The Pediatric Traveler Workshop  
*Children are not small adults*
  
**CISTM 16**  
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**Workshop Objectives**

**Familiarize attendees with age-group specific considerations prior to international travel regarding:**

- Vaccines
- Mosquito avoidance and malaria prophylaxis
- Prevention and management of travelers’ diarrhea
- Safety-risks and injury-prevention strategies
- Travelers with chronic illness or special health care needs

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**Case 1**

Family with 3 healthy children visiting family in Ghana for 3 months.

- Children are 5mos, 4yrs and 7yrs old
- Routine vaccines are up to date
- No allergies
- 5mo old is breastfeeding
- 7yo hospitalized there 2 years ago with severe diarrhea
- Parents are anxious about the children getting sick there

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**Travel Consultation**

- Food & Water born illnesses / precautions
- Vector born illnesses / insect precautions
- Vaccines
  - Routine and travel specific
- Medications
  - Prophylaxis and treatment
- Anticipatory Guidance
  - Safety altitude logistics
  - Infant air travel teen issues sleep aids?

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**Age specific issues**

- **0-6 mo**
  - Infectious disease risk/immunity; immobility
  - Flight safety
- **6 mos-2yrs**
  - Safety concerns, severe TD
- **2yrs-adolescence**
  - Trauma, severe TD less likely
- **Adolescents**
  - Exposure - STDs, high risk activities

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Unique transportation considerations for families

- Prepare for delays – diapers, formula, etc.
- Request bassinet from airline
- Sit the child away from the aisle
- Bring a car seat / stroller
- Get info on your rental car (seatbelts) and accommodations

Vaccinating the child traveler

- Routine vaccines
  - Catch-up missed doses
  - Accelerate as needed
- Travel specific vaccines
  - Required
  - Recommended

Links to recommended immunization schedules

- Summary of WHO position papers
- WHO - Country specific information
  - www.who.int/vaccines/GlobalSummary/Immunization/CountryProfileSelect.cfm
- Center for Disease Control - US
  - https://www.cdc.gov/vaccines/schedules/hcp/imz/child-adolescent.html

WHO recommended vaccines for children

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Age of injection</th>
<th>Dose</th>
<th>Sites of administration</th>
<th>Booster doses</th>
<th>Additional notes</th>
</tr>
</thead>
</table>
| Diphtheria | 8 weeks | 1 | Deltoid | Year 1 | Diphtheria + Pertussis + Haemophilus influenzae Type b (DPhHb) or Pneumococcal conjugate vaccine (PCV)
| Tetanus | 6 weeks | 1 | Deltoid | Year 1 | Diphtheria + Pertussis + Haemophilus influenzae Type b (DPhHb) or Pneumococcal conjugate vaccine (PCV)
| Polio | 2 months | 1 | Deltoid | Year 1 | Diphtheria + Pertussis + Haemophilus influenzae Type b (DPhHb) or Pneumococcal conjugate vaccine (PCV)

WHO recommended vaccines for children

- Routine vaccines
  - Catch-up missed doses
  - Accelerate as needed
- Travel specific vaccines
  - Required
  - Recommended
Number of Reported Measles Cases (6 month period)

<table>
<thead>
<tr>
<th>Country</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madagascar</td>
<td>59,388</td>
</tr>
<tr>
<td>Ukraine</td>
<td>40,031</td>
</tr>
<tr>
<td>India</td>
<td>14,304</td>
</tr>
<tr>
<td>Brazil</td>
<td>9,198</td>
</tr>
<tr>
<td>Philippines</td>
<td>8,212</td>
</tr>
<tr>
<td>Venezuela</td>
<td>5,668</td>
</tr>
<tr>
<td>Thailand</td>
<td>4,871</td>
</tr>
<tr>
<td>Pakistan</td>
<td>4,775</td>
</tr>
<tr>
<td>Yemen</td>
<td>4,057</td>
</tr>
<tr>
<td>Israel</td>
<td>3,146</td>
</tr>
</tbody>
</table>

*Countries with highest number of cases for the period*

Measles

- Most common disease in many parts of the world
- 10 million cases / 110,000 deaths per year
- Infants 6 – 11 mo
  - One dose prior to travel
  - Will not count as routine vaccine, must be repeated
- Children over 1 yr
  - Second dose prior to travel
  - Not a booster: 5% do not respond to 1st dose
  - 2nd dose can be given 28 days after the first dose
- Teens and adults without evidence of immunity
  - Should get two doses separated by at least 28 days

Rotavirus diarrheal deaths in children <5 yrs

Rotavirus vaccine

- Rotateq* 2, 4, 6 months, oral
- Rotarix* 2, 4 months, oral
- Accelerated: 6, 10, 14wks
- Complete series by 32wks
- Series should not be started after 15wks old
- 70% decrease in US hospitalization rates since vaccine in use

Accelerated routine vaccines

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>MIN AGE</th>
<th>MIN INTERVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTaP</td>
<td>6 wks</td>
<td>4 wks</td>
</tr>
<tr>
<td>IPV</td>
<td>6 wks</td>
<td>4 wks</td>
</tr>
<tr>
<td>Roto</td>
<td>6 wks</td>
<td>4 wks</td>
</tr>
<tr>
<td>Hib</td>
<td>6 wks</td>
<td>4 wks</td>
</tr>
<tr>
<td>HepB</td>
<td>birth</td>
<td>4 wks</td>
</tr>
<tr>
<td>PCV13</td>
<td>6 wks</td>
<td>4 wks</td>
</tr>
<tr>
<td>Hep A</td>
<td>6 mos</td>
<td>6 mos, followed by 2 dose series, 6 mo after #1</td>
</tr>
<tr>
<td>MMR</td>
<td>6 mo</td>
<td>repeat at 12mos and 4-6yrs</td>
</tr>
</tbody>
</table>

If 1st dose > 1yr can give 2nd dose min 4 weeks later (complete)

Travel vaccines, minimum ages - U.S.

- Yellow fever – 9 mos
- Meningococcal meningitis – 2 mos
- Hepatitis A – 6 mos *
- Japanese encephalitis – 2 mos
- Typhoid
  - Injectable – 2 yrs
  - Oral – 6 yrs
- Influenza - 6 mos
- Cholera, oral - 2 yrs
- Oral – 6 yrs
- TBE - 1 yr
- Rabies - no minimum

* new 2018
**Influenza**
- Rate of severe illness & death highest among
  - Children <2 yrs
  - >65 yrs
  - Those with underlying medical issues
- Universal recommendation to vaccinate > 6 mos old

**Yellow Fever Vaccine**
Age related risk of post-vaccine encephalitis

<table>
<thead>
<tr>
<th>Age</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6 mos.</td>
<td>NEVER</td>
</tr>
<tr>
<td>6-9 mos.</td>
<td>CDC consult</td>
</tr>
<tr>
<td>&gt;9 mos.</td>
<td>Same as adults</td>
</tr>
</tbody>
</table>

**Rabies Vaccine**
- 40% of all human rabies cases occur in <14 yo
- Consider pre-exposure prophylaxis for children traveling for extended periods to rural, remote, or developing areas
- Same dose for infants and adults, no age limitations
- Expensive in US
  - Often not covered by insurance

**Hepatitis A**
- Routine pediatric vaccine in US
- Two dose series
  - 12 mos and 6-18 months later
  - Approved >6 mos in 2018
  - Does not count and must be repeated
- Peds dosing 0.5mL
- Adult dosing 1mL

**Combined Hep A-Hep B vaccine**
**TWINRIX™**
- Approved in U.S for > 18 yrs old
  - 720 U Hep A + 20 mcg Hep B
  - 2 doses, minimum 6 mo apart
  - Accelerated: Day 0,7,14-28 & 1 yr
- Pediatric formulation: Europe
  - 360 U Hep A + 10 mcg Hep B
  - 1-15 yrs 0,1,6 mo schedule

**Typhoid vaccines**
- Oral Ty21a
  - 4 capsules over 1 week
  - >6 yrs old in US
  - Repeat every 5yrs
- Vi Polysaccharide
  - >2 yrs old
  - Repeat every 2 yrs
Meningococcal meningitis conjugate vaccines

- Protein conjugate vaccines available for Serogroups A, C, A/C combination
- T-cell dependent response produced
  - Stronger immune response in infants
  - Induces immunologic memory
  - Booster responses with future doses

Case 2
Dad is planning to take his healthy 10yr old hiking and camping throughout Brazil for 4 weeks

- His immunizations include:
  1 Hep B, 2 Hib, 3 PCV, 3 DTaP, 2 IPV, 1 MMR, 1 Varicella
- They only want “what is absolutely necessary”
- They do not plan to take malaria chemoprophylaxis

Summary of recommendations

- Routine vaccines:
  - DTaP, IPV, Hep A, Hep B, MMR, Varicella
- Travel specific vaccines:
  - YF, Typhoid & Rabies
- Medications:
  - Malaria prophylaxis, antimotility medications, ?? antibiotics
- Other:
  - Evacuation insurance, satellite phone
Vaccine hesitancy - TM provider influence

- Based upon the individual's perception
  - Disease susceptibility, severity
  - Vaccine safety, efficacy, cost
  - Social media input

How to approach the vaccine hesitant

- Recognize the spectrum
  - Find common ground
  - Review evidence of vaccine safety and efficacy
- Avoid attempts to engage in direct anti-vax statements
- Offer links to fact based literature

Beyond vaccines...

- Vector born illnesses & insect precautions
- Food and water born illnesses & precautions

Insect Precautions

- Physical barriers
  - Permethrin treated clothing
  - Screened windows / AC
  - Bed nets
- Insect repellent
- Chemoprophylaxis

Repellent Application

- Apply sprays outdoors to minimize inhalant exposure
- Apply to exposed skin only - not under clothing
- Do not apply to hands, near eyes, mouth or irritated skin
- Patch test selected children
- Do not to use DEET on infants <2mo (EPA & AAP)
- DEET + sunscreen: Not recommended due long-term exposure considerations

DEET Repellent Toxicity

- Subacute encephalopathy and seizures reported
- Extremely rare - millions of exposures per year
- Majority of events occurred in children < 8yrs old

Non-DEET containing repellents

- Picaridin
- Citronella
- Eucalyptus oil
- Neem oil
- Coils

Besides physical barriers and repellents...

- Continuous chemoprophylaxis
  - Provide sufficient doses for entire trip and post-travel
- Stand-by malaria treatment
  - Prolonged stays with limited access to treatment medication

Chloroquine

250 or 500 mg tablet
Dose: 8.3 mg/kg/week (salt)

**Negatives**
- Resistance in many areas
- Difficult to split
- No readily available liquid
- Bitter taste
- Dosing is cumbersome
- Highly toxic in overdose

**Positives**
- Weekly dosing
- Inexpensive
- Good for prolonged trips

Mefloquine

**Negatives**
- Neurological side effects
- Difficult to split
- No readily available liquid
- Bitter taste
- Dosing is cumbersome

**Positives**
- No age/weight restrictions
- Weekly dosing
- Inexpensive
- Good for prolonged trips

CDC Health Information for International Travel 2018
Mefloquine dosing - 250mg tablet

<table>
<thead>
<tr>
<th>Weight</th>
<th>Dose (250 mg tab)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 9 kg</td>
<td>5mg/kg/wk*</td>
</tr>
<tr>
<td>10-19 kg</td>
<td>1/4 tab q wk*</td>
</tr>
<tr>
<td>20-30 kg</td>
<td>1/2 tab q wk*</td>
</tr>
<tr>
<td>31-45 kg</td>
<td>3/4 tab q wk*</td>
</tr>
<tr>
<td>≥ 46 kg</td>
<td>1 tab q wk*</td>
</tr>
</tbody>
</table>

* Start 2 weeks before entering malaria endemic region, take weekly & 4 wks after return

Mefloquine side effects

- Pediatric data is limited
  - Albright TA, et al; J Travel Med 2002
- Vomiting at higher doses
- 2 Case reports – anxiety and mania
  - Thapa R; J Child Neurology 2009
  - Clattenburg RN; J Am Acad Child Adolesc Psych 1997

Atovaquone/Proguanil (Malarone)

**Negatives**
- Daily dosing
- Expensive
- Not readily available liquid
- Bitter taste

**Positives**
- Pediatric and adult pills
- Good for short or last-minute trips
- Well tolerated

Atovaquone/Proguanil dosing

<table>
<thead>
<tr>
<th>WEIGHT</th>
<th>MALARONE (250mg A/100mg P)</th>
<th>MALARONE-PEDIATRIC (62.5mg A/25mg P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-8 kg</td>
<td>--</td>
<td>½ tab</td>
</tr>
<tr>
<td>&gt;8-10 kg</td>
<td>--</td>
<td>½ tab</td>
</tr>
<tr>
<td>&gt;10-20 kg</td>
<td>¼ tab</td>
<td>1 tab</td>
</tr>
<tr>
<td>&gt;20-30 kg</td>
<td>½ tab</td>
<td>2 tabs</td>
</tr>
<tr>
<td>&gt;31-40 kg</td>
<td>¾ tab</td>
<td>3 tabs</td>
</tr>
<tr>
<td>&gt;40 kg</td>
<td>1 tab</td>
<td>4 tabs</td>
</tr>
</tbody>
</table>

*Start 1-2 days before travel, continue DAILY while there, and for 7 days after leaving endemic region

Doxycycline

Dose: 2 mg/kg/day up to 100 mg/day

**Negatives**
- Contraindicated in children
  - US <8yrs Europe <12yrs
- Daily dosing
- Sun sensitivity
- Poor compliance
- 4 wks after return

**Positives**
- Inexpensive
- Helps treat acne

Start 1-2 days before travel, continue DAILY while there, and 8 days after leaving malarious area

Prescribing tips

- Write dose and frequency clearly
- Additional doses for unplanned extended stays & lost doses
- For prolonged stays
  - Encourage identification of local medical provider
  - Dose adjustment with weight change
  - Medication supply
Administration tips for malaria medications

- No child friendly preparations
  - Tablets only
  - Buy pill cutter for more accurate dosing
- Bitter taste
  - Crush or dissolve in small amount of liquid
  - Disguise flavor: pudding, chocolate syrup, candy bar
  - Child specific enticements

Malaria Treatment

- Counsel families regarding urgency of medical evaluation
- Stand-by therapy - Oral for uncomplicated malaria
  - Atovaquone-proguanil ‘Malarone’
  - Artemether-Lumefantrine ‘Coartem’
  - Quinine plus Doxycycline
  - Mefloquine

Case 3

- 4yr old visiting family in rural India
- Non-bloody watery diarrhea x4 in past 12hours
- Able to tolerate some liquids but not interested in eating
- Mildly ill appearing, no fever

Preventing traveler’s diarrhea

“Boil it, cook it, peel it, or forget it”

<table>
<thead>
<tr>
<th>What to do...</th>
<th>What not to do...</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Wash hands frequently</td>
<td>• Don’t eat from street vendors</td>
</tr>
<tr>
<td>• Eat at quality establishments</td>
<td>• Nothing raw or under-cooked</td>
</tr>
<tr>
<td>• Food is well cooked and served hot</td>
<td>• No leafy vegetables and salads</td>
</tr>
<tr>
<td>• Fruits than can be washed and peeled</td>
<td>• No unpasteurized dairy products</td>
</tr>
<tr>
<td>• Eat baked goods, crackers</td>
<td>• Don’t drink the tap water</td>
</tr>
<tr>
<td>• Bottled or boiled water / drinks</td>
<td>• Don’t brush teeth with tap water</td>
</tr>
<tr>
<td>- Mix formula with bottled or boiled water</td>
<td>• No Ice</td>
</tr>
<tr>
<td>• Continue to breast feed infants</td>
<td></td>
</tr>
</tbody>
</table>
Managing traveler’s diarrhea

- Diet
- ORS
- Probiotics
- Anti-secretory agents
- Anti-motility agents
- Antibiotics

Oral rehydration

- World Health Organization formula
  - NaCl: 3.5 gms/L
  - KCl: 1.5 gms/L
  - Anhydrous glucose: 13.5 gms/L
  - Trisodium citrate: 2.9 gms/L

- Homemade recipe
  - 1 Liter clean water
  - One level teaspoon salt
  - Eight level teaspoons sugar

Anti-secretory medications

- Bismuth subsalicylate ‘Pepto-Bismol’
  - Contains aspirin – Reye syndrome
  - Do not use in children <12yr
  - Use with caution in older children with viral symptoms

Role of Probiotics

- No standardized dosing as of yet
- Effectiveness against traveler’s diarrhea mounting
  - Lactobacillus SS & Saccharomyces boulardii most promising

When is antibiotic treatment appropriate?

- If hydration, ORS & probiotics not sufficient
- Azithromycin 10 mg/kg x 1-3 days
  - Dispense as powder – liquid stable 2 weeks
  - ‘Blind spot’ in the expert guidelines

Case 4

- Family of four traveling to South East Asia - Thailand, Vietnam & Malaysia for approximately 3 months. They have 2 children; 3 and 8 yrs old. The 8 year old has moderate persistent asthma and is on daily inhaled steroids and a long acting bronchodilator. Last hospitalized for asthma 2 years ago.
- They plan to travel by local transportation, buses, and planes. They are planning to have local accommodations, not big hotels and want to be flexible.

Case 5

Healthy 16yr old going to Peru for 12 days with school

- Itinerary:
  - Fly into Lima – 2 days/1 night
  - Fly to Cusco – 4 days/3 nights
  - Private charter bus to the Aguas Calientes
    - 4 days exploring the Sacred Valley, hiking the Inca Trail and Machu Picchu Ruins
    - Spend 1 day doing community outreach project at orphanage
- Accommodations: small hotels

CASE 4 - What vaccines would you recommend? (Click all that apply.)
- Hep A
- Typhoid
- Rabies PREP
- Meningococcal meningitis
- Japanese encephalitis
- Yellow fever

CASE 4 - What would you recommend besides vaccines?
- Evacuation insurance
- Inhaled asthma medications
- Oral steroids for acute asthma attack
- Advise against going
- Develop emergency plan prior to arrival

Answers 1, 2, 3, & 5

Traveling with chronic medical conditions

- Get clearance to travel from primary provider & specialty provider
- Medications & equipment
  - Bring additional routine medications
  - Emergency / back-up medications
- Locate reputable clinics / medical providers PRIOR to arrival
- Evacuation insurance
- IAMAT – membership provides up-to-date health information and international network of English speaking providers

CASE 5 - What would you recommend?
- Acetazolamide q12hr (1-2 prior to altitude and 2 days there)
- Slow ascent to altitude
- Dose of dexamethasone to prevent AMS
- Be alert for atypical symptoms of AMS in self and others

2 & 4

None of the above is correct combination
Educate parents about kids and altitude

**Signs and symptoms:**
- AMS - Children <3yr: alteration in sleep, appetite, activity and mood
  - Children 3-8 yo: difficult describing symptoms
- HAPE – dyspnea, hypoxia, decreased exercise tolerance
- HACE – lethargy, confusion, ataxia, convulsions

**Prevention:**
- Slow ascent
- Consider Acetazolamide 5mg/kg/day divide q 12hs

**WMS and ISMM – excellent accessible online education**
www.fallingrain.com-altitude reference

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Consensus statement ISMM: Children at altitude

**Treatment of Acute Mountain Sickness**

- **Mild**
  - Rest - No further ascent (preferably descend) until symptoms cease
  - Symptomatic treatment, such as analgesics and antiemetics.
- **Moderate (worsening symptoms despite rest and symptomatic treatment)**
  - Descent
  - Oxygen
  - Acetazolamide 2.5 mg/kg/dose p.o. 8 to 12 hourly (max 250mg per dose)
  - Desamethasone 0.15 mg/kg/dose p.o. 6 hourly
  - Hyperbaric chamber
  - Treat symptoms


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Other things to consider

- **Vaccines**
  - YF not typically recommended for this itinerary
  - Typhoid
  - Routine vaccines: Tdap, MCV, HPV
- **Medications**
  - Malaria prevention not typically recommended for this itinerary
  - Traveler’s diarrhea
- **Teens traveling with other teens**
  - High risk behaviors
  - Drugs and alcohol
  - Sexual activity – emergency contraception
    - https://ec.princeton.edu/worldwide/

Summary - Children are not small adults!

- **Vaccines**
  - Routine and Travel vaccine – Accelerate and catch-up as needed
  - Age restrictions on vaccines
- **Medications**
  - Provide liquid when possible
  - Share administration tips
  - Encourage traveling with medical kit
    - Prescription medications, OTC meds, ORS
- **Safety concerns**
  - Car seats, strollers, no motorcycles, pedestrian traffic
  - Theft and Violence
- **Excellent resource for parents**
  - https://www.healthychildren.org symptom checker

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Selected resources: Pediatrics

- CDC Yellow Book 2018
- Am Acad Pediatrics Red Book 2018