenge and the doctor should educate the caregiver in this regard.

2. Doctors should clearly explain the indication dose and frequency of administration of each and every prescribed drug. It is also worthwhile explaining the time it might take for the clinical response to appear. This would help scale down the parental expectations to realistic levels and would enhance compliance. In addition to the expected drug effect, the caregivers should educate guardians about the side effects.

3. Children are extremely choosy about taste and recognize even minor alterations in taste when a medicine is mixed in food for administration.

4. Forcing a medicine down the throat of an angry and reluctant child heightens the child□s resistance to having any medicine.

5. Formulations which are not appealing to children (e.g., due to initial bad taste, its odor or color) also add to child's reluctance. Religious, cultural, local and personal beliefs are often important determinants of medication acceptance.

6. Non-availability of sugar-free liquid/ dispersible medicines in the child prone to caries.

7. A pediatrician should be able to tackle each of these above-mentioned issues. Reinforcement and elaboration of the physician's instructions by the pharmacist and other members of the health-care team are important. Proper education of the parents, grandparents and the adolescent child regarding the prescribed medications including the need to report red flag signs may improve compliance, increase the possibility of reporting concerns during treatment and decrease chances of discontinuation of therapy.

ROUTES OF ADMINISTRATION

Medicines vary in form and are given by different routes.

1. By mouth

- Liquid Solutions, suspensions, syrups, elixirs, emulsions and oils.
- Solid Tablets, capsules, granules and lozenges.

2. Inhaled Metered-dose inhalers (MDI), powder devices and compressed air nebulizers

3. Into the ear - Solutions, suspensions, drops and ointments.

4, Into the eye Solutions, suspensions, drops, and ointments.

5. Into the nose Solutions, suspensions, drops, ointments, and sprays.

6. On the skin Solutions, suspensions, drops, ointments, sprays, creams, lotions, pastes, powders, shampoos and soaps.

7. In the mouth Lozenges, chewing gum and sublingual tablets (rarely).

8. Injected Water solutions, suspensions, and oil in water emulsions, depending on the route - subcutaneous (SC), intramuscular (IM), IV, intrathecal or intraosseous (IO).

9. Into the rectum Enema, suspensions, oils, suppositories and ointments.

Oral Administration Liquids:

Though a child less than 5 years of age would swallow or chew on solids, they cannot be forced upon to take tablets. Older children also often prefer liquids. Taste, as mentioned earlier, is a factor that determines compliance with liquid formulations. Taste (unpleasant or otherwise) may be masked by adding acceptable flavoring agent or by mixing them in foods or drinks that the child likes. There is always the possibility that a child could recognize the change in taste of the foodstuff thus served and refuse any further feeds thinking the medicine would be added again. The dosage and absorption of medications may also be affected when it is mixed with food. It is important to check literature including drug monographs to ensure that mixing with food does not affect absorption/bioavailability of the drug and advice accordingly. As a general rule, it is advisable to avoid mixing drugs in feeding bottles.

Excipients are added to liquid medications to provide stability and taste. Preparations containing sugar, salt and alcohol need to be identified. Permissible alcohol content in medication intended for adults and children less than 12 years, 6-12years and more than 6 years is 10%, 5%, and 0.5%, respectively. Sugar-free preparations are preferable. The amount of lactose in most medications is too small to produce any symptoms in those with primary or secondary disaccharidase deficiency. Nevertheless, the lactose-containing preparations need to be administered cautiously to children with severe lactose intolerance. The child may be occasionally sensitive to oils used as emulsifiers. Propylene glycol is generally considered safe but large amounts can cause lactic acidosis, if its elimination is impaired, e.g., in renal failure, in neonates and young children, and in slow metabolizers. It may interact with metronidazole.

There are several different ways to get the medicine down the hatch. Deciding which one can depend on your baby's age, his feeding style, and the medicine itself. Here are the options: A calibrated syringe: This method gives you the most control. Insert the syringe between baby's gum and cheek, which will make it harder for her to spit the liquid out. This syringe is different from medication syringe. This can be used for giving medications as well as feeding the young infants. There is always an issue of availability everywhere and cost also.

Baby's bottle:

Detach the nipple with its collar from baby's bottle and let baby suck on it; then use a syringe to squirt medicine into the nipple. As baby sucks, He or she will swallow the liquid. This is commonly used for the bottle feeding the infants and young children.

Medicine dropper:

When using a medicine dropper, it will help to have the baby sitting up with his head tilted

back so the medicine can go straight down the mouth. Use an infant seat for kids younger than 9 months, or sit an older baby in his stroller or high chair. It is available as 1ml calibrated dropper, provided with most of medicinal syrups/drops/ suspensions. It is useful in giving the smallest quantity of medicine to be given like 0.1 ml to 1ml. Dosing cups and ounce glasses: They are also a handy way to give liquid medicines. However, dosing errors have occurred. It is good to check whetjher the units (teaspoon, tablespoon, mL, or cc) on the cup match the units of the dose you want to give.

Spoon:

Hold the spoon up to fill it, then tilt it down and let your child drink the medicine off the spoon's end. One teaspoon having the capacity of 5ml is generously available in most of the places. For kids who are 1 year or older, try a hollow-handled medicine spoon. One tablespoon can accommodate 15ml liquid, may be used in adolescents and adults. Be careful about the selecting the spoon as they have sharp edges which may cause oral trauma in children. However, spoons are a last option as they are available in various shapes and volumes and one cannot be absolutely sure of the quantity the baby actually gets, Liquids are limited by their short shelf life. Powders for suspension are affected by humidity and need to be mixed with sterile fluids.

Tablets:

Tablets are cheaper than most other preparations; one can carry them around easily, and they are stable. It is generally felt that children in the school-going age can swallow tablets. However, there are exceptions to the rule and many are uncomfortable with swallowing tablets even till adolescence. A liquid chaser could follow immediately after the tablet is swallowed. Most tablets can be crushed and most capsules may be emptied to make a suspension in something acceptable to the child. But crushing certain tablets to mix them with food or water may change the rate or extent of drug absorption and its efficacy, e.g., drugs like lopinavir/ ritonavir used in antiretroviral therapy. Crushing drugs with a narrow therapeutic index, such as levothyroxine, could also result in considerable variability between doses. It is not advisable to break or crush slow-release or enteric-coated tablets. When cutting a tablet, it is necessary to follow specific instructions on the process, including the proper use of a tablet splitter. And whatever method is used to cut or crush a tablet, it is near to impossible to provide an accurate dose where small doses are required as in the neonate, infant or small sized toddler. Splitting tablets are easier when scored tablets are available. Tablets that melt on the tongue in a small amount of saliva or the tablets that can be dispersed in a small amount of liquid on a spoon are easy to administer and ensure accurate dose provided their taste is acceptable. Sublingual administration of drugs is difficult to young children. It is definitely not advisable to open a capsule and administer the powder, If the reason for having a capsule formulation is to avoid its degradation or neutralization by gastric juices. Advances in pharmaceutical technology have resulted in the development of many different types of tablets, those that melt in the mouth; chewable and or dispersible tablets and films.

Inhalational Route

For respiratory ailments, administering medicines through inhalation is the most logical method of delivering medicines directly to the

IAP DRUG FORMULARY
IAP Recommendations On Drug Therapy For Pediatric illnesses
Project of the Computer and Medical Informatics Chapter (IAP CMIC)
Publication of Indian Academy of Pediatrics
IAP Presidential Action Plan 2004

Snippets from IAP Drug Formulary

Medications which should be taken on an empty stomach

Alendronate	Ampicillin	Astemizole	Bethanechol
Bisacodyl	Captopril (Take 1 hour before meals)	Dicloxacillin	Didanosine
Etidronate	Indinavir	Lansoprazole (take before eating)	Levothyroxine
loratadine	Methotrexate	Mycophenolate	Omeprazole (take before eating)
Penicillamine	Rifampin	Roxithromycin (take at least 15 minutes before or after a meal)	Sucralfate
Co-trimoxazole	Sulfadiazine	Tetracycline (Do not take with milk or other dairy products)	Zafirlukast

Medications which should be taken with food

Allopurinol (take after meal)	Atovaquone	Amoxycillin +clavunic acid	Aspirin
Amiodarone	Baclofen sodium	Clofazimine	Carvedilol
Carbamazepine	Cefpodoxime	Chloroquine	Cimetidine
Diclofenac	Doxycycline	Felbamate	Fenofibrate
Fludrocortisone	Griseofulvin	Hydrocortisone	Hydrochloroquine
Indomethacin	Iron preparations (Take in-between meals if GI upset, take with food)	Itraconazole capsules	Ketoconazole
Lithium	Metronidazole	Misoprostol	Mebendazole
Methylprednisolone	Naproxen	Nitrofurantoin	Niacin
Piroxicam	Potassium salt	Prednisolone	Procainamide
Ritonavir	Saquinavir	Spironolactone	Sulfasalazine
Valproate sodium			

lungs, the target organ. The dose required to achieve the necessary drug levels in the lungs is minuscule when this method is used and hence, the side effects (both local and systemic) are also minimal. These advantages need to be explained to the caregivers and the adolescent patient, to ensure compliance.

The child needs to be provided information on various available devices and should be allowed to decide the device of her/his choice. Long-term compliance is poor in young children who are uncooperative and in those whose caregivers force the procedure on them. The teaching of technique (using MDI, MDI with the spacer, dry-powder inhalers) and good care of the devices are essential for success (Box 1). Regular review is necessary to ensure that the devices are functional and effective and to check if the child is using them in an appropriate way. Because products and delivery systems vary, it is important that the manufacturer□s directions are followed precisely.

Box 1 Administration of inhalational drugs

1. With metered-dose inhalers

- Remove the mouthpiece cover
- Shake the inhaler well
- Breath out as much air as is possible, gently
- Place the inhaler mouthpiece in the mouth between the teeth. Seal lips around it
- As the child begins breath in slowly through the mouth, press the canister and continue breathing.

  This coordination is vital for ensuring appropriate delivery of the drug
- Remove the inhaler from the mouth and hold breath for about 10 seconds
- Wait for at least 1 minute if another dose needs to be taken.

2. Metered-dose inhalers with spacer device

- Remove the mouthpiece cover
- Shake the inhaler
- Fix the mouthpiece of the inhaler in an upright position into the slot provided on the spacer
- Put the spacer mouthpiece between teeth without biting and close lips to form a good seal
- Press the canister firmly once to instil the spray into the spacer
- Breathe through mouth, in and out, gently and slowly
- The inspiratory breath must be sufficient to visibly or audibly open the valve
- Remove the spacer from the mouth and hold the breath for 10 seconds or as long as comfortable
- Dismantle the assembly of spacer and metered-dose inhalers
- If an extra dose is required, wait for a minute and repeat the steps. Instilling two or more doses simultaneously results in droplets crash/colliding against each other and settling at the bottom of the spacer. These are then not available for inhalation
- Spacer should be cleaned weekly by washing. It should be allowed to dry and should not be wiped. It should be replaced annually.

3. Dry powder inhalers

- To use these correctly, children need to be able to take a good deep breath in, to draw the powder into the airways
- They need to be able to hold their breath and not to blow out first.

Nebulizers can be used in children of all ages. The child breathes an aerosol through a facemask or preferably, a mouthpiece. A mouthpiece gives the better deposition. In acute asthma, oxygen and not air should be used as a driving gas while administering drugs such as salbutamol, terbutaline or ipratropium to minimize the possibility of exacerbating hypoxia.

Breath-activated inhalers do not require coordination but the child must be able to take a deep breath. MDI require a child to press and breathe in at the same time.

Most school children cannot manage them and their use without spacers is not encouraged. A spacer should always be used if a corticosteroid is being administered via the MDI.

Ophthalmic Preparations

Medicines meant for ophthalmic use should be kept sterile. An ophthalmic preparation should be discarded 28 days after it is opened as the probability of bacterial contamination is high beyond this period. The idea is to drop the solution or squeeze the ointment into a gully formed by the pressure of a finger on the lower lid. Tilt the head back or lie the child down and direct the gaze of the child upward. Avoid touching the eye. Alternatively, lay the infant on his or her back, drop the solution or ointment into the corner, wait until the infant's eyes open and then gently mop away the excess. In neonates and infants, it is more appropriate to instill into the inner angle of the open eye. Gentle finger pressure on the inner corner of the eye to occlude the tear duct enhances the effect of the eye drop. Massage the ointment into the upper and lower conjunctival sacs with finger massage on the upper and lower lids. Eye ointment may be applied either at night (if eye drops used during the day) or 3-4 times daily (if eye ointment used alone).

One drop is all that is needed; installation of more than one drop at a time should be discouraged because it may result in an overflow and wastage of medicine or increase the probability of occurrence of systemic side effects, and results in an overflow. A small amount of eye ointment is applied similarly; the ointment melts rapidly and blinking helps to spread it. If multiple drugs are to be instilled, to avoid dilution and overflow it is recommended to maintain an interval of at least 5 minutes between the two; interval may be extended for eye drops with a prolonged contact time, such as gels and suspensions. Application of an eye ointment should follow that of eye drops if both need to be administered at the same time.

Contact Lenses and Ophthalmic Preparations

Drugs and preservatives in eye preparations can accumulate in hydrogel lenses and can cause adverse reactions. Therefore, unless medically indicated, the lenses should be removed before instillation of the eye preparation and not worn during the period of treatment. Eye drops may, however, be instilled while patients are wearing rigid corneal contact lenses. Ointment preparations should never be used in conjunction with contact lens wear; oily eye drops should also be avoided.

Aural Medications

These are used to treat conditions of the

external auditory canal, which is not sterile. The method of administering medications into the external auditory canal is described in Box 2.

Box 2 Administration of aural medications

- Warm the bottle of ear drops if the weather or the room is cold. Rub the bottle back and forth between the palms to let the warmth thus generated heat the bottle
- Place the head on one side
- Pull the ear back and down for the infant and back and up for the older child
- Place the number of drops prescribed in the ear so that they hit the side of the ear canal and roll into the eart
- Wipe any excess drops off the outside of the ear
- Have the child remain with her head tilted or lying on her side for a few minutes to allow the drops to flow all the way into the ear
- Do not put the drops directly into the ear canal without allowing it to hit the side as this could cause pain or dizziness
- Gentle massage immediately in front of the ear helps the drops to descend into the ear and relax the child.

Delivering into the Nostrils

The lining of the nose is very vascular, so the intranasal route offers an alternative to an injection to achieve a systemic effect. This is the chosen route for some peptides (e.g., desmopressin). Currently, however, most nose drops are given for the treatment of local conditions. Some children might not like having liquid squirted into the nose.

Because the nasal passage connects to the throat, there is a tendency for the saline solution to drip down the back of the throat, giving rise to a bad taste. The method of administration of intranasal drops and sprays is described in Box 3.

Box 3 Administration of medications by nasal route

1. Intranasal Administration

2. Administration of nasal drops

- Lay the child on his or her back with neck extended
- Instil the prescribed drops
- Tilt head forward

3. Administering nasal spray to infants

- Make sure to have a nasal spray, small towel, and tissues on hand
- Lay the baby on the lap, with head resting gently on the knees and feet pointed toward caregiver□s waist
- Gently spray one or two nasal drops in one nostril and allow a few seconds for the solution to moisturize the nasal passage and loosen the excess mucus
- Use a tissue to wipe any drainage from the nose or face
- Avoid touching the applicator to your baby's nose to prevent the spread of germs.

4. Administering nasal spray to older child

- Hold child in sitting position and support him with one arm. Use the other arm to squirt the nasal drops
- Tilt the child's head back slightly. As child takes

in a breath, administer one saline nasal dose to each nostril

- After the spray has had time to moisten the nasal passage and loosen excess mucus, help the child gently blow his nose to remove mucus
- Avoid touching the applicator to your baby's nose to prevent the spread of germs

Topical Application

Topical applications are mainly used for treating disorders of the skin. However, it can be used as a route for drugs with systemic effect, and it must always be remembered that topical drugs may cause systemic toxicity, particularly if applied to the damaged skin or to preterm infants. Generally, the skin is left exposed, but a wet dressing may facilitate absorption, and a dry dressing may be used for protection.

Creams are a semisolid emulsion with equal amounts of oil and water. They are easy to spread and wash off with water. The active ingredient gets well absorbed and creams promote hydration of the skin. Lotions are thinner than creams and feel very light on the skin. The ingredients in lotions are absorbed very quickly. They are preferred for hairy areas. Ointments are 80% oil and 20% water. Although the ingredients are not absorbed well quickly, the ointment remains in contact with the skin for longer periods due to its occlusive properties. In this manner, ointments promote absorption of the ingredients. This makes them more potent than when packaged as cream or lotion. Gels are emulsions that contain oil-in-water. They usually have an alcohol base. They dry into a thin, greaseless, non-staining film.

They may be used on hairy areas and when large areas need to be treated. Because they dry the skin they may be used for those with oily skin. Pastes are a mixture of powder and ointment (e.g., zinc oxide 20% paste) - powder improves porosity (breathability).

It is important therefore to keep in mind the type of vehicle used for topical medications. An occlusive vehicle like an ointment enhances penetration of the active ingredient and improves efficacy. The vehicle itself may have a cooling, drying, emollient, or protective action. It can also cause side effects by being excessively drying or occlusive. The type of preparation used can be determined by the type and site of lesions. For example, greasy ointments should not be preferred for acute weepy dermatitis, and powder in the paste is useful when treating diaper rash. Gel or lotion should be preferred for hairy areas. The irritation or sensitization potential should also be taken into consideration. Generally, ointments and water-in-oil creams are less irritating, while gels are irritating. Ointments do not contain preservatives or emulsifiers and can be preferred when allergy to preservatives is a concern.

Parenteral Administration:

Drugs may be injected into most of the body spaces. The drugs must be sterile and pyrogen-free. The skin may be washed and then cleaned with antiseptic (70% isopropyl alcohol) or in children not sensitive to iodine, with an iodophor. If alcohol is not allowed to evaporate, this may add to the pain of injection. A topical anesthetic cream may also be used. Neither is common practice when insulin is self-administered or vaccines are given. Children less than 5 years of age should be held firmly; older children should be well-supported but not overpowered; those over 12 years of age, like many adults, may be

frightened of needles and their feelings need to be recognized and addressed. Many parents are a great help and will assist with restraining and be comforting their child, but others find the experience upsetting and should not be forced to hold their child during the procedure, but encouraged to comfort afterward.

Adolescents need to be told to lie down for a while after a parenteral drug administration to avoid possible vasovagal syncope (e.g., human papillomavirus vaccine).

Subcutaneous Route

Small volumes (under 2 mL) of isotonic solutions are usually given into the SC tissue using short needles with the narrow bore and regular bevel. The SC route is used for insulin self-injection. There is a possibility of fat atrophy or hypertrophy occurring. This can be minimized by rotating the injection sites, over the outer aspect of the upper arm, the anterior or lateral thigh, and the abdomen. In thinner children, it may help to pick-up the skin gently between the fingers to create a pocket in which to inject vertically.

Intramuscular Route

Most drugs can be injected into the muscle. However, the IM route should be avoided, whenever possible. In practice, the route is used for administering concentrated and irritating solutions, which may cause local pain if injected subcutaneously. Volumes of 1-2 mL can be administered by the IM route in infants, while older and bigger children can receive volumes up to 5 ml. The shorter and the narrower the needle, the less pain it will cause. Some draw up the fluid with one needle and inject with another, to avoid the solution on the wet needle irritating the needle track. Using a single needle saves time and for most drugs leads to no extra reaction. Before injecting the solution, the plunger should be slightly withdrawn to check whether the needle has entered a blood vessel. If blood is withdrawn, another site must be chosen. IM injections should not be given to children on anticoagulants or to those with thrombocytopenia. As IM injections can damage muscles and leave deep scars, injection sites should be regularly inspected, particularly in the immobile and very sick.

Intravenous route2

Hospitalized infants and children frequently are at risk for IV medication errors, which can occur at any point during the medication use process; from ordering by the physician, to dispensing by the pharmacist, to administration by the nurse. To eliminate IV medication errors in the pediatric population, comprehensive safety measures and corrective actions must be implemented at every point in the care continuum, a task that can only be accomplished with a thorough understanding of the unique difficulties and challenges involved in pediatric patient care.

Essential Pediatric Safety Considerations

Determine the weight of the child and verify pediatric doses, for example, a dose of ceftriaxone for an infant with meningitis would be higher than a dose of ceftriaxone for the same infant with bacteremia. Checking every medication dose (IV or oral) against a pediatric reference is absolutely necessary. Beware of decimal points and dosage units. Some medication infusions change between dosage units depending on the rate of infusion or indication. For example, vasopressin infusion can be dosed in mill units/kg/minute, units/kg/minute, mill units/kg/hour, and units/kg/hour; therefore, mislabeling the dose with incorrect

units of measure can lead to significant overdose or under dose of the medication. Always double-check your calculations. Whenever in doubt, refer the drug book or ask a colleague to confirm that your calculations are correct.

Standardization of policies and procedures in the unit/PICU/ NICU reduces pediatric IV errors. Fewer mistakes will occur as a result of misinterpretation if policies are extremely specific. Educating staff on newly developed guidelines is imperative.

IV medication preparation in children2

Key Points

Drug concentration:

Drugs have maximum and minimum dilutions for the IV bolus or continuous infusions, for example, IV max concentration for continuous infusion of furosemide is 10 mg/ml and max infusion is not more than 0.5mg/kg/hr or not more than 4mg/min. Older children and adolescents can tolerate higher fluid infusion, on the side, younger infants and neonates may not tolerate the higher infusion of the fluid. For example, in 50 kg patient, with furosemide 1mg/ml drug concentration, IV furosemide infusion of 0.5mg/kg/hr will have 25ml/hr while in 5 kg child, with same infusion rate will have 2.5ml/hr. Sometimes, the flow rate may be difficult to run the drug in children.

The size of Vial:

Strive to provide most IV medications in a unit dose to ensure safe dosing; if the unit dose is not available, dispense only the amount required to make up the dose. Be careful when ordering to administer the partial amount of drug from a standard sized drug dispensation. For e.g. Child with 6 kg, will need 600mg of ceftriaxone for meningitis per day in one or 2 divided doses, if you order 1000 mg, rest of the drug may go, wasted, instead you can order 500mg only. IV infusion technique and medication duration: Certain drugs need to be prepared and infused over a particular time period. Concentration-dependent antibiotics like aminoglycosides have to be given once daily over 1 to 2 hrs. On the contrary, in time-dependent drugs, like cephalosporins or imipenem have to be given as infusions over 8 to 12hrs, 2 to 3 times in a day. We have to prepare drug drip every 6 to 12th hourly otherwise efficacy will come down or there is a risk of contamination.

IV Medication tips3

1. Use aseptic technique when preparing and administering fluids and medications

2. Adhere IV medication safety procedures

3. Prepare patient and family for the procedure

4. Involve play and distraction techniques, relaxation and other coping skills appropriate to the age of the child.

5. Be careful with children who have had prior traumatic experience with IV insertion.

Pain Management

Infants <3 months:

1. Oral sucrose with a pacifier should be used or encourage a mother to feed infant during IV insertion procedure.

2. Give parent or caregiver option to hold infant during IV insertion procedure & employ multisensory stimulation.

Older infants and children:

1. Apply local anesthetic cream to several possible IV sites and cover with transparent film dressing for minimum 45-60 minutes prior to cannulation,

2. Use distraction techniques prior to and during the procedure. Prepare appropriate methods of distraction for the child. Ascertain from the child and family what techniques are most likely to attract their attention. For example, pop-up books, musical books, blowing bubbles and guided imagery.

IV Cannulation:

1. Dressings to IV sites are the first line of defense against infections and must be kept secure, clean and dry.

2. The type of secure dressing for the IV cannula depends on upon the child's age, the condition of the skin, site of the IV, child's activity and/or mobility.

3. Consider placing a small piece of cotton wool ball or gauze underneath the hub of the cannula to reduce pressure.

4. Cover the cannula site with sterile transparent semipermeable occlusive dressing placed aseptically over the catheter.

5. If desired, place sterile tape over the hub and wings of the device before placing the transparent dressing.

6. IV board / splints are recommended to secure IV cannula placed in or adjacent to areas of flexion. This will adequately immobilize the joint and minimize the risk of venous damage resulting from flexion.

7. When using Splints, ensure these are positioned and strapped with the limb and digits in a neutral position to prevent restricting blood or nerve supply and pressure sores.

8. Inspect the splint at least daily and change if soiled by blood or fluid leakage.

9. Cover with gauze or non-compression tubular bandage; when using a non-compression tubular bandage, ensure there is a clear window where the cannula enters the skin so the site can be viewed.

In Summary, when dressing a peripheral IV cannula ensure:

- it is secure,
- the site is visible
- the child can't injure themselves on the connections
- the child can't remove or dislodge the cannula
- That tapes are not too tight.
- Change the dressing only if it becomes insecure or if there is blood or fluid leakage.

Administration of bolus/loading doses

If the cannula is used infrequently for the administration of medications or fluids, it should be flushed with Normal saline only as evidence suggests equal or no benefit of using heparin flushes. The cannula should be flushed on a 6 hourly basis if accessed intermittently. Administration of intravenous fluid, drug infusions or blood products through IV device Monitoring and evaluation of patients on fluid therapy is mandatory to prevent the occurrence of the fluid overload.

Assessments are completed hourly to determine that the fluid infusing is as per medical

prescription. Check the solution is the prescribed one, the rate of infusion, the amount infused and the remaining amount to be infused is confirmed as per the order.

Drugs administered as an IV infusion may be inserted into a bag of IV fluids, the burette of an infusion set for administration via a volumetric infusion pump or in a syringe for use in a syringe driver. The most appropriate method should be selected depending on the volume of diluent required and intended rate of delivery.

Drugs administered via:

- Burette of an infusion set: to dilute the drug in a smaller volume via burette giving system-hang the bag of infusion fluid and gradually open the roller clamp to allow the appropriate amount of diluent into the burette. Inject the prescribed drug into the burette via the additive port. Ensure the drug is well mixed in burette by shaking the burette.

- Syringe driver: is recommended for children weighing less than 10 kg. Draw up required volume of diluent in appropriate size syringe and then pull back the syringe plunger to enable you to inject the drug into the syringe using aseptic technique. Ensure the drug is well mixed in the syringe by gently shaking.

- Infusion bag: Clean the rubber bung with the alcohol swab before injecting prepared drug into infusion fluid bag via the additive port and mix well by shaking the bag. Without contaminating the key parts insert the spike on the administration set into the septum of the infusion bag.

- Attach a completed drug label detailing the drug, dose, diluent, volume of diluent, date, time and signature of the nurse and the staff who double checked
- Access the IV cannula only after cleaning the rubber bung with alcohol swab (Scrub the hub)
- For intermittent infusions, IV lines can be disconnected between infusions, but ensure the cannula is flushed with appropriate flush once IV line is disconnected from the cannula.
- Administering blood products
- Check patient and blood product identification.
- Administer blood product transfusions via a volumetric infusion pump or syringe driver to ensure accurate delivery. Use gravity sets only when the rapid administration is required with diligent monitoring of volume. Depending upon age, weight, severity of anemia and cardiac status of the child

Following blood products are to be given at required volume per kg over particular time period.

Packed cell RBCs 10 to 20ml/kg over 2 to 4 hrs., FFP at 10 to 20 ml/kg over 1 to 3 hrs., Platelet concentrate RDP or SDP to be given based on body weight, Platelet count, underlying disease and whether bleeding diathesis is present or not. Cryoprecipitate 1 unit for every 5kg in the presence of coagulation factors deficiency, DIC and massive transfusion syndrome.

- Use a syringe driver for delivering small volumes of blood products but sometimes, if use size extension tube may cause hemolysis due to mechanical stress.
- Burettes should not be used for transfusion of blood products.

Changing cannulas

Re-cannulation should be avoided where possible, as this will cause the child and family further distress. There is no limit to the length of time that a cannula may remain in situ and with appropriate care, several days may be possible. Cannulas only need to be replaced when there is accidental dislodgement, occlusion, Phlebitis, and infection.

Removal of IVs

- The possible reasons for removal of the cannula include: Infiltration, extravasation, no longer be required, no longer be functioning effectively or it may be causing the child excessive discomfort, signs of phlebitis or infection.

- Perform hand hygiene, wearing non-sterile gloves, carefully remove the dressing, holding the cannula in place at all times.

- Hold a piece of sterile gauze or cotton wool over the exit site but do not apply pressure

- Slowly withdraw the cannula, maintaining a neutral angel with the child's skin.

- A cover site with cotton wool and tape or Band-Aid.

- Advise the child and family that the cotton wool and tape or Band-Aid should remain in situ for 24 hrs.

- Document date and reason of removal.

Prevention of infections:

- Good hand hygiene before peripheral intravenous line catheter insertion and maintenance, combined with proper aseptic technique during catheter manipulation provides protection against infection.

- Prior to accessing peripheral intravenous cannula, clean with an approved antiseptic wipe.

- All children with a capped peripheral intravenous access device in situ should have the site inspected at the commencement of shift and least every six hours for signs of infusion phlebitis.

- Where children are receiving continuous IV fluids/medication, the site should be inspected hourly and documented on the fluid balance flowsheet for the duration of the infusion.

Management of complications

Complications associated with IV therapy are common. Most are preventable by attention to IV infusion equipment, aseptic technique and attention to fluid and electrolyte prescribing. Common problems are

a. Infection:

- Skin-based bacteria may enter through insertion site

- Local cellulitis or systemic bacteremia are possible.

- If the infection is present, remove the IV cannula immediately, swab the insertion site and contact medical team to review.

b. Phlebitis:

- Vein irritation due to the presence of the catheter/fluids or medication

- Chronically ill patients requiring multiple and recurrent IV access.

- Notify medical team to review and document in patient record

c. Infiltration:

- Occurs when fluids or medications leaks into surrounding tissue.

- If infiltration occurs: Immediately stop the infusion and disconnect the tubing as close to the catheter hub as possible.

- Remove the catheter without placing pressure on the site.

- Elevate the affected limb.

- Continue to assess and document the appearance of the site and associated signs and symptoms.

d. Extravasation:

- Delivery of fluids or medications into surrounding tissue.

- If extravasation occurs, assess the Grade of extravasation Injury.

- Most extravasation injuries are of Grades 1 & 2 and do not require extensive intervention to prevent long-term skin and soft tissue damage.

- Grade 3 & 4 injuries have a greater potential for skin necrosis, compartment syndrome and need for future plastic surgery, depending on the type of solution extravasated.

Other considerations:

- The infant's parents should be informed of an extravasation injury and management plan.

- An incident report should be completed for grade 3 & 4 extravasations.

- Documentation

Care of peripheral IVs

- Peripheral IV site - document the presence of any atypical findings or complications and any actions taken in the LDA (Lines, Drains, and Airway) section of EMR/progress notes. VHIMS should be completed for all IV extravasations.

- Fluids and medications through peripheral IV's

- Pump pressures for each IV line: should be documented hourly on Fluid balance activity. The blue Alaris pumps have a maximum pressure set and the pressure should not exceed 100mmHg

- Infused volume: Hourly on fluid balance flowsheet (it is advised to clear the infusion pump hourly.)

- Any complications

Record the date and time of the infusion when extravasation was noted, the type and size of the catheter, the drug administered, the estimated amount of extravasated solution, and the administration technique used. Record the patient's signs and symptoms, treatment, and response to treatment. Include the time you notified the patient's primary care provider and the primary care provider's name.

Per-rectal administration:

This route is used when drugs cannot be given orally or intravenously or when a local effect is desired. The rectal routes avoid the hepatic first-pass effect. The rectum offers a relatively constant environment for drug delivery provided the drug is presented in a well absorbable form. The rate controlled dosage forms resulting in a constant steady-state concentration of drugs in plasma may be used for selected therapeutic indications.

The release rate of a drug dose from suppositories is affected by characteristics of the excipients (melting temperature and rate

viscosity at rectal temperature hydro-lipophilic characteristics) hence with a difference in drug availability. Its contact with the digestive fluid is avoided, thereby preventing acidic and enzymatic degradation of some drug.

Drug delivery can be stopped by removing the dosage form and drug absorption can be easily interrupted in cases of accidental overdose or suicide attempts. The child should be lying on his side, with legs curled up in a fetal position. With babies, it is possible to administer drugs per-rectally by lifting her legs and flexing the knees (as for changing a nappy). The suppository should be gently inserted into the anus, just beyond the anal sphincter. It may be necessary to hold the buttocks together for several minutes to prevent the immediate expulsion of the suppository.

Drugs which are given per rectally are rectal suppository Diazepam for control of acute seizure, paracetamol rectal suppository for the control of fever and Enema for constipation etc. The major disadvantages of rectal suppositories; they are not preferred by patients; they are inconvenient. Rectal absorption of most drugs is frequently erratic and unpredictable. It is also administered in unconscious and pediatric patients as well as for the treatment of chemotherapy and allergy induced emesis4. The presence of diarrhea, impacted feces, and fissure in ano are contraindications to the use of this route.

Intra-osseous Route

For patients in extremis from respiratory failure or shock, securing vascular access is crucial, along with establishing an airway and ensuring adequacy of breathing and ventilation. Peripheral intravenous catheter insertion is often difficult, if not impossible, in infants and young children with circulatory collapse. Intraosseous (IO) needle placement, shown in the images below, provides a route for administering fluid, blood, and medication. An IO line is as efficient as an intravenous route and can be inserted quickly, even in the most poorly perfused patients. Current guidelines for cardiopulmonary resuscitation support the use of IO techniques in patients of all ages. Intraosseous access is resorted to if vascular access is not rapidly achieved in any infant or child requiring IV drugs or fluids, especially in a life-threatening emergency within 2 peripheral IV access attempts or within 90 sec of the attempt. Those trained in the procedure can achieve access successfully in around 80% of attempts, within 1–2 minutes.

In infants and children, proximal tibia is the most commonly chosen site for IO catheter insertion. The recommended site is the flat area approximately 1-2 cm distal to the tibial tuberosity. The needle may be angled 10-150 caudally to avoid injury to the epiphyseal growth plate.

The marrow of long bones has a rich network of vessels that drain into a central venous canal, emissary veins, and, ultimately, the central circulation. Therefore, the bone marrow functions as a non-collapsible venous access route when peripheral veins may have collapsed because of vasoconstriction. The intraosseous (IO) route allows medications and fluids to enter the central circulation within seconds. The intraosseous route is contraindicated relatively in conditions like local infection over the site, osteomyelitis, osteogenesisimperfecta and those in which previously tried sites.

The risks and complications of intraosseous (IO) insertion are few, and the benefits far

outweigh the risks in a child without intravenous (IV) access who needs rapid administration of medication or fluid. Extravasation of fluid is the most common complication. It typically occurs when a needle is misplaced. Rarely, extravasation occurs with a properly placed needle and is associated with excessive movement during or after insertion, which may lead to enlargement of the entry site in the bone relative to the diameter of the needle.

Compartment syndrome is a risk with IO insertion. The needle must enter through the cortex and into the marrow cavity without passing through the cortex on the other side. If the needle is passed through the opposite cortex, infused fluid enters the calf rather than the venous system. If left undetected, fluid accumulation may lead to a compartment syndrome, with the potential loss of the limb. Frequent checks are therefore essential. This complication can also be limited by making only one attempt per tibia. Repeated attempts in the same bone allow fluid to flow through the previous holes produced in the bone. Extravasation of hypertonic or caustic medications, such as sodium bicarbonate, dopamine, or calcium chloride, can result in necrosis of the muscle. Infection and osteomyelitis are relatively rare complications and occur most commonly if aseptic technique is not followed during insertion. Children with bacteremia can develop this complication, as well. Cellulitis at the insertion site has also been reported. The levels of drugs, chemistries, and hemoglobin, as well as acid-base status, obtained from bone marrow, are reliable predictors of serum levels.

Intrathecal Route:

The latest advancement in intrathecal analgesia and intrathecal drug delivery systems have allowed for a range of medications to be used in the control of pain and spasticity. This technique allows for reduced medication doses that can decrease the side effects typically associated with oral or parenteral drug delivery. Recent expert panel consensus guidelines have provided care paths in the treatment of nociceptive, neuropathic, and mixed pain syndromes. In 1999, the Joint Commission on Accreditation of Healthcare Organizations issued comprehensive standards of care for pain management. It stated, that no cancer patient should live or die with unrelieved pain 5. Currently, there are only three medications approved by the US Food and Drug Administration (FDA) for use via the intrathecal route, i.e., morphine, Fentanyl, ziconotide, and baclofen. Morphine targets opioid receptors within the dorsal horn6. It is considered by many to be the gold standard intrathecal opioid agonist, against which all other opioids are compared. Morphine binds to receptors on the primary afferent neurons (presynaptic) and cells within the dorsal horn of the spinal cord (postsynaptic) to inhibit the release of neurotransmitters like substance P and calcitonin gene-related peptide and hyperpolarize postsynaptic neurons, respectively. Recently studies have shown that combination of Bupivacaine and Fentanyl or Morphine. Several other factors should be included when considering the patient for intrathecal drug delivery, such as previous adherence to treatment, willingness to attend for follow-up, and anatomical changes that may affect implantation of either the pump or catheter. The patient's disease state, failure of conservative therapy, psychological state, adherence to treatment, and candidacy for a surgical procedure all reflect important considerations prior to possible implantation6.

Patient selection for IDDS therapy can be divided into cancer and non-cancer pain. In

both groups, patients suffering from significant side effects of oral, transdermal, or intravenous opioids that inhibit adequate titration of these medications or those patients who cannot achieve adequate analgesia despite high doses of opioids should be considered for intrathecal therapy. Indications for the use of IDDS in chronic non-cancer pain typically include pain originating from the spine and, specifically, patients with failed back surgery syndrome primarily, followed by compression fractures, spondylosis, spondylolisthesis, and spinal stenosis. Other conditions include spinal cord injury-induced spasticity, complex regional pain syndrome, chronic pancreatitis, neuropathies, and rheumatoid arthritis7.Most experts believe that IDDS can be quite effective for a smaller subset of patients with cancer, non-cancer, and spasticity-induced pain. Further, trialing patients prior to implantation are generally recommended but may be less necessary for patients suffering from cancer pain. The data emphasize the value of intrathecal therapy for cancer pain in terms of pain relief, reduction in adverse effects, and cost-effectiveness. The evidence is less clear for long-term relief in non-cancer pain other than spasticity, although the cost-effectiveness data support its use within approximately 12-24 months compared with traditional therapies. Implanting physicians should be mindful of the need to monitor fluctuations in selected serum hormones, especially with intrathecal opioids as well as the potential for development of granuloma. Studies in progress with novel intrathecal agents coupled with advanced IDDS technology offer promise for the complete pain relief, enhanced safety, and better long-term outcomes in terms of quality of life.

Table 6: Recommended starting dosage ranges of intrathecal medications

Drug	Recommended starting dosage
Morphine	0.1-0.5 mg/day
Hydromorphone	0.02-0.5 mg/day
Ziconotide	0.5-2.4 mcg/day
Fentanyl	25-75 mcg/day
Bupivacaine	1-4 mg/day
Clonidinel	40-100 mcg/day
Sufentanil	10-20 mcg/day

Note: Reprinted with permission from Polyanalgesic Consensus Conference 2012: Recommendations for the management of pain by intrathecal (intraspinal) drug delivery: report of an interdisciplinary expert panel. Deer TR, Prager J, Levy R, et al. Neuromodulation. 15(5):436-466.18 Copyright - 2012 John Wiley and Sons,Inc.

Table 7: Recommended doses for intrathecal (IT) bolus trialing

Drug	Recommended IT bolus dose
Morphine	0.2-1.0 mg
Hydromorphone	0.04-0.2 mg
Ziconotide	1-5 mcg
Fentanyl	25-75 mcg
Bupivacaine	0.5-2.5 mg
Clonidinel	5-20 mcg

Sufentanil	5-20 mcg

Note: Reprinted with permission from Polyanalgesic Consensus Conference 2012: Recommendations for the management of pain by intrathecal (intraspinal) drug delivery: report of an interdisciplinary expert panel. Deer TR, Prager J, Levy R, et al. Neuromodulation. 15(5):436-466.18 Copyright - 2012 John Wiley and Sons, Inc. .

Intraventricular route:

Intraventricular drug delivery is the delivery of medication within the cerebrospinal fluid of the cistern (C1-2 vertebra) and intracranial ventricles. By administering medication directly, less medication is needed, and fewer side effects are seen than with orally administered drugs in case of pain management. The medicine can be delivered through an implanted catheter connected to a pump. The pump may be programmable, and either implanted or external. Intracisternal or intraventricular delivery of analgesic agents is primarily used for patients with head and neck pain, as in pain from tumors of the face and neck.

Further, Intraventricular/lumbar intrathecal antibiotics can lead to very quick CSF sterilization in post-neurosurgical patients with meningitis and ventriculitis. The relapse rate of meningitis and/or ventriculitis is also very low among patients treated by IVT/IT antibiotics. Intraventricular/lumbar intrathecal administration of antibiotics appears to be an effective and safe treatment for infections of the CNS caused by multidrug-resistant organisms. In patients with signs of ventriculitis, the authors prefer the IVT route of antibiotics8. IntraventricularColistin, amikacin, and vancomycin can be administered.

Drug Administration via Enteral Feeding Tube:

Administration of the drug via the enteral feeding tube is an unlicensed activity. There are few published data and guidelines for the administration of drugs via the enteral tube, it is mostly theoretical and or local unit guidelines. Enteral feeding tubes come in many different types, lengths and sizes, and exit in a variety of places in the GI tract. Enteral feeding tubes can be inserted via a number of routes: via the nasopharynx, for example nasogastric (NG) or nasojejunal (NJ), or via direct access to the GI tract through the skin, for example, gastrostomy or jejunostomy tubes. These ostomy tubes can be placed surgically, radiologically or endoscopically.

The type of feeding tube used will vary depending on the intended duration of feeding and the part of the GI tract the feed needs to be delivered to. Nasoenteric tubes are used for short- to medium-term feeding (days to weeks), whereas ostomy tubes are used for long-term feeding (months to years). The external diameter of the feeding tube is expressed using the French (Fr) unit where each 'French' is equivalent to 0.33 mm. enteral feeding tubes are composed of polyvinylchloride (PVC), polyurethane (PUR), silicone or latex. Silicone and latex tubes are softer and more flexible than polyurethane tubes and therefore require thicker walls to prevent stretching and collapsing. As a result of the differences in rigidity, a silicone or latex tube of the same French size as a polyurethane tube will have a smaller internal diameter[9].

General guidelines for drug administration via the enteral feeding tube:

1. Drugs charts should have the written

order for the route of administration like NG, ND or NJ route

2. Ensure site of the tip of enteral feeding is at the desired site in the body (Confirm the tube position).

3. Confirmation is done by auscultation technique or doing X-ray or fluoroscopically.

4. Stop the infusion of the feed when administering drugs

5. Flush the tube with at least 15 ml of water, sterile for jejunal tube, use either 20 ml or 50 ml syringe

6. Administer each drug separately (gravity flow) as a sediment free liquid

7. Document the total volume of the fluid given including flush volume on a fluid balance sheet

8. Monitor the clinical response if: changing from m/r to normal release preparation,a drug has a narrow therapeutic range and or the drug bioavailability differs between tablet and liquid

9. Do not administer bulk-forming laxatives because they may block the enteral tube, use enteral feed with a high fiber content instead

10. Do not add drugs to the feeds; this will increase the microbial contamination, tube block, incompatibility and under dosing or over dosing if the feed rate is altered.

11. The patient should be nursed semi-recumbent (sitting up) at an angle of 30 degrees or greater to reduce reflux of the medication and flushes. This promotes gravity-assisted progression of the fluid

12. It is recommended to check nasogastric feeding tube placement at least once every 24 hours as tubes may be dislodged after vomiting or coughing

13. Aspirate every 4 to 6th hourly for the gastric residual volume for the feeding

14. No need to do abdominal girth monitoring

15. Try use recommended osmolality drugs or feeds as may increase the feed intolerance or cause NEC in young infants.

16. Try to minimize the drug interactions by following strict unit guidelines of medication errors prevention

17. Remove the enteral feeding tube once the purpose is served and stop the feeds at least 2 hrs. prior to the removal

18. Use wide-bored silicon or latex tube for the long term feeding plan and regular follow the child

The complications or difficulties associated with this enteral feeding are non-cooperation in conscious children, noncompliance, migration, blockade, inadvertent insertion into the lung, perforation of the gut, bleeding in the case of bleeding diathesis child.

Endotracheal Route

The endotracheal route may be used for administering drugs when IV or IO access is not achieved especially in a life-threatening or serious condition. Medications are absorbed through this route but the blood levels attained may not be equivalent to those produced by IV/IO administration. Further, for most drugs the optimal doses for endotracheal use are unknown. Drugs that can be given by this route include surfactant, lidocaine, epinephrine, atropine and naloxone.

IAP DRUG FORMULARY
IAP Recommendations On Drug Therapy For Pediatric illnesses
Project of the Computer and Medical Informatics Chapter (IAP CMIC)
Publication of Indian Academy of Pediatrics
IAP Presidential Action Plan 2004

Snippets from IAP Drug Formulary

METHODS OF GIVING MEDICINES

Young children and infants who cannot understand will usually take medicine from someone they know and trust, a parent or the main caregiver. It is important that those who give medicines know about the medicine and how to give it. Occasionally, a medicine has to be disguised or masked with small quantities of food. Rarely, a child has to be restrained for the medicine to be administered. Then, especially, the child should be comforted and reassured.

They must not be left with the impression that being given medicine is a punishment for being sick. The approach depends on the child's understanding and the circumstances:

- Under 2 years of age: Administration by parents if possible, using an approach which they believe is most likely to succeed.

- Two to five years old need a calm, gentle, firm and efficient approach after they have been told what is happening. Play and acting out may help them understand. Rewards and an acceptable chaser (drink) encourage further collaboration.

- Five to twelve years old also need encouragement, respect for their trust, and an explanation attuned to their understanding.

- Children over 12 years of age: At this age children must have a proper understanding of what is happening.

They should be having a share in the decision-making process as well as the responsibility for adhering to the agreed plan. They must feel in control.

Ensuring Safety of Medicines

Children and neonates are extremely vulnerable to harm due to errors while prescribing, administering and storing medicines. The doctors, parents, and caregivers need to be extremely vigilant to ensure that children do not suffer from undue harm. All of them need to take coordinated steps to ensure this safety. Some of the steps are enlisted in Box 4.

Box 4 Steps to avoid undue harm during prescribing and administration of drugs to children

Doctors

- Prescribe suitable formulation based on the child□s age, development and ability
- Calculate doses diligently. Do not hesitate to use calculators. It is better to have another independent check
- Check the concentration of active ingredient in the formulation
- Prescribe oral medications in terms of mL and not in terms of teaspoon/tablespoons. The volume in spoons is highly variable
- Avoid the use of decimal points by prescribing in whole units, i.e., 100 □g rather than 0.1 mg
- If a decimal point is required, always use a leading zero, i.e., 0.5 mL
- Avoid using a trailing zero. For example do not write 5 mg as 5.0 mg. The latter can lead to a tenfold error
- Remember to account for any administration issues such as displacement volume for IV medicines, the correct diluent and administration method

- Provide complete information regarding the dose, frequency, side effects, possibility of response and action to be taken if any untoward event is noticed
- Instruct parents/caregivers regarding appropriate storage of medicines, keeping them away from children and discarding them
- Ensure that parents/ caregivers have understood the instructions. Encourage them to get doubts clarified.

Parents/caregivers

- While buying drugs, ensure that the preparation is the same as prescribed. Check for the expiry date
- Follow instructions regarding administration, storage and discarding of medicines provided diligently
- If something is not understood, do not hesitate to get doubts clarified
- If there is an unexpected event, contact the doctor. It could be due to progression of disease or due to an unrelated event. It could also be due to a side effect of the drug.General
- Report adverse events
- Advocacy for the conduct of clinical trials in children and for availability of formulations appropriate for children.

IN A NUTSHELL

1. Administering medicines to children is a challenge and requires special attention. It needs the cooperation of the child and understanding of the parents/caregivers.

2. Depending upon their age and developmental abilities, children require different types of oral formulations: drops, syrups, suspensions and dispersible tablets. Tablets and capsules are suitable for older children.

3. Lack of appropriate formulations compromises the right of children to safe medicines.

4. Caregivers need to be informed about the medicines and way to administer them. It is advisable to demonstrate the method of measuring actual volume of oral liquid preparations to them to avoid under or overdosing.

5. Additional specific equipment may be necessary to ensure that correct dose is administered. For administering aerosol medicines, young children might need a spacer device in addition to a MDI. To ensure that the correct volume is delivered while providing IV fluids and drugs, doctor may have to use syringe infusion pump. The syringe infusion pump allows measured delivery of small volumes over a longer time period.

6. Well-coordinated actions by doctors, pharmacists and parents are required to ensure that children receive their medicines in the right amount, at the right frequency, for the right duration without exposing them to undue risks.

MORE ON THIS TOPIC

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NAVI MUMBAI IAP BRANCH REPORT – JANUARY 2023

ACADEMIC –

1. 3rd Jan 2023 – Diamond Jubilee Academic Pearls Series
   Topic – PCR based infection diagnosis, Use & Misuse.
   Convener – **Dr Mahesh Mohite**

2. 4th Jan 2023 - Journal Journey (MAHAIAP & RAIGADIAP)
   Chief Guest – **Dr Upendra Kinjawdekar, President CIAP 2023**.
   Expert – **Dr Leena Deshpande**
   Speaker – **Dr Priyanka Amonkar** – Feeding difficulty as an indicator of developmental delay in childhood
   Moderator – **Dr Chitra Kulkarni**
   https://us02web.zoom.us/j/86762410661?pwd=TG5MWHNVWExobmpwU1JPTElNWnluQT09

3. 6th Jan 2023 – IAP PG Teachings
   Experts – Dr S Balasubramanian, Dr S Srinivasan
   Scientific convenors – **Dr V N Yewale, Dr Snehal M, Dr Jeetendra G, Dr Satish S**.
   https://us02web.zoom.us/j/86742014064?pwd=L29EWlB3OWUwSWxZa0paRnNzYTFWZz09

4. 10th Jan 2023 – Academic Pearls 2023
   Topic – Optimizing serodiagnosis in infections
   Moderator – **Dr Vijay Yewale**
   Panelist – **Dr Dhanya Dharmapalan**

5. 11th Jan 2023 – Launch of Apollo Genomic Institute
   https://us06web.zoom.us/j/81188875682?pwd=Z2w0dzJpS3VkL0pMOS9KZFNDOEFsdz09

6. 13th Jan 2023 - MGM IHS Navi Mumbai under the able guidance of HOD & Prof. Paediatrics(MGM hospital, Kamothe)**Dr Vijay Kamale** and Prof. and PICU incharge(MGM HOSPITAL, Kamothe) **Dr. Jeetendra Gavhane** successfully conducted the **Advanced Neonatal Resuscitation Program (First Golden minute project), Advanced NRP Provider Course*** at MGM HOSPITAL, Kamothe. The session was hands on training for Post graduate students, EMS,Anasthesia General Practitioners and healthcare staff which was well received by all. The training was superbly conducted by trained Paediatricians **Dr Anjali Otiv, Dr Omprakash Jamadar, Dr Vinay Mishra and Dr Samir Shaikh.**

7. 14th &15th Jan 2023 - IX NATIONAL CONFERENCE OF PEDIATRICS ASSOCIATION OF INDIA MGMPAICON- 2023, ORGANISED BY DEPARTMENT OF PEDIATRICS, MGM MEDICAL COLLEGE, NAVI MUMBAI AND AURANGABAD IAP RAIGAD AND NAVI MUMBAI
   a) Topic - Hyper in activity
      Moderator – **Dr Shilpa Aroskar**
   b) Topic – Disease Modifying therapy in SMA & DMD
      Moderator – **Dr Bhageshree Seth**
   c) Topic - Seizure Mimics
      Moderator – **Dr Prashant Moralwar**

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d) Topic – Multidisciplinary actions in neurodevelopmental disorders
Speakers – **Dr Mahesh Sambhare, Dr Shweta Nair**
Moderator – **Dr Vijay Kamale**

e) Topic – Flu Vaccine
Speaker – **Dr Jeetendra Gavhane**
Moderator **– Dr Shailesh Kabra**

f) Topic – Adolescent & Adult Immunization
Moderator **– Dr Piyush Jain**

g) Topic – Inhalational Therapy
Moderator **– Dr Sagar Warankar**

h) Topic- Personality Development Kick start at birth
Moderator – **Dr Mangai Sinha**

i) Topic – Journal Club
Moderators – **Dr Revathi, Dr Chitra Kulkarni**

j) Topic – Primary Immunodeficiencies are more common than we think
Chairperson – **Dr Mahesh Mohite, Dr Vijay Vishwanathan**

k) Topic – Kawasaki Disease, clinical diagnosis & controversies
Chairperson – **Dr Satish Shahane**

l) Topic -Advances in Febrile Seizures
Chairperson – **Dr Suryakant Ingale**

m) Topic – Why we miss childhood cancers?
Chairperson – **Dr Amit Saxena**

n) Topic – Epilepsy & its effects on development
Chairperson – **Dr Dorab Daruwalla**

o) Topic – Genetic tests, which & when
Speaker **– Dr Snehal M**
Moderator – **Dr Rakesh Thamke**

p) Topic – Rational Cough Management
Speaker – **Dr Vikram Patra**

q) Topic – Developmental Supportive care in KMC
Moderator – **Dr Anjali Otiv**

8. 20th Jan 2023 - IAP PG Teachings
Experts – Dr S Balasubramanian, Dr S Srinivasan
Scientific convenors – **Dr V N Yewale, Dr Snehal M, Dr Jeetendra G, Dr Satish S.**
https://us02web.zoom.us/j/85324020063?pwd=UTR3TTFQZjVrVlhuNGRENHdVVjBuUT09

9. 21st & 22nd Jan 2023 – MARPCON 2023 (IAP LATUR & CPS MUMBAI)
Experts – **Dr Upendra Kinjawdekar, President CIAP 2023, Dr Jeetendra Gavhane, Dr Omprakash Jamadar, Dr Suresh Birajdar**.
Dr Jeetendra Gavhane was awarded **The Bhoomiputra Award** in the same conference for his outstanding contribution towards IAP

10. 22nd Jan 2023 – Padmabhushan Awardee Late Dr. R.D. LELE oration
Orator – **Dr Y.K.Ambdekar**
Topic – Medicine a science of health & not just disease.
Chief Guest – **Dr. Upendra KInjawdekar, President CIAP 2023**.
https://mc.clirnet.com/mastercast/connect/D1216-medicine

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ARTICLES / PUBLICATIONS –

1. Published in Pediatric Infectious Diseases Vol-4, Issue 4.
   Dilemmas in Diagnosis of Urinary Tract Infection (UTI) in Fever without Focus and other conditions - **by Dr Pankaj Deshpande**

SOCIAL -

1. Navi Mumbai IAP 's installation ceremony was a fun filled family evening with superb performances by our talented kids and NMAP members, academic talk by **Dr. Vijay Yewale** and **Dr. Nitin Shah**, and Installation of the New Team and President, **Dr.Satish Shahane**. **Dr. Jeetendra Gavhane** summarized the work done in his Three years of successful tenure. Felicitation of the outgoing team was done in the hands of the **Chief Guest, Dr.Upendra Kinjawadekar , Guest of Honour, Dr. Ramakant Patil and Special guests, Dr. Amol Pawar and Dr. Mohan Warke** .Our Star Student Achiever's were also felicitated by the Esteemed Dignitaries. The evening ended with Sangria with SA-VVy hosted by **Dr. Shilpa Aroskar** and **Dr. Vijay Vishwanathan** in their unique style keeping everyone enthralled till the end, But the Most Memorable Moment of the Evening was Confering the **Lifetime Achievement Award to our Dear Dr. Prashant Moralwar**, a befitting award to the most loved and respected NMAP senior. The evening was graced by our IAP guests from Maharashtra IAP, Mumbai IAP, Thane IAP and Raigad IAP.

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2. The **fourth & last issue of MAHAIAP Bulletin, DRUSHTIKSHEP of the year 2022** was released at the worthy hands of **Chief Guest Dr. Upendra Kinjawadekar, President CIAP 2023** in presence of the MAHAIAP President Dr. Ramakant Patil, CIAP Joint Sec Admin Dr. Purna Kurkure & other OBs, EBs of MAHAIAP, CIAP Maharashtra EBs.
3. **Dr Bhushan C, Ped. Cardiologist** was live on ZEE 24 TAAS, giving his expert opinion on congenital heart diseases and its management.
4. Navi Mumbai association of Pediatrics and Navi Mumbai Obstetric and Gynaecological Society has come up with this simple, easy to understand **Poster - highlighting the need and importance of Newborn Hearing Screening test to be done in Newborns**. This Poster was displayed in clinics & circulated in parent groups so that we can be sure that every newborn undergoes the hearing screening and we don't miss out anyone with Hearing Defects.
5. Children are unaware of the fact and become easy victims of **Road Traffic Accidents**. To percolate and enhance their knowledge on Road Safety is our priority and commitment towards Sensible citizens of Future India. Friends as we know we are **celebrating National Road Safety Week.** Our Navi Mumbai IAP branch has brought a Educational Poster to be used in schools, society and our Clinics to spread awareness about it in our children.
6. Navi Mumbai IAP with help of Rotary Club Kamothe Panvel Area arranged MEDICAL CAMP AT **ASHIDHARA SCHOOL** (School for children of BPL families of street vendors) IN KAMOTHE, PANVEL for 160+ students of Ashidhara School, Kamothe today.Our Dynamic **President Dr. Satish Shahane** and **EB Member Dr Cyril D'Souza** were present for this school camp. Needy children were given free medications and future guidance for their medical conditions detected.
7. **Tata Mumbai Marathon**, **Dr Prashant Weekay(Full Marathon completed**), **Dr Arti Gaikwad(10,000kms completed) & Dr Prashant Gaikwad (Half Marathon completed)**
8. **Blood donation camp** was organized at Airoli by NMIAP, **Dr Mahendra Topale** and Several other practicing pediatricians from Airoli participated in the same.
9. **Podcast Episode 3- Zindagi na milegi dobara- Seize the day**.
   90% of times we either worry about the future or relive our past. And forget to enjoy the precious now which is today. Author, blogger and pediatrician **Dr Shilpa Aroskar** in her 3rd episode of podcast When life gives you lemons gives a new insight into living life in conversation with her guest Dr Ramgopal Chejera who survived a near death experience and shares how he values and lives life each day in the NOW.
   https://open.spotify.com/episode/6DBUby53Q8X1qbJQQBoIOi?si=tGYhdeeTRo-sMLE77buNhw&utm_source=whatsapp
10. NMAP celebrated National Girl Child Day at **Pediatric ward, PGIMS, General Hospital, Vashi** with **NMAP Executive Board members Dr.Madhavi Ingale and Dr. Gargi Bangar**. During the program, the speakers and pediatric residents emphasized the importance of realising the inequality in upbringing of a girl child in the society in terms of Nutrition,education, career,decision taking, financial freedom etc.The parents of the patients also participated in the discussion. The purpose of the celebration of this day was emphasized upon and a pledge was taken by all the attendees about contributing their part in changing the inequality,self defence, developing confidence and giving more opportunities to the girl children. The girl patients in the ward were distributed chikki and stationary items.

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IAP Jalandhar

Team JAP 2023 began its tenure on January 1, 2023 with Charity activity at Mother Teresa orphanage. Ration, daily needs commodities and medicines were distributed to the inmates by JAP President Dr Rohit Chopra alongwith his team

IAP Jalandhar

National Girl Child Day was celebrated on January 24, 2023 by Team JAP. Stationary kits and sanitary pads were distributed amongst the girl inmates of Nari Niketan

IAP Jalandhar

On this occasion, members of Jalandhar Academy of Pediatrics distributed free iron folic acid tablets and syrups to adolescent girls and anemic girl children visiting their OPDs emphasizing on anemia awareness & prevention

IAP Kerala

IAP AHA & IAP Kerala module release

Nalla padam - IAP Kerala presidential action plan in association malayala manorama

IAP Kerala

Adolescent health class by IAP Trivandrum

IAP Kerala

IAP Kerala presidential action plan -R DIET

IAP Kerala

1st EB meeting IAP Kerala 2023

POINT Workshop -IAP Kottayam

IAP Kerala

Installation IAP Wayanad

IAP Kerala

Adoption of Tribal colony by IAP Kerala & IAP Wayanad

IAP Kerala

Immunisation class IAP Malappuram

IAP Kerala

-Installation IAP Thalassery

IAP Kerala










BNRP programme IAP Kasargode