Anatomy of a Pediatric Clinical Visit

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Objectives

- Engaging effectively with children and families in clinical encounters
- Key components of the pediatric visit
  - History
  - Physical exam
  - Assessment
  - Plan

Meeting the Patient

- Observe first
- Smile, introduce self
- Is parent anxious?
- Is child fearful?
- Begin history with easy questions
- Begin examination with observation of developmental milestones
- Explain what you will do before you do it

Taking the History

Birth History

- Birth weight
- Mode of delivery
- Maternal health
- Maternal ART use
- Infant ART use
- Neonatal complications

Taking the History

Developmental History

- Gross motor milestones
- Fine motor milestones
- Language
  - Receptive
  - Expressive
- Problem solving

Taking the History

Past Medical History

- Illnesses
  - Pneumonia
  - Ear infections, drainage
  - Fevers
  - Diarrhea
- Hospitalizations
- Medications
- Immunizations

Taking the History

Family History

- Who is living? Current health status?
- Who has died? Cause of death?
- HIV status?

Parents
Grandparents
Siblings

Taking the History

Social History

- Who lives in household?
- Who is child's guardian?
- Where does child live?
  - Water supply
  - Food supply
- School

Physical Exam

- Approaching a child
  - Perform least frightening elements first
  - Enlist child's cooperation
- Growth parameters
  - Weight
  - Length or height
  - Head circumference
- Vital Signs
  - Respiratory rate
  - Heart rate

Physical Exam

Observation

- Breathing pattern
  - Indrawing or retractions
  - Nasal flaring
  - Grunting
- Motor activity
  - Symmetry
  - Using all extremities
- Skin color and perfusion
- Interaction with others

Physical Exam

- Mouth
  - Ulcers
  - White patches
  - Teeth and gingiva
- Ears
- Neck
  - Parotid swelling
  - Lymph Nodes
- Scalp

Physical Exam

Chest

- Lungs
  - Symmetry in aeration
  - Crackles, wheezes
  - Dullness
- Heart
  - Rate, rhythm, extra heart sounds
  - Murmur
- Axillae
  - Lymph nodes

Physical Exam

- Abdomen
  - Contour
  - Bowel sounds
  - Soft or hard
  - Tenderness
  - Mass
  - Liver
  - Spleen
  - Inguinal lymph nodes
- Genitalia
  - Anomalies
  - Rash, ulcers, drainage

Physical Exam

- Musculoskeletal
  - Deformities
  - Mobility
- Neurological
  - Strength
  - Reflexes
  - Symmetry
- Skin

Assessment

- Growth chart
- Development
- HIV status
- Problem List
  - Infections
  - Organ system abnormalities
- Social support system

Plan

- Treatment for problems
- Nutritional support needed?
- PCP prophylaxis needed?
- ART indicated?
- Referrals for home and community support
- Plan for next visit

Follow-up Visits

- Interval history
- Growth
- Development
- Physical exam

- Tracking patterns over time

Summary

- Initial visit involves complete history and physical examination
- Follow-up visits focus on interval changes
- Track patterns over time
- Build trusting relationship – will facilitate adherence with care and treatment

Confirming HIV Infection & Clinical Staging in Children

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Learning Objectives

- Review HIV diagnostic testing in infants and children
- Assess level of immune suppression based on age
- Discuss clinical classification in pediatric HIV disease

Where will patients be identified?

- VCT for children & adolescents
- Referral sources
  - PMTCT
  - Adult ART
  - OVC
  - Hospital inpatient & outpatient
  - TB
  - Nutrition

Where will patients be identified?

- Newborns detected through screening
- Infants presenting with illness

- Children presenting with illness
- Children detected through screening

- Adolescents presenting with illness
- Adolescents detected through screening

Confirm HIV diagnosis

- Over age 18 months
  - HIV antibody
- Under age 18 months
  - HIV DNA PCR
  - HIV RNA PCR

WHO-HIV Infection Diagnosis

Children 18 months or older:

- positive HIV antibody testing (rapid or laboratory-based enzyme immunoassay). This is usually confirmed by a second HIV antibody test (rapid or laboratory-based enzyme immunoassay) relying on different antigens or of different operating characteristics.

and /or

- a positive virological test for HIV or its components (HIV-RNA or HIV-DNA or ultrasensitive HIV p24 antigen) confirmed by a second virological test obtained from a separate determination.

WHO-HIV Infection Diagnosis

Children younger than 18 months:

- a positive virological test for HIV or its components (HIV-RNA or HIV-DNA or ultrasensitive HIV p24 antigen) confirmed by a second virological test obtained from a separate determination taken more than four weeks after birth.

- Positive antibody testing is not recommended for definitive or confirmatory diagnosis of HIV infection in children until 18 months of age.

Baseline evaluation

- Complete clinical history & physical exam
- Neurodevelopmental assessment
- Growth parameters: weight, height, head circumference
- Laboratory:
  - Hematology
  - Liver enzymes
  - CD4 % (absolute CD4)
  - Viral load (HIV RNA)
- Chest radiograph

WHO Immunologic Class

	Less than 12 months % CD4	12-35 months % CD4	36-59 months % CD4	5 years and older Absolute CD4
None or not significant	>35	>30	>25	>500
Mild	30-35	25-30	20-25	350-499
Advanced	25-29	20-24	15-19	200-349
Severe	<25	<20	<15	<200 or <15%

WHO Clinical Stage 1

- Asymptomatic
- Persistent generalized lymphadenopathy

WHO Clinical Stage 2

- Unexplained persistent hepatosplenomegaly
- Papular pruritic eruptions
- Extensive wart virus infection
- Extensive molluscum contagiosum
- Fungal nail infections
- Recurrent oral ulcerations
- Unexplained persistent parotid enlargement
- Lineal gingival erythema
- Herpes zoster
- Recurrent or chronic upper respiratory tract infections (otitis media, otorrhoea, sinusitis or tonsillitis)

WHO Clinical Stage 3

- Unexplained moderate malnutrition not adequately responding to standard therapy
- Unexplained persistent diarrhoea (14 days or more)
- Unexplained persistent fever (above 37.5°C intermittent or constant, .
- for longer than one month)
- Persistent oral candidiasis (after first 6–8 weeks of life)
- Oral hairy leukoplakia
- Acute necrotizing ulcerative gingivitis or periodontitis

Stage 3

- Lymph node tuberculosis
- Pulmonary tuberculosis
- Severe recurrent bacterial pneumonia
- Symptomatic lymphoid interstitial pneumonitis
- Chronic HIV-associated lung disease including brochiectasis
- Unexplained anaemia (<8 g/dl), neutropaenia (<0.5 × 109 per litre) and or chronic thrombocytopaenia (<50 × 109 per litre)

WHO Clinical Stage 4

- Unexplained severe wasting, stunting or severe malnutrition not responding to standard therapy
- Pneumocystis pneumonia
- Recurrent severe bacterial infections (such as empyema, pyomyositis, bone or joint infection or meningitis but excluding pneumonia)
- Chronic herpes simplex infection (orolabial or cutaneous of more than one month’s duration or visceral at any site)
- Extrapulmonary tuberculosis

Stage 4

- Kaposi sarcoma
- Oesophageal candidiasis (or candidiasis of trachea, bronchi or lungs)
- Central nervous system toxoplasmosis (after one month of life)
- HIV encephalopathy
- Cytomegalovirus infection: retinitis or cytomegalovirus infection affecting another organ, with onset at age older than one month
- Extrapulmonary cryptococcosis (including meningitis)
- Disseminated endemic mycosis (extrapulmonary histoplasmosis, coccidiomycosis)

Stage 4

- Chronic cryptosporidiosis
- Chronic isosporiasis
- Disseminated non-tuberculous mycobacterial infection
- Cerebral or B-cell non-Hodgkin lymphoma
- Progressive multifocal leukoencephalopathy
- Symptomatic HIV-associated nephropathy or HIV-associated cardiomyopathy

In summary,

- Confirm HIV infection
- Assess immune suppression (CD4)
- Assess clinical status (history & physical exam)

Monitoring Growth and Nutrition in the HIV-infected Child

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Objectives

- Discuss the clinical significance of growth patterns in HIV-infected children
- Review basic feeding recommendations for HIV-infected infants & children
- Outline an approach to monitoring growth

Growth & HIV

- Child growth is a composite of weight, linear growth, and head growth
- Growth is a sensitive indicator of health and disease in childhood
  - Healthy, well-nourished children thrive
  - Ill or undernourished children fail to thrive
- Poor growth may be the first indication of HIV disease progression
- Improved growth is a sign that antiretroviral therapy is helping a child
- Malnutrition increases the morbidity & mortality due to HIV
  - Breastfeeding is recommended for infants with documented HIV infection

Risk Factors for Malnutrition

- Maternal malnutrition & low birth weight (LBW)
- Repeated infections (oral, dental)
- Loss of nutrients (vomiting, diarrhea)
- Increased basal requirements (fever)
- Psychosocial factors

- Prevention, early detection, intervention

Infant Feeding

- Breastfeeding
  - Exclusively for 6 months
- Complementary foods
  - After 6 months of age
  - Breastmilk still important in diet
    - Half of nutrition 6-12 months
    - Third of nutrition 12-24 months
- Replacement Feeding
  - Milk replacement must be prepared correctly

Additional Considerations

- Provide additional meal when ill
- Treat underlying infections
- Multivitamin and mineral supplementation
- Counsel about food and water hygiene
- Refer to community food programs

- Treat HIV with antiretrovirals based on eligibility criteria

Taking a Diet History

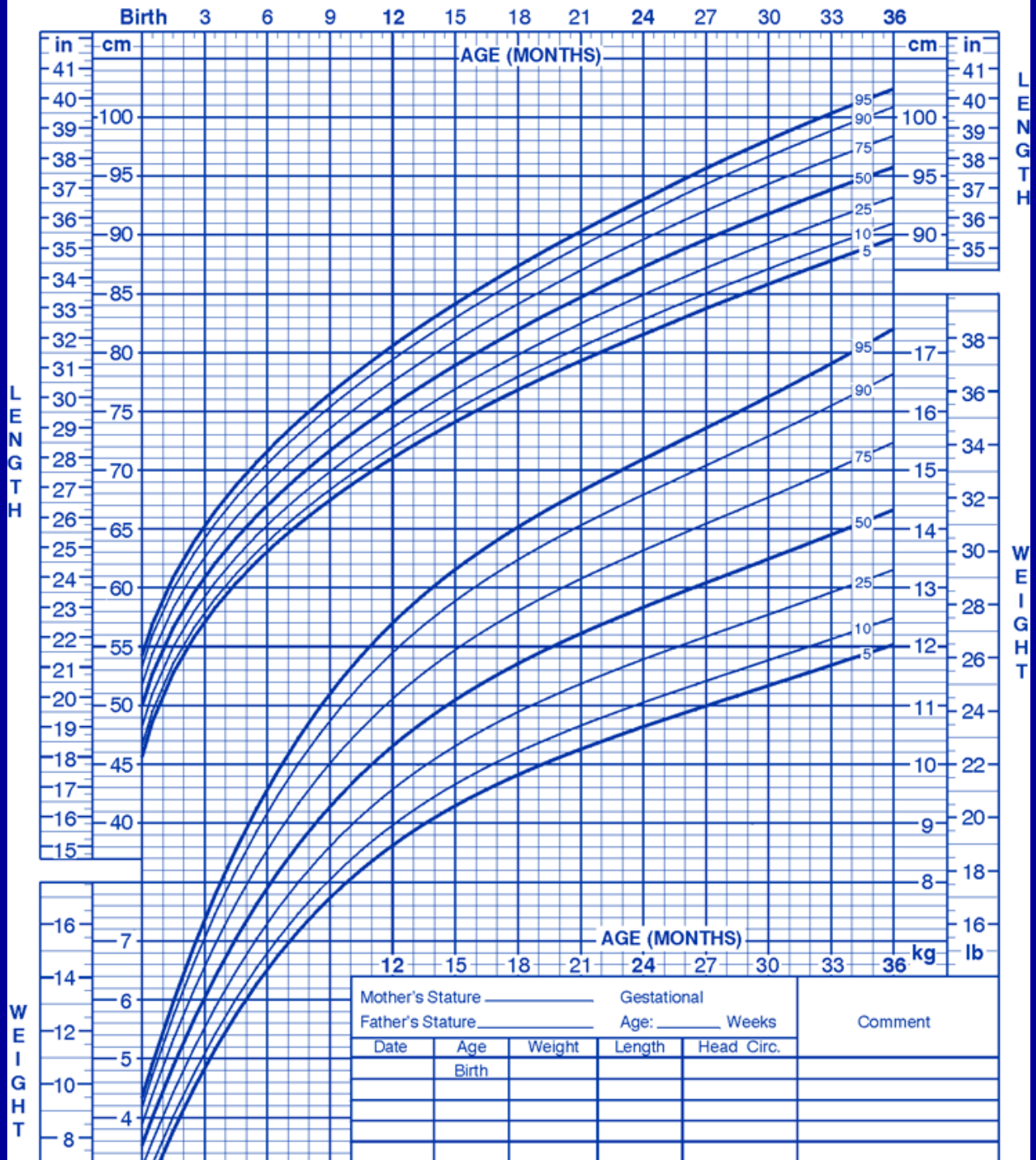
- Ask about child's diet
  - How many times a day does child eat
  - Any problems with breastfeeding
  - What does child eat
- Ask about food availability
- Illnesses that interfere with feeding
  - Mouth pain
  - Vomiting
  - Diarrhea

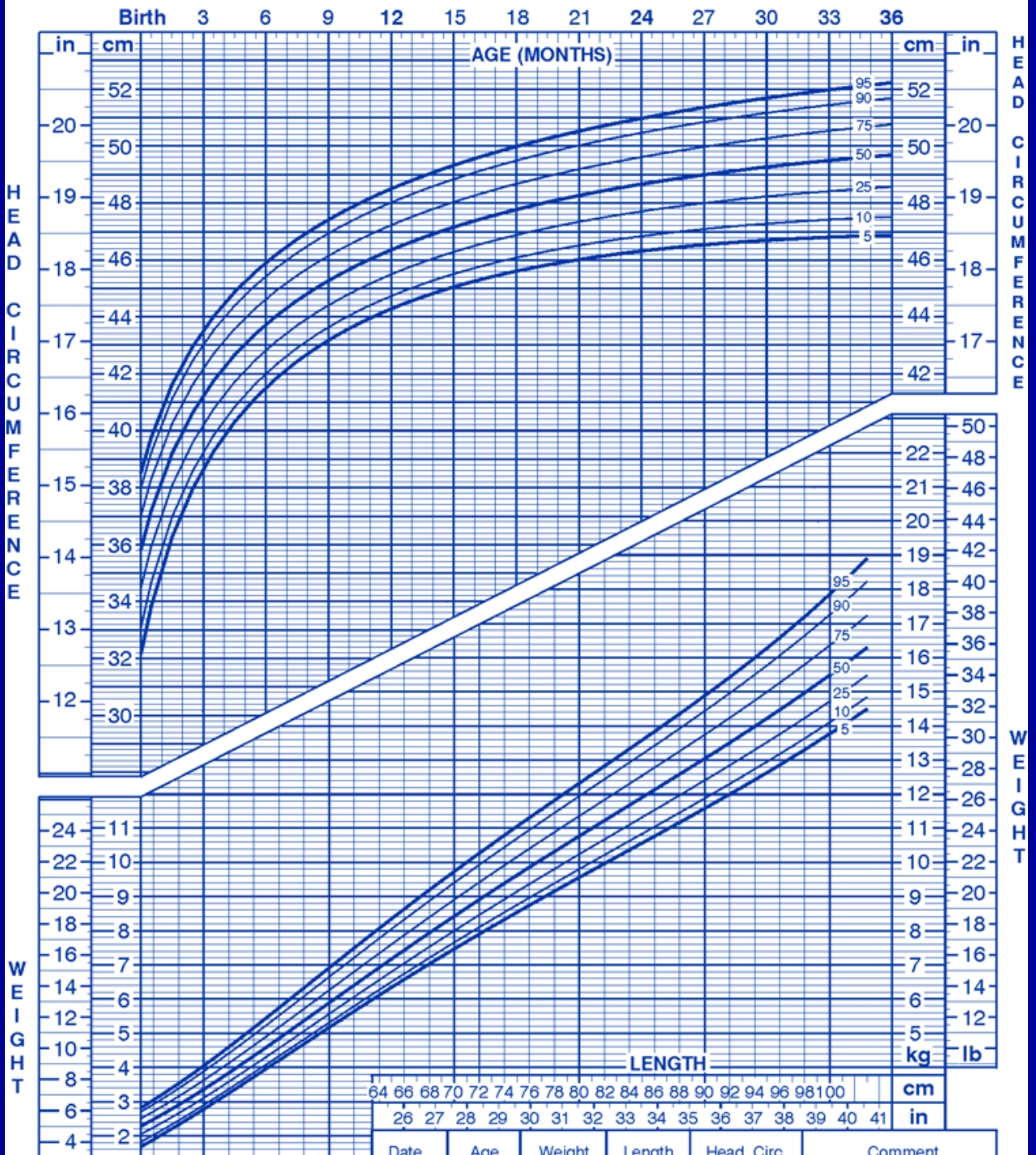
Growth Monitoring

- Measure children at every visit
- Infant and child scales for weight
- Flat surface for length (up to 24 months)
- Stable vertical surface for height
- Measuring tape for head circumference
- Growth charts – standardized, locally appropriate
- Child health card

Growth Chart

- Document birth weight, length, and head circumference
- Calculate current age
- Plot current measures carefully
- Assess current percentiles
- Assess change since last visit
  - Growing along same percentile
  - Falling across percentiles
  - Increasing across percentiles


Birth 3 6 9 12 15 18 21 24 27 30 33 36
AGE (MONTHS)
in cm
cm in
LENGTH
95 90 75 50 25 10 5
WEIGHT
AGE (MONTHS)
kg lb
Mother's Stature
Father's Stature
Gestational Age: Weeks
Comment
Date Age Weight Length Head Circ.
Birth


Birth 3 6 9 12 15 18 21 24 27 30 33 36
AGE (MONTHS)
in cm
cm in
HEAD CIRCUMFERENCE
HEAD CIRCUMFERENCE
95 90 75 50 25 10 5
WEIGHT
WEIGHT
LENGTH
64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100 cm
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 in
kg lb
Date
Age
Weight
Length
Head Circ.
Comment

Growth Failure

- Clinical Indicators
  - Crossing two major percentile lines
  - If <5%, failure to grow parallel to curve
- Wasting
  - Weight for height <5%
  - Loss of >5% of lean body mass
- Stunting
  - Height for age < 5%
  - Weight for height maintained

Case example

- Mary is a 12 month old with HIV who presents to the ART clinic for initial evaluation.
- Growth parameters:
  - Weight = 8 kg (<5th %)
  - Length = 70 cm (<5th %)
  - Head circumference = 46 cm (50th %)
  - Weight for Length = 10th percentile

- Dietary history:
  - Mary is breastfed 4 times daily and eats 3 small meals per day
  - Her mother is on ART and doing well
  - Her family has adequate food supply
- HIV staging
  - Class 2 (hepatosplenomegaly, recurrent acute otits media)
  - CD4 15%

- ART initiated
  - Nevirapine
  - Stavudine
  - Lamivudine
- Age 15 months
  - Weight = 9.2 kg (5^{th} %)
  - Length = 75 cm (10^{th} %)
  - Weight for length = 25^{th} %

Summary

- Growth is an important indicator of child health, especially in HIV-infected infants and children.
- Dietary intake and growth measurement should be part of each clinical encounter.
- Plotting a growth curve over time provides valuable information about disease progression and success of ART.

Promoting Quality of Life Through Palliative Care

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Objectives

- Define palliative care and its role in HIV care and treatment
- Discuss symptom management in children
- Outline basic elements of care at the end of life

Palliative Care

- Is the active total care of someone whose disease is not curable
- Includes care of the body, mind and spirit, and also involves giving support to the family
- It begins when illness is diagnosed, and continues regardless of whether or not a person receives treatment directed at the disease
- Goal is achievement of the best quality of life for patients and their families

World Health Organization (1998) Cancer Pain Relief and Palliative Care in Children

Palliative Care

- Affirms life and regards dying as a normal process
- Neither hastens nor postpones death
- Provides relief from pain and other distressing symptoms
- Integrates psychological and spiritual aspects of patient care

Palliative Care

- Offers a support system to help the family cope during their loved one's illness and in their own bereavement
- Treatments often considered "curative" have a role in palliative care, provided that the symptomatic benefits of treatment outweigh the disadvantages
- Multidisciplinary approach includes the family and available community resources
- Can be successful even if resources are limited

Integrate Palliative Care

- Physical comfort and function
  - HAART is the best palliation for HIV
  - Anticipate and manage side effects
- Emotional reaction/coping
- Social & family support
- Respectful communication
- Health care planning & decisions

Integrated Care Continuum

Symptom Management

- What is a symptom?
- Which symptoms are most common in your patients?
- Which symptoms are most distressing?

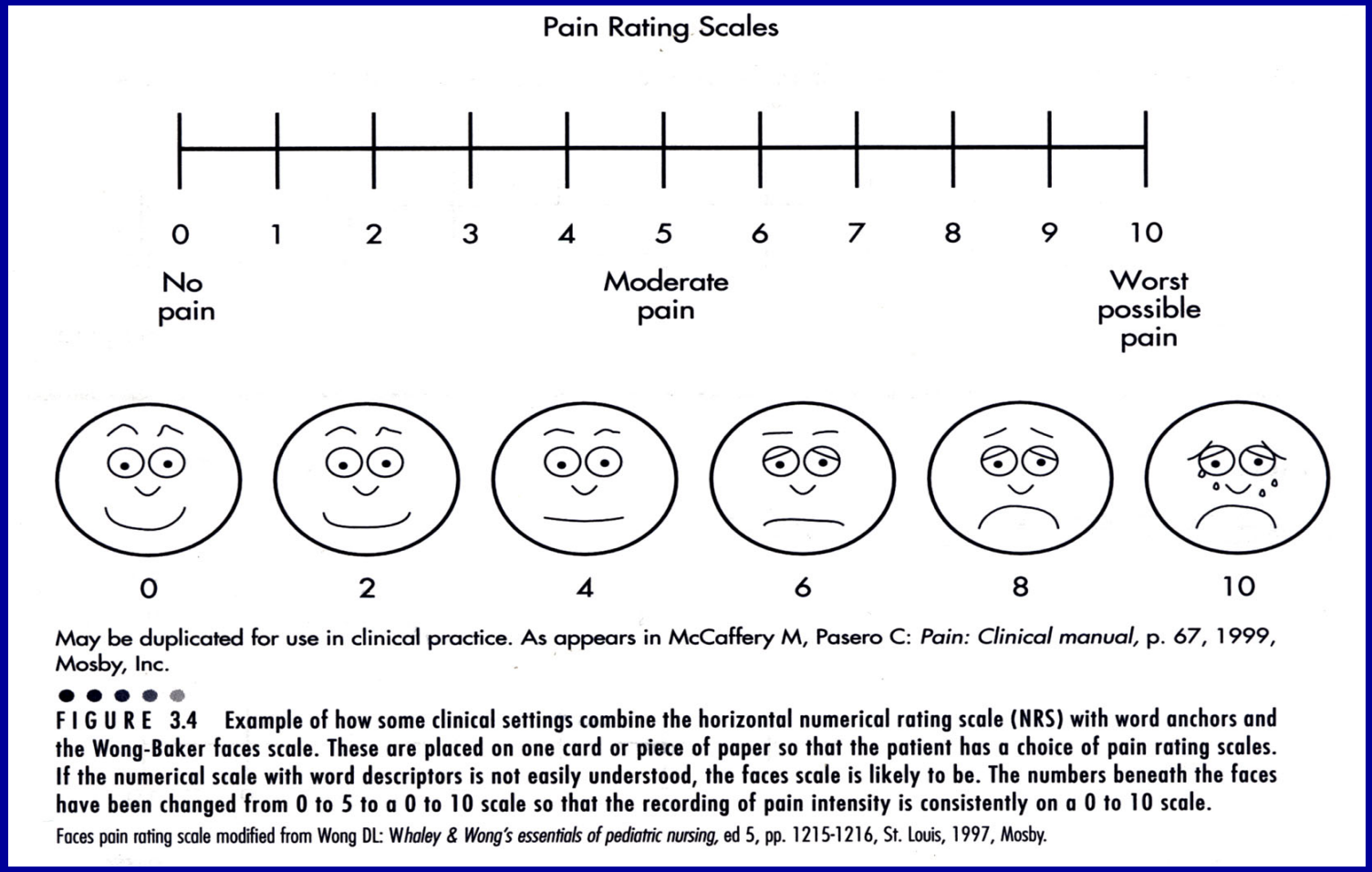
Symptoms

- Pain
- Anorexia
- Nausea & Vomiting
- Diarrhea
- Respiratory Symptoms
- Fevers
- Restlessness & Agitation
- Sleep Disturbance

Symptom Management

- Assess accurately
  - Developmental approach
- Manage effectively
  - Pharmacologic
  - Non-pharmacologic
- Barriers to effective management
  - Fears (morphine, addiction, death)
  - Lack of professional knowledge & skill
  - Effective medicines unavailable

Wong-Baker Faces Scale



May be duplicated for use in clinical practice. As appears in McCaffery M, Pasero C: *Pain: Clinical manual*, p. 67, 1999, Mosby, Inc.

FIGURE 3.4 Example of how some clinical settings combine the horizontal numerical rating scale (NRS) with word anchors and the Wong-Baker faces scale. These are placed on one card or piece of paper so that the patient has a choice of pain rating scales. If the numerical scale with word descriptors is not easily understood, the faces scale is likely to be. The numbers beneath the faces have been changed from 0 to 5 to a 0 to 10 scale so that the recording of pain intensity is consistently on a 0 to 10 scale.

Faces pain rating scale modified from Wong DL: W*haley & Wong's essentials of pediatric nursing*, ed 5, pp. 1215-1216, St. Louis, 1997, Mosby.

Manage Symptoms

- Emotional support
- Physical methods
  - Touch (stroking, massage, rocking, vibration)
  - Ice or heat
- Cognitive methods
  - Preparation for procedures
  - Distraction (music), imagery, hypnosis
  - Play
- Traditional practices that are helpful

World Health Organization 3-Step Analgesic Ladder

Step 1: Non –opioid for mild pain

Step 2: Opioid for mild to moderate pain

+/- Non-opioid

Step 3: Opioid for moderate to severe pain

+/- Non-opioid

Analgesics – Step 1

- Paracetamol
  - Not anti-inflammatory
  - No gastrointestinal or hematological side effects
- Ibuprofen
  - Anti-inflammatory
  - Gastrointestinal and hematological side effects
- “Ceiling effect”
  - No further analgesic effect if higher dose
  - Increased toxicity

Analgesics – Steps 2 & 3

- Codeine
  - Oral
- Morphine
  - Oral: 0.15-0.3 mg/kg/dose every 4 hours
  - IV: 0.05-0.1 mg/kg/dose every 2-4 hours
- Infants <6 months – start at ¼ dose
- No “ceiling effect”
  - Titrate to effect
  - No maximum dose
  - The correct dose is the dose that works

Advanced Disease

- How do we know a child is approaching the end of life?
  - Pattern of complications more frequent and severe
  - Recovery is never back to baseline
  - Not responding to HAART
  - Help one problem and two more get worse
- Death can be sudden and unexpected

Advanced Disease

- Decisionmaking
  - What is medically possible?
  - What is uncertain?
- Review values and goals
  - Views change with time and experience
  - Patients may become unable to communicate
- Listen carefully; respect child and family wishes
- “Hope for the best; plan for the worst”

Advanced Disease

- Discontinue antiretroviral therapy
  - If all regimens have failed
  - If medicines are causing more problems than they are helping
  - If it is impossible to administer the medicines
- Continue active management consistent with palliative care goals
- There is NEVER “nothing more we can do”

Social & Emotional Care near End of Life

- Developmentally appropriate activities
  - Physical touch
  - Play
- Honesty
- Legacy and memory making
  - Photographs
  - Hand molds, hand prints
  - Child's wishes after his/her death

Physical Comfort at the End of Life

- Moisten lips, mouth, eyes
- Keep child clean & dry
- Only give essential medications
- Control symptoms with medical treatment as needed
- Eating less is OK
- Skin care/turning at least every 2 hours
- Make sure pain is controlled

World Health Organization, IMAI
Palliative Care Module, 2003

Care of the Family

- Saying goodbye
  - Sibling visits
  - Extended family
- Bereavement support
  - Maintain contact
  - Families want to know their child is not forgotten

Caring for the Caregiver

- Compassion fatigue & burnout
  - Multiple losses
  - Young death “unnatural”
- Intentional plan for prevention
  - Self care
  - Our teams
  - Our families

Myths & Realities: Can I get HIV from this Child?

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Objectives

- Identify common misconceptions about HIV transmission
- Review Standard Precautions
- Discuss PEP (post-exposure prophylaxis)
- Advocate for inclusion of HIV infected children in homes, schools, and community settings

Common Misconceptions

- Fears of HIV
  - Health care workers
  - Family members
  - School staff
  - Neighbors & community
- Restrictions
  - Placement in orphanages
  - Use of bowls, cups, eating utensils
  - Physical touch and comfort

Advocacy

- Children deserve the best care and treatment available
- School is a child's work
  - Learning
  - Socialization
- Living in a family household
  - Material needs
  - Emotional growth & development

Standard Precautions

- WHO and CDC
- Health care settings
- Home and community settings
- All people should be treated the same way
  - Promotes most successful protection against transmission of infectious agents
  - Avoids stigma

Standard Precautions

- Body fluids considered infectious
  - Blood
  - Any body fluid containing visible blood
  - Pleural fluid
  - Pericardial fluid
  - Cerebrospinal fluid
  - Synovial fluid
  - Amniotic fluid
  - Semen
  - Vaginal secretions

Standard Precautions

- Body fluids not infectious for HIV, HBV
  - Tears
  - Feces
  - Urine
  - Saliva
  - Nasal secretions
  - Sputum
  - Vomit
  - Sweat

Standard Precautions

- Hand washing
  - Soap & water, before & after patient contact
- Avoid exposure of skin & mucous membranes to blood & body fluids
- Gloves
  - For contact with blood or body fluids
- Gown, mask, eye protection
  - If risk of splash with blood or body fluids
- Dispose of sharps safely

Standard Precautions

Clinical Situation	Precautions
• Holding a baby	• Wash hands
• Changing a diaper with urine and feces	• Wash hands
• Drawing a blood specimen	• Gloves, wash hands
• Performing lumbar puncture	• Gloves, wash hands, consider gown, mask, eye protection
• Cleaning eating utensils	• Wash hands & utensils in soap & water

*P*ost *E*xposure *P*rophylaxis

- Health care settings
- Written plan before exposures occur
  - Report exposure
  - Assessment & management of exposure
  - Monitoring & counseling
- Educate all health care workers
- ART must be available on site 24 hours per day

Health care worker exposure

- Immediately wash exposure site with soap & water or flush with water
- Report exposure to PEP program
- PEP program initiates evaluation and management protocol promptly
- Pregnancy in health care worker not a contraindication for PEP

Assess Exposure

- Assess risk level of exposure
  - Type of exposure
    - Percutaneous
    - Mucous membrane
    - Non intact skin
  - Type & amount of body fluid
  - HIV infection status of source
    - HIV antibody result; symptomatic?
    - Unknown source
  - HIV susceptibility of exposed person
    - HIV antibody result

Assess health care worker

- Medical history
- Baseline HIV testing
- Counsel
  - HIV testing baseline
  - PEP antiretrovirals if needed
  - Reduce risk to others until transmission ruled out
  - Follow and retest at 6 & 12 weeks, 6 months

Percutaneous

- More severe percutaneous
  - Large bore hollow needle
  - Deep puncture
  - Visible blood on device
  - Needle used in artery or vein
- HIV positive source
- Recommend 3 drug regimen, 4 weeks
- HIV negative source – no PEP

Percutaneous

- Less severe percutaneous
  - Superficial injury
  - Solid needle
- Asymptomatic HIV positive source, low viral load
  - Recommend 2 NRTI regimen, 4 weeks
- Symptomatic HIV positive source
  - Recommend 3 drug regimen, 4 weeks
- HIV negative source – no PEP

Skin & Mucous Membranes

- Skin exposure – only if not intact
- Eye, nose, mouth exposure
  - Small volume, asymptomatic – consider 2
  - Small volume, symptomatic – recommend 2
  - Large volume, asymptomatic – recommend 2
  - Large volume, symptomatic – recommend 3
  - 4 week course
- HIV negative source – no PEP

Summary

- Acknowledge and dispel incorrect assumptions about HIV transmission in casual or household settings
- Train health care providers and family members to use Standard Precautions
- Implement a clear plan for PEP in health care settings
- Advocate for children to participate fully in school and family settings

Skin Disease in the HIV-infected Child

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Objectives

- Review a structured approach to evaluating skin disease
- Discuss skin conditions seen commonly in children with HIV infection

- Primary skin disease
  - Infections
  - Inflammation
- Secondary to systemic process
  - Infections
  - Drug eruptions

Assessment

- Onset
- Progression of lesions
- Associated pruritis or pain
- Systemic signs of illness
- Medication history

Visual Examination

- Skin exam
  - Type of lesion
  - Shape
  - Size
  - Color
  - Distribution
- Microscopic exam
  - KOH
  - Gram stain
  - Oil prep

Skin lesions

- Macule, patch
- Plaque
- Papule, nodule
- Vesicle, bulla
- Pustule
- Wheal
- Scale
- Crust
- Erosion, ulcer
- Scar
- Excoriation
- Lichenification

Fungal infections

- Candida
  - Oral
    - White plaques on oral mucosa
  - Diaper & intertriginous areas
    - Erythematous plaques with satellite papules or pustules
  - Persistent or recurrent suggests severe immunodeficiency
  - Can be invasive (eg. esophagitis)

Fungal infections

- Dermatophytes – *Trycophyton* species
  - Tinea capitis (scalp)
  - Tinea corporis (skin)
  - Tinea pedis (feet)
  - Tinea unguum, Onychomycosis (nails)
- Annular plaques
  - Scale
  - Alopecia

Viral infections

- Herpes simplex
  - Gingivostomatitis – oral ulcerations
  - Recurrent - clusters of vesicles on erythematous base with crusting
  - Chronic - ulcer
- Varicella zoster
  - Varicella (chickenpox)
  - Zoster (“shingles”) – dermatomal distribution

Viral infections

- Kaposi's sarcoma
  - Violaceous color
  - Flat or raised lesions, small or larger
- Human papillomavirus
  - Verrucous warts (hands, feet, face)
  - Flat warts (face)
- Molluscum contagiosum
  - White umbilicated papules
  - Face most common

Bacterial infections

- Skin lesions
  - Pustule
  - Abscess
  - Crust
  - Tender plaque
- Secondary infection
  - Wounds
  - Varicella
  - Insect bites

Dermatitis

- Seborrheic dermatitis
  - Scaly plaques in scalp, eyebrows, nasolabial folds, diaper area
- Atopic dermatitis
  - Severe pruritis
  - Excoriations
  - Lichenification

Drug eruptions

- Macular, papular, confluent
  - "morbilliform" or "measles-like"
- Erythema multiforme
  - "target" lesions
- Mucous membranes
  - Stevens-Johnson syndrome
- Fixed drug eruptions
- Urticaria

Summary

- Skin conditions are common in children with HIV infection.
- A systematic approach to examination and description of skin lesions is often diagnostic.
- Drug eruptions require careful assessment and discontinuation of offending agent when serious or life-threatening.

Cardiac Disease in the HIV-infected Child

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Objectives

- Review the range of cardiac conditions experienced by children with HIV infection.
- Discuss the clinical assessment of cardiac conditions.

Etiology of Cardiac Disease in HIV

- Cardiac disease directly associated with HIV infection
- Cardiac complications due to infections or nutritional deficiencies associated with HIV infection
- Cardiac complications due to side effects of medications used to treat HIV or its associated conditions

Range of Conditions

- Congestive heart failure
- Cardiomyopathy
- Myocarditis
- Arrhythmia
- Pericardial effusion
- Congenital heart disease

Assessment

History

- Fatigue, dyspnea with exertion
- Pallor
- Cyanosis
- Diaphoresis with feedings
- Chest pain
- Palpitations
- Failure to thrive
- Persistent lower respiratory symptoms

Assessment

Physical exam

- Heart rate & rhythm
- Blood pressure
- Heart sounds
- Lung sounds
- Hepatomegaly
- Perfusion
- Color

Assessment

- Chest x-ray
  - Cardiomegaly
  - Pulmonary edema
- Electrocardiogram
  - QTc interval
- Echocardiogram
  - Left ventricle function
  - Structural anomaly
- Holter monitor

Management

- Congestive heart failure
  - Diuretic therapy
  - Digoxin
  - Nutrition (selenium)
- Arrhythmia
  - Discontinue offending medication
- Congenital heart disease
  - Manage same as if no HIV infection

Summary

- Congestive heart failure may occur in HIV-infected children as a result of infectious myocarditis, HIV cardiomyopathy, or secondary to other conditions.
- Arrhythmia may occur when medications or infections affect the normal conducting system.

Gastrointestinal Disease in the HIV-infected Child

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Objectives

- Review the range of gastrointestinal conditions experienced by children with HIV infection.
- Discuss the clinical assessment of gastrointestinal conditions.

Etiology

- GI disease directly associated with HIV infection
- GI complications due to infections or nutritional deficiencies associated with HIV infection
- GI complications due to side effects of medications used to treat HIV or its associated conditions

Range of Conditions

- Mouth
- Esophagus
- Stomach
- Small intestine
- Colon
- Liver
- Pancreas

Assessment

History

- Anorexia
- Nausea, vomiting
- Pain
  - Location: oral, substernal, epigastric, periumbilical, right upper quadrant
  - Character: colicky, radiating
  - Precipitating factors: chewing, swallowing
- Diarrhea
- Jaundice
- Bleeding

Assessment

Physical exam

- Skin and eyes for jaundice
- Oral cavity for mucosal and dental lesions
- Abdomen
  - Contour
  - Bowel sounds
  - Tenderness
  - Organomegaly or mass
- Anus & rectum

Assessment

- Stool exam
- Abdominal x-ray
- Endoscopy
  - Upper
  - Lower
- CD4+
- Hepatic transaminases, bilirubin
- Pancreatic amylase, lipase

Management

- Identify & treat infections
  - Candida
  - Herpes simplex
  - Cytomegalovirus
  - Cryptosporidium
  - Clostridium difficile
- Supportive care
  - Nutrition
  - Hydration

Management

- Review medications for potential side effects
  - ART
  - Antimicrobials
- Liver toxicity
  - Mild elevations of ALT
  - Marked elevations of ALT
  - Evidence of hypersensitivity

Summary

- Immunocompromised children experience opportunistic infections throughout the GI tract.
- Medications often cause mild GI distress.
- A few medications, such as nevirapine and cotrimoxazole, can cause hypersensitivity and severe hepatic damage.

Renal Disease in the HIV-infected Child

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Objectives

- Review the range of renal conditions experienced by children with HIV infection.
- Discuss the clinical assessment of renal conditions.

Etiology of Renal Disease in HIV

- Renal disease directly associated with HIV infection
- Renal complications due to infections associated with HIV infection
- Renal complications due to medications used to treat HIV and accompanying infections

Range of Conditions

- Electrolyte & acid-base disorders
- Hematuria
- Pyuria
- Proteinuria
- Acute renal failure
- Tubular disease
- Glomerular disease
- Hypertension

Assessment

History

- Medications

Physical assessment

- Blood pressure
- Edema
- Urine output
- Perfusion

Laboratory assessment

Assessment

- Serum electrolytes
  - Na, K, Cl, CO2
  - Anion gap
- Blood urea nitrogen (BUN) and creatinine
- Urine dipstick
  - Blood, protein, glucose
- Urine microscopy
  - RBC, WBC, casts, crystals
- Urine culture

Acute Renal Failure

- Pre-Renal – decreased perfusion
  - Low intravascular volume
  - Hypotension
- Renal
  - Acute tubular necrosis
  - Interstitial nephritis
  - Rapidly progressive glomerulonephritis
- Post-renal - obstruction
  - Tubules
  - Ureters

Drug Toxicity

Trimethoprim	*Hyperkalemia*
Aminoglycosides	*Acute renal failure*
Penicillins	*Interstitial nephritis*
Rifampin	*Fanconi syndrome*
Pentamidine	*Acute renal failure*
Non-steroidal anti-inflammatory agents	*Interstitial nephritis*
Indinavir	*Nephrolithiasis*
Tenofovir	*Fanconi syndrome*

Fanconi Syndrome

- Proximal tubular dysfunction characterized by excessive urinary losses of glucose, phosphate, bicarbonate, sodium, & amino acids
  - Metabolic acidosis
  - Hypokalemia
  - Hypophosphatemia
- Toxic exposure

Glomerular Disease

- Definitive Diagnosis: Renal biopsy
- Focal segmental glomerulosclerosis
  - HIV-associated nephropathy
  - Heavy proteinuria, renal insufficiency, hypertension
  - May progress to end stage renal disease
- Mesangial hypercellularity
  - Proteinuria or nephrotic syndrome
  - Better prognosis
- Mesangial proliferative glomerulonephritis
  - Variable prognosis

Treatment of Glomerular Disease

- Control hypertension
- Angiotensin antagonists reduce blood pressure, proteinuria, and fibrosis in chronic kidney disease
  - Angiotensin-converting enzyme (ACE) inhibitors
  - Angiotensin receptor blockers
- Trial of prednisone for heavy proteinuria due to mesangial hypercellularity

Summary

- Renal disease may occur early or late in the course of HIV infection.
- Hypertension, hematuria, and proteinuria are common presentations of renal disease in HIV-infected children.
- Drug toxicity must be considered in the presence of renal failure, Fanconi syndrome, nephrolithiasis, and electrolyte disturbance.