MacPeds Pediatric Survival Guide

For Residents and Clinical Clerks 2020-2021

Editor: Dr. Bojana Babic

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Welcome to MacPeds!

This handbook was designed for the large number of residents from a variety of programs that rotate through pediatric CTU and MacPeds during their training. It may also be helpful for clinical clerks during their time on the pediatric wards.

Hopefully this demystifies some of the 'pediatric specific' logistics, and gives a few practical suggestions for drug dosages and fluid requirements. This is intended only to act as a guideline for general pediatrics use, and some drugs, doses, indications and monitoring requirements may differ in individual situations. **The Drug Formulary in this book is intended for pediatric patients only and is up to date as of June 2020. For neonatal drugs to be used in the neonatal nurseries please refer to the neonatal drug book in the neonatal nurseries**.

We would like to thank the following individuals for their roles in compiling and editing sections

- Nicole Clarke and Melani Sung - pediatric formulary
- Rocio Monroy and Julie Pace - St Joseph's Nursery section

We would very much appreciate any feedback, suggestions or contributions emailed to peded@mcmaster.ca.

Sincerely,
Bojana Babic and MacPeds
Editors

ALLIED HEALTH – CONTACT NUMBERS/PAGERS

SPECIALTY	NAME	PAGER	Phone
RT	Ward General Pager	1607	
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SLP	Sara Webster	5082	73726
PT	Weekend	1148	
PT	Sarah Fairfield	1148	76549
PT	Alex Schimmell	1029	75814
PT	Barb Pollock	4317	76549
CCAC	Ann Rush	1092	72840
Child Life	After hours/ Weekends	1225	
Child Life	Margaret Karek	1225	76129
Child Life	Laura Vos	4086	76129
Child Life	Maria Restivo	4087	76129
Child Life	Lora Zimmerman	4092	76129
Dietitian	Helena Pelletier	1279	73562
Dietetic Assistant	Allison Pottinger	1074	73159
Pharmacist	Nicole Clarke	1423	76356
Pharmacy Technician	Carrie Morrell	1099	76356
IV Nurse		1007	
Lactation Consultant		5062	
Pediatric Thrombosis Nurse	Rebecca Goldsmith	4445	75970
Pediatric Thrombosis Nurse	Kay Decker	4444	75978

Social Work	Sarah Anderson	1039	76339
Social Work	Josie Cirella	1522	73714
Nurse Practitioner Team 1,2,5	Sandra Russell	1583	78911
Nurse Practitioner Team 1,2,5	Denise Irwin	7402	78911
Nurse Practitioner Team 1,2,5	Robyn Stevens		78911
Team 1 Pager		5301	
Team 2 Pager		5302	
Team 3 Pager		5303	
Team 5 Pager		5305	
Senior Pediatric Resident		1645	
Pediatric ICU Resident/ Subspecialty Night Coverage		1000	

Paging

To page someone from within the hospital:

1. dial 87
2. enter person's pager number (4 digits)
3. enter call-back extension (5 digits)
4. enter priority code (* * then 1 for CODE/STAT, 2 for ROUTINE, 3 for ANYTIME, 4 denotes PHYSICIAN paging)

If you don't know their pager #, wish to leave a typed message or to wait on an outside line: call **x76443**

To inactivate/activate your own pager:

1. dial 87
2. enter your own pager #
3. dial 08

Division of Pediatric Medicine – CTU 1 and 2 Expectations

Orientation:

At the beginning of each block, the attending should meet with their team members to review the objectives, expectation and schedule of the rotation. The senior resident and/or general pediatric fellow may have valuable input during this time.

Morning Handover:

Morning handover starts at 7:15 or 7:35. Team 1 is 'on take' and will be late handover on odd days of the month. Team 2 is 'on take' and will be late handover on even days of the month. Morning teaching begins promptly at 8:00. It is therefore important to complete a succinct handover within your team's allotted 20 minutes. Teams should divide the patient list among learners prior to handover, if possible.

On weekends, morning handover takes place at 8:30 for both teams.

Morning Teaching:

Morning teaching takes place every morning at 8:00. Please refer to the CTU teaching schedule for locations – this will be posted online as well as on the wards.

Morning Huddle:

Morning huddle occurs daily to discuss anticipated discharges as well as anticipated length of stay of all patients. These will occur with the attending pediatrician and senior pediatric resident (SPR) from 9:15-9:30am in 3C conference room along with nursing and allied health staff. Discharge planning should always be occurring and the team should be aware of potential discharges each day. The attending and SPR should aim to assess and discharge those patients promptly before the start of ward rounds.

See Patients:

After teaching, learners will see their assigned patients. The chart and nursing notes should be reviewed to identify any issues that have arisen over night. The patient should be seen and examined. All lab work and radiological procedures that are pending should be reviewed. The house staff should then come up with a plan for the day and be ready to present that patient during ward rounds. It is not necessary that full notes be written at this time, as there will be time allotted for that later in the day.

Ward Rounds:

Ward rounds are to take place from 10:30-12:30. During ward rounds the attending paediatrician, SPR, and house staff will round on patients for their team. These are family-centered rounds. Effort should be made to have the family present, either at the bedside or outside the room, while the team is discussing the patient status and management plan. These are also work rounds and orders should be written while rounding on each patient. Some spontaneous teaching during rounds and at the bedside can occur during this time, however there is allotted time for that later in the day.

Multidisciplinary Rounds:

Multidisciplinary rounds take place daily for senior team members at 1pm in 3C conference room.

Patient Care:

During this afternoon residents will follow through with decisions made during ward rounds. This may include arranging investigations, consulting other services, or following up on results. Progress notes, dictations, and other documentation should be completed during this time.

Afternoon Teaching Sessions:

Afternoon teaching will take place at 1:15pm. Please refer to the CTU teaching schedule for locations – this will be posted online as well as on the wards.

Evaluations:

Time is left in the schedule for evaluations. This would be the time to give residents mid-way evaluations, as well as end of rotation evaluations.

Evening Handover:

Evening handover occurs at 16:40 or 17:00. The day team should provide the night team with printed patient lists. The team will then run the list and handover to the on-call team in iPASS format.

Division of Pediatric Medicine, CTU 1 and 2 Weekly Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
7:15-7:55	Handover	Handover	Handover	Handover	Handover
8:00-9:00	Teaching: See schedule	Teaching: See schedule	Teaching: See schedule	Teaching: See schedule	Teaching: See schedule
9:00-10:30	See Patients	See Patients	See Patients	See Patients	See Patients
10:30-12:30	Family-centred Rounds	Family-centred Rounds	Family-centred Rounds	Family-centred Rounds	Family-centred Rounds
12:15-13:00	**Lunch**	**Lunch**	**Lunch**	**Lunch**	**Lunch**
13:00	MDR	MDR	MDR	MDR	MDR
13:15-14:00	Clerk Bedside Teaching	Teaching or Patient Care	Pediatric AHD	Subspecialty Teaching	Patient Care
14:00-16:00	Patient Care	Patient Care		Patient Care	
16:00-16:40	Evaluations	Evaluations		Evaluations	Evaluations
16:40-17:20	Handover	Handover	Handover	Handover	Handover

The detailed monthly schedule for this can be found at
www.macpeds.com
MDR=Multi-Disciplinary Rounds

May 2020

Rounding Process: 3C – McMaster Children's Hospital

Purpose of rounds is to:

- collaboratively develop and communicate a plan of action for each patient with the Interprofessional health care team, the patient and the patient's family
- facilitate safe and timely patient discharge planning
- provide a forum for education
- provide excellent patient care

Pre-Rounding Agenda

*(to be done before round start time of **10:30**)*

Team Member	Pre-Round Tasks
SPR/Fellow/Staff/NP	• See watchers and new admissions as needed • See patients for pre-round discharge • Call urgent consultants and arrange urgent investigations/procedures • Determine time allotment for each patient based on census and rounding time goal of 2 hours • Charge RN and/or quality nurse to create daily rounding schedule → if watchers identified as a need to see more urgently SPR to let them know prior to starting rounds to adjust schedule
Resident/Clerk/NP	• Talk to patient/family and bedside nurse • Examine patient • Review physician progress notes (chart), interprofessional team notes (Meditech), medication profile, flow sheet data (VS, I/O, weight) and new investigation results • **Gather patient charts onto chart racks, and obtain computer for rounds**
Bedside RN	• Gather pertinent data to be presented (weight change, I/O, Urine Output, Fluid Balance, VS, etc) • Ask patient/parents if they want to participate in rounds (if asleep should team wake them?) • **Bring Red Binders to rounds for all patients**
Charge RN	• Charge RN and/or quality nurse to create daily rounding schedule and then pass this information on to bedside nurses to assist with planning for breaks **During rounds:** Help with coverage while bedside nurse attends rounds
Business Clerk (done prior evening)	• Ensure each chart has stamped order sheets • Ensure there are patient label stickers in chart (to facilitate completing and faxing of legible req's)

Notes for Rounds:

- Rounding time goal: **2 hours (10:30-12:30)**
- SPR/Staff to monitor time and lead brief teaching points (1 per patient)
- Once a bedside RN joins rounds aim to round on all of their assigned patients
- Rounds to be completed in patient room unless otherwise requested by patient/family
- Information to be presented in a sensitive manner for all patients/families
- **Follow rounding schedule and all learners to help with finding next nurse to round with**
- Pharmacist will attend rounds with each team on alternate days to assist in reviewing of medications

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Post-Rounding Agenda

Team Member	Afternoon Tasks
SPR/Fellow/ Staff/NP	• Help facilitate and arrange urgent consults, investigations, or procedures • Complete family update if not already done at rounds (include junior learner if possible) • Ensure learners attend afternoon teaching on time • Ensure list is updated and review iPASS with learners before evening handover
Resident/ Clerk/ NP	• Arrange investigations/consults as discussed at rounds (Give req's/consults to be faxed to Business Clerk) • Follow-up on any outstanding investigations • Attend afternoon teaching (13:15-14:00) • Complete documentation including progress notes and dictations • If done early, help with new admissions/consults or transfers • Ensure **list is updated** with clear plan for oncoming night-time team • Communicate any changes to the plan made at rounds with bedside nurse/family *Note: Patient care to be completed **before** evening handover*
Bedside RN	• Transcribe and implement orders (ensure yellow sheets sent to pharmacy)
Charge RN	• Ongoing updates on plan from bedside RN and NP as applicable
Business Clerk	• Fax req's/consults and keep record that fax went through • Follow-up on bookings of tests/procedures

Rounding Process: 3C – McMaster Children's Hospital

Rounding Template

Section	Details		Presenter
ID	Brief sentence: gender, age, reason for admission and pertinent PMHx ***Note:*** *If pt admitted overnight discuss presentation and initial workup.* Does this patient have a POST?		Resident/ Clerk/NP
Prioritized Issue List:	1. Issue #1 2. Issue #2 …		Resident/ Clerk/NP
Note: Nurse to present information below but resident/clerk/NP to review prior to rounds.			
Systems Review *Only discuss concerns or pertinent negatives*	**CNS:**	LOC, Pain Management, Withdrawal (WAT Scores), NVS	Bedside Nurse
	CVS:	Fevers, HR, BP, Perfusion, IV access (difficult?), IV Fluid & Rate, Consider TKVO?	
	RESP:	Cough, Breath Sounds, RR, WOB details, FiO_2, Secretions, Suctioning, NS Drops, Incentive Spirometry, Chest Tube	
	GI/GU:	Diet, Feed Amount (Route), TPN, Last BM (Consistency), G/JT?, Ostomy?, Drains? Abdo Girth, Emesis, **Today's Wt (↓or ↑from previous)**, Foley or I/O Cath? **Urine Output (ml/kg/h), Fluid Balance**	
	MSK/Skin:	Ambulation/Mobility, Pressure Sore Risk, Breakdown, Rashes, Wounds/Dressings	
	ID:	Isolation, New Diarrhea/Vomiting/Cough	
	Social:	Patient/Family Questions & Concerns, Stressors/Coping, Safety Concerns	
	Investigation /Procedures:	Frequency of Bloodwork, Outstanding Investigations or Procedures	
	Medications	Review MAR, PRNs Given, Held/Refused, Stop Dates	Pharmacy if available
	Which Disciplines are Currently Involved → ☐CLS ☐OT ☐PT ☐RD ☐RT ☐SLP ☐SW ☐Wound Nurse ☐**Other**		
Assessment and Plan:	• Summary of relevant information from Systems Review, Physical Exam and Investigations. • Review subspecialists involved • **Impression and Plan: Present Active Issues List with plan for each** 1. Issue #1 – Plan (i.e. further investigations, reassess meds, consult services, etc) 2. Issue #2 – Plan … • **Consider →** Hydration, Growth and Nutrition, and Discharge Planning (CCAC needed?). • **Reassess Daily →** CRM/Continuous $SP0_2$, VS/Wt freq., Accurate I/O, Bloodwork Freq. • **Orders and requisitions→** to be completed by other learner/NP before moving on to next patient		Resident/ Clerk/NP
Conclusion	Final Summary (+/- revisions) of Plan		SPR/ Fellow/ Staff
Outstanding Questions and Concerns			Pt, Family & Team
Post Rounding Multi-disciplinary Team Meeting	After rounding on all patients, Team 1 & 2 will meet in the 3C Conference Room with the Multidisciplinary Team [including CLS, OT, PT, RD, SLP, SW, CCAC (when available)] to run through the patient list. *Whichever team completes rounding first will begin.*		SPR/Fellow /NP/Staff

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Training the next generation of pediatricians

AM Handover Guidelines

7:15 am
Early Team Handover

The **Early Team** will receive handover at this time
- ❑ **Team 1: Even** Days
- ❑ **Team 2**: **Odd** Days

Please bring your own printed list to handover

Weekend & Holiday AM Handover starts at 8:30am

The overnight JRs (junior residents) & clinical clerks will present new patients

Spend **2 to 3 min** for each patient and discuss:
- ❑ Name, age, main presenting complaint(s)
- ❑ Brief history with the most important pertinent positives/negatives
- ❑ Relevant past medical history
- ❑ Brief summary of objective findings (physical exam, investigations)
- ❑ Admitting diagnosis and plan

Try to remember to focus on information that will change or inform patient management!

Subspecialty AM Handover occurs in the PICU at either 7:30am or 9:00am on weekdays and at 9:30am on weekends & holidays

JRs present team issues:
- ❑ Briefly state overnight issue(s) and management
- ❑ Inform the team of any issues that need follow-up or task(s) that were handed over the night before
- ❑ If there are no overnight issues or follow-up, simply state "No issues" or skip the patient and move on

7:35 am
Teaching Session

Clinical Clerk/JR/SR will present a case seen overnight or a topic of interest. Points to include:
- ❑ Salient clinical features
- ❑ Diagnosis and differential diagnosis for the patient
- ❑ Acute treatment options and brief long-term management goals (evidence-based, if possible)

7:35 am
Late Team Handover

The **Late Team** will receive handover at this time:

"Team on Take = Handover Late"
- ❑ **Team 1**: Late Handover on **Odd** Days
- ❑ **Team 2**: Late Handover on **Even** days

7:50 am
Heme-Onc & Team 3 Handover

Heme-Onc & **Team** 3 will handover at this time to incoming residents, fellows or staff

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PM Handover Guidelines

***CTU Seniors are expected to contact the Weekend Day SPR to handover the weekend plans for patients on their respective teams**

4:30 pm

The incoming team will print their own lists – please have them updated by 4:30pm

Team 3

- ❑ **Team 3** will give handover to the covering JPR (junior pediatric resident) along with the SPR (senior pediatric resident)
- ❑ Note: If this handover is expected to take longer than 10 minutes, the JPR will accept the rest of handover outside of the room and Team 1 or 2 will start handover

4:40 pm
Early Team Handover

The outgoing team will present team handover
Please follow the IPASS format

I-PASS
BETTER HANDOFFS. SAFER CARE.

I	Illness Severity	• Stable, "watcher," unstable
P	Patient Summary	• Summary statement • Events leading up to admission • Hospital course • Ongoing assessment • Plan
A	Action List	• To do list • Time line and ownership
S	Situation Awareness and Contingency Planning	• Know what's going on • Plan for what might happen
S	Synthesis by Receiver	• Receiver summarizes what was heard • Asks questions • Restates key action/to do items

(Starmer et. al, 2012)

Subspecialty PM Handover occurs at 5:30pm in the PICU on weekdays, weekends and holidays

5:00 pm
Late Team Handover

The **Late Team** will give handover at this time:
"Team on Take = Handover Late"
- ❑ **Team 1**: Late Handover on **Odd** Days
- ❑ **Team 2**: Late Handover on **Even** days

Note: If the early team arrives late for handover, or has exceeded the allotted handover time, their handover will be interrupted by the Late Team Handover at 5:00pm. The Early Team can then resume handover once the Late Team has finished

5:20 pm
Heme-Onc Handover

Heme-Onc will handover to the JPR & SPR at this time.
Please ensure that patient lists are updated.

I-PASS
BETTER HANDOFFS. SAFER CARE.

I	Illness Severity	• Stable, "watcher," unstable
P	Patient Summary	• Summary statement • Events leading up to admission • Hospital course • Ongoing assessment • Plan
A	Action List	• To do list • Time line and ownership
S	Situation Awareness and Contingency Planning	• Know what's going on • Plan for what might happen
S	Synthesis by Receiver	• Receiver summarizes what was heard • Asks questions • Restates key action/to do items

FIGURE 1
Elements of the I-PASS mnemonic.

Handover Format – the I-PASS break-down

I: Status: stable vs. watcher

P: One-line summary of child and reason for admission.
List of active issues +/- relevant management

A: Overnight action list

S: Anticipated overnight issues with management plans

S: Brief clarification from receiver (1-2 questions) if needed. If further questions, defer to end.

Recommended PEDIATRIC RESOURCES

Handbooks/Pocketbooks:

- *The Harriet Lane Handbook*
- *Pediatrics on Call*
- *Pediatric Drug Dosage Handbook* (available on most wards)
- *SickKids Drug Handbook and Formulary (only in e-Book)*

Texts:

- *Nelson's Essentials of Pediatrics*
- *Zitelli and Davis' Atlas of Pediatric Physical Diagnosis*
- *Rudolph's Fundamentals of Pediatrics*
- *Pediatric Clinical Clerkship Guide*

Clinical Skills:

- *Pediatric Clinical Skills* - Richard A. Goldbloom

Journals (all accessible via e-Resources at McMaster Libraries):

- *Pediatrics In Review*. Monthly publication by AAP (American Academy of Pediatrics), consisting of review articles and case presentations
- *Paediatrics & Child Health*. Monthly publication of CPS (Canadian Pediatric Society).

WEBSITES

McMaster Pediatrics Residency Program
http://www.macpeds.com
Our residency program site that includes staff & resident presentations, subspecialty orientation materials, policy statements and our favorite links.

Canadian Pediatric Society - *Position Statements*
http://www.cps.ca/en/documents The national association of paediatricians, committed to working together to advance the health of children and youth by nurturing excellence in health care, advocacy, education, and research.

- Position statements are a very valuable source of information for clinical management and evidence-based practice
- Separate site for information for parents (Caring for Kids): http://www.caringforkids.cps.ca/
- Caring for Kids New to Canada – peer reviewed web resource for health providers http://www.kidsnewtocanada.ca/

American Academy of Pediatrics (AAP)
https://www.aap.org
The American equivalent of CPS, which has an expansive collection of practice guidelines and policy statements that are widely quoted.

CDC & WHO Growth Charts
http://www.cdc.gov/growthcharts/

WHO Growth Charts Training Modules– Dieticians of Canada
http://www.dietitians.ca/Knowledge-Center/Live-Events/Online-Courses/WHO-Growth-Chart-Training.aspx

SOGC Guidelines (Society of Obstetricians & Gynecologists of Canada)
https://www.sogc.org
SOGC evidence-based guidelines as indexed by topic area. Some of these are quite helpful in Level 2 Nursery and other newborn settings. Many others are quite helpful during your obs/gyn rotation!

MORE WEBSITES …

Stanford School of Medicine Newborn Nursery Photo Gallery

http://newborns.stanford.edu/PhotoGallery/GalleryIndex.html

Alphabetically organized collection of photographs of common neonatal conditions and dermatology

CanChild-Centre for childhood disability research

http://www.canchild.ca/en/

National Advisory Council on Immunization (NACI)

http://www.phac-aspc.gc.ca/naci-ccni/

A program of the Canadian Public Health Association for educating parents and families, as well as health care professionals about the benefits and guidelines regarding childhood immunizations.

MOBILE TECHNOLOGY 'APPS'

- **Pediatrics on call** – useful for common pediatric conditions
- **Pedistat / PALS advisor** – quick access pediatric resuscitation information
- **Paed EKG or Rapid Paed ECG** – common pediatric ECG findings
- **BiliCalc** or **BiliTool.org**– useful to plot neonatal bilirubin levels
- **Ped(z)** – various tools including growth charts and vital ranges
- **MedCalc** – access to medical formulas
- **ePocrates** (http://www.epocrates.com) – free, drug database
- **PedsCases Podcasts:** www.pedscases.com - created by University of Alberta, excellent general pediatrics topics

OTHER LINKS

Hematology Oncology:

http://www.pedsoncologyeducation.com/

Neurology Exams:

http://library.med.utah.edu/pedineurologicexam/html/home_exam.html

Cardiology: Heart murmur audio clips
http://depts.washington.edu/physdx/heart/demo.html

DICTATIONS – Hamilton Health Sciences Corporation

x5000 to enter, (905) 575-2550 externally

Enter Author ID (#)

Enter site (#)
11. General
12. Henderson
13. MUMC
14. Chedoke

Enter Report Type (#)
21. Consultation
22. Discharge
3. Operative Report
4. Pre-op History & Physical
25. Clinic Note

Enter Chart Number (#) – the ID # after the 'M'

Enter Patient Type (#)
1. Inpatient
2. Outpatient
3. ER
4. Child & Family

Press 2 to dictate, *5 to disconnect

1. Hold
2. Pause/Continue
3. Skipback/Play
4. Fast Forward (44 to move to end)
5. Disconnect
6. Prioritize
7. Rewind (77 rewind to beginning)
8. End Report

For each report:
- your name, patient name (spelling if difficult)
- chart number, work type, copies to (FD, pediatrician, relevant consultants, MRP, etc)
** ensure copy is sent to all physicians who will be following patient post-discharge**

ADMISSION ORDERS (AD DAVID)

Please use the **printed admission order sets** when admitting patients on CTU. The following is a general approach to admission orders.

Admit:
Admit to (Ward 3B/3C/NICU/L2N) under *(staff name, Team #)*
***If admitting a patient overnight double check with your senior resident which team that patient should be admitted to.*
"Admit to (Ward) under the care of (Team #), under Dr. (day staff), with Dr. (on call) to cover until 8 am."

Diagnosis: (confirmed or suspected) – be as specific as possible

Diet:
Nothing by mouth (NPO), Sips only, Clear fluids (CF), Full Fluids (FF), Diet as tolerated (DAT) – may order as Advancing Diet
For infants – specify type of feed (breast vs. formula), volume and frequency or allow "ad lib" feeds
NG/G-tube Feeds – specify type of feed, volume, rate, and frequency
Special diets – thickened fluids (dysphagia), diabetic diet, ketogenic diet, hydrolyzed or fortified formulas, etc

Activity:
Bed rest +/- bathroom privileges, Non-weight bearing (NWB), Full weight bearing (FWB), Activity as tolerated (AAT)
May specify frequency of ambulation – i.e. ambulate BID, up in chair TID

Vital Signs / Monitoring:
Which vitals do you want to monitor (HR, RR, BP, Temp, O2 sat, Neurovitals)
How frequently? i.e. Q4H, Q8H, QShift (Q12H)
Accurate Ins & Outs – tracks oral and IV intake, urine output, stool losses
Daily weights – used in specific patients (i.e. renal, cardiac, failure to thrive)

Investigations:
Bloodwork – CBC, CRP, Electrolytes, Renal function, Liver enzymes, etc
Consider need for repeat bloodwork – if so, how frequent?
Cultures – Blood, urine, CSF, wound, NPS, etc
Imaging – CXR, Ultrasound, CT, MRI, ECHO, etc
Specific tests – ECG, EEG, swallow study, spirometry, etc
Consults – Dietician, OT, PT, Subspecialists (ID, Neuro, GI, etc)

Drugs
Home Medications
Treatment for current problem/presentation
Antibiotics
Antipyretics
Analgesics
Antiemetics

*__Always write patient's weight on orders and double check that dosing is appropriate for weight__. Refer to Drug Formulary for drug dosing.

**__Review Drug Allergies prior to ordering medications.__

DOCUMENTATION TIPS for PHYSICIANS

- Colleges and legislation define good documentation
- Documentation = an essential part of being a competent physician
- Provides communication amongst team members and other physicians
- Information documented in chart belongs to the patient - - you are the caretaker
- ALL notes in medical records should be written with expectation that they will be viewed by the patient and/or their legal representative

PROFESSIONALISM

- Colleges require a written, legible, medical record accompany patient encounters, as a standard of practice
- Hospitals require documentation be done in a timely manner
- Documentation should provide a clear indication of physician's thought process

Documentation in clinical notes should:

- Be factual, objective, and appropriate to the purpose
- Be dated and timed (preferably with 2400 clock)
- Provide chronological information
- Be written in a timely manner
- Be legible, including signature and training level
- Use only well-recognized abbreviations

Documentation should allow someone to determine:

- Who attended the appointment (i.e. mother, father)
- What happened
- To whom
- By whom
- When
- Why
- Result
- Impression
- Plan
- Late entries must be recorded as such
- Phone contact should also be timed

Choose words carefully – use:
'Reported no…..' VS 'denied'
'Declined' VS 'refused'

Avoid subjective and/or disparaging comments relating to the care provided by other HCP.

Doubts about a colleague's treatment decisions should not be recorded in medical records. Better to talk to your colleague instead.

Write only what YOU did or did not do. You cannot testify to the truth of the event if no personal knowledge.

- If negative event occurs, document what steps you took (who notified, course of action). Again write no comments as to what others did, will do, or said, etc. Notes may be written elsewhere (not in chart) in the event of potential litigation, but these notes are not protected,

NEVER change, tamper with or add to a medical record. Any subsequent additions or changes should be dated and signed at the time you make them, to avoid undermining the credibility of any changes.

- Do NOT later change an existing entry.
- Do NOT black-out or white-out words or areas.
- Do NOT insert entries between lines or along the margins of the chart as these may appear to have been added later, casting doubt on their reliability.
- Do NOT add an addendum to the chart after learning of a legal action, threat of a legal action or other patient complaint.

Poor charting may be perceived as reflecting less attention to detail, risking the conclusion that care provided was poor.

DISCHARGE CHECKLIST and REMINDERS

- Discharge should be anticipated at least 24-48 hours in advance, particularly for longer stay patients
- **Write prescriptions** (ideally at least 24hrs prior to discharge)
    - Ensure sticker, not bradma, is on both copies of prescription (or at least 3 identifiers written clearly: name, DOB, HC#, address)
    - Ensure all components of prescription are included:
        - Name of medication (ideally, generic name)
        - Dose (in mg or grams, with a few exceptions)
        - Route (ie. PO, PR, NG/Gtube, IV, subcutaneous)
        - Frequency (ie. daily, BID, TID)
        - Amount to dispense (if chronic medication, at least 1 month supply)
        - Number of repeats, if applicable
        - Signature, printed name and CPSO # of prescriber
    - OHIP+ covers most medications for children and youth <25years, but has some notable exceptions – before writing prescription, ensure the medication will be covered by OHIP+ https://www.ontario.ca/page/check-medication-coverage/
        - Some prescriptions will require a Limited Use (LU) code – see formulary section for frequently used LU codes
- **Ensure all follow-up appointments are arranged**
    - For family physicians, families generally requested to make these appointments themselves, ideally confirm prior to d/c
    - For consulting pediatricians or subspecialists, please request these in orders 24-48 hours in advance, and ideally confirm date/time prior to d/c
- **Write order to discharge home,** along with any added follow-up or other relevant orders
- **Complete face sheet** (found in front of patient chart)
- **Dictate discharge summary** using template
    - Write dictation number on facesheet after completing dictation

DISCHARGE SUMMARY TEMPLATE: PEDIATRICS

My name, designation (i.e. resident, clinical clerk) – spell your name
Attending MD (**ensure this is the consultant most responsible for this patient at the time of your dictation – check with senior resident if unsure**)
Patient name, ID#
Copies of this report to: FD, pediatrician, others (only if outside MUMC) – ensure all names are spelled properly and accurate
Date of Admission:
Date of Discharge:

ADMISSION DIAGNOSIS:
DISCHARGE DIAGNOSIS: include numbered list, as applicable
OTHER (non-active) DIAGNOSIS: if applicable
FOLLOW-UP: (appointment date/time, pending investigations, home care)
DISCHARGE MEDICATIONS: (dose, frequency, route and duration)

SUMMARY OF PRESENTING ILLNESS:

- 1-2 line summary of child's presenting illness and reason for admission. Refer to separately dictated note for full history and physical examination of admission.
- Only if no admission dictation completed, indicate full history of presenting illness (HPI), Past medical history, and initial physical examination prior to 'Course in Hospital'

COURSE IN HOSPITAL:

- Describe briefly the events and progression of illness while in hospital including status upon discharge
- Details of drug doses used, IV rates, etc rarely required and difficult to confirm as signing staff physician. Rather, say "XXX required hourly nebulized Ventolin for 5 hours after which the dosing interval was extended to every three hours".
- If the child has multiple medical issues, this section can be done by system (cardiovascular, respiratory, fluids and nutrition, ID, hematological, CNS, etc)
- List complex investigations (with results) under a separate heading.

PROCEDURES: (list of procedures for diagnostic or treatment)

State your name, designation; Attending MD name Press 8 to end dictation, and write down job # on face-sheet of chart

Hamilton Health Sciences

QUALITY DOCUMENTATION INITIATIVE

Discharge Summary Template

Diagnosis on Admission: Includes most responsible diagnosis for hospital admission

Diagnosis at Discharge: Includes most responsible diagnosis for hospital admission as well as co-morbid conditions identified either at time of admission or during the hospital admission as well as complications developed during course in hospital

Procedures: Includes a comprehensive list of procedures performed during hospital admission for definitive treatment, diagnostic or exploratory purposes

Course in Hospital: Includes a detailed comprehensive list of critical events while in hospital, complications, response to treatment

Discharge Medications: Includes a comprehensive list of medications, active at discharge, dosage and mode of administration

Discharge Plans/ Follow-up: Includes a comprehensive list of appointments, treatments, referrals, recommendations and follow-up including responsible physician(s), health care team(s), or agency involved, including arrangements for aftercare

Discharge Summary Tips for Electronic Patient Viewing via MyChart™

Currently, any patient can review their discharge summary (and entire hospital chart) by requesting access at Health Records; however, in reality, this rarely happens. As of October 1, 2018, discharge summaries will be available online -- for patients who sign up for MyChart Patient Portal access.

Regardless of the date they sign up for access, patients will be given access to their discharge summaries retroactive to October 1, 2018. This means that all providers should now be preparing these documents with the expectation that the patient will read them.

Key areas to focus on:

- Health/medical issues only
- A clear summary of the facts, including:
    - Presentation to hospital
    - Course in hospital
    - Investigations and results
    - Diagnosis(es)
    - Discharge plans, including:
        - Medications
        - Follow up appointments booked or to be booked
        - Instructions to patient and community providers (eg. Family Physician)

Avoid:

- Unnecessary judgements re: character of patient or family members
- Criticism or judgmental statements about members of the healthcare team
- Discussion of medical errors or adverse events – unless the error or event has been properly disclosed to the patient and family

Remember:

- Discharge summaries, in many cases, function as our primary communication with community physicians and caregivers who will be caring for the patient after admission. Please ensure that you are including all relevant information and instructions to maintain seamless care of the patient
- Don't include anything that you wouldn't be comfortable with if it appeared on the front page of a newspaper or in social media

PEDIATRIC HISTORY & PHYSICAL EXAMINATION

HISTORY

Identifying Data:
- Name, sex, age (years + months), race, who accompanies child, significant PMHx

Chief Complaint: in patient's or parent's words

History of Presenting Illness (HPI):
- Open-ended questions, allow parents/child to express their concerns
- Similar HPI details to an adult history
- Establish time line: "when was your child last well?", "what happened next?" etc.
- Select key symptoms and expand:
    - colour, character, quantity of vomit etc,
    - OPQRST of pain, aggravating/relieving factors etc
- Always ask about recent exposures to ill contacts – family, school

Past Medical History (PMHx):
- Significant ongoing medical problems
- Prenatal history:
    - Mother's age, gravida, live births, abortions etc
    - Planned vs unplanned pregnancy, onset of prenatal care
    - Complications, smoking, drinking, meds, drug use in pregnancy
    - Gestational age at birth
- Birth history:
    - Spontaneous vs induced labour, duration, complications
    - Presentation: breech, vertex, transverse
    - Interventions required: forceps, vacuum, c-section
    - Resuscitation required, Apgars, birth weight (conversion chart)
    - NICU, Level 2 nursery admission, duration
- Newborn history:
    - Common problems: jaundice, poor feeding, difficulty breathing
- Hospitalizations and significant accidents
- Surgical history

Medications – including dose changes, compliance
Allergies – list specific reaction
∗ **Immunizations** – ask specifically about Prevnar, Menjugate, Varivax, Synagis (if neonate).

Feeding History (if relevant):

- Breast feeding: exclusively?, duration, frequency
- Formula: brand, how is it prepared/diluted, # of feedings/day, quantity
- Solids: when started, tolerated, any reactions
- Vitamins (especially iron and Vit D): which ones, how often, dose
- Present diet: cereals, fruit, vegs, eggs, meat, amt of cow's milk
- Any difficulties with feeding? Any concerns from primary physician about poor weight gain?

Developmental Milestones (if relevant)**:**

- "Have you ever had any concerns about your child's development?"
- "How does child compare with siblings/peers?"
- Ask about current milestones in each category as appropriate for their age:
    - Gross motor
    - Fine motor, vision
    - Speech, hearing
    - Social skills
- Use major milestones (walking, first word, toilet training, etc) to assess previous development *(Reference in Development Section)*
- Use Denver II charts etc. to assess current stage of development

Social History

- Who lives at home? Who are primary caregivers? Parents work outside the home?
- Does the child attend daycare? How many other children? In a home vs. institution?
- Stability of support network: relationship stability, frequent moves, major events (death in family etc), financial problems, substance abuse in the home
- Has CAS ever been involved?
- School adjustment, behaviour problems, habits (nail-biting, thumbsucking etc), sleep changes

- How has this disease affected your child/ your family?
- What does your family do for fun? What does your child do for fun?
- For an asthma history: smoke, pets, carpets, allergens in the home, family history of asthma / atopy.

Family History:

- Are parents both alive and well? How many siblings? Are they healthy?
- Are there any childhood diseases in the family?
- Consanguinity – are mother and father related in any way?
- Relevant family history (3 generations) – autoimmune hx in Type I DM, atopic hx in asthma etc
- Draw pedigree if possible for genetic assessment

Review of Systems:

General: feeding, sleeping, growing, energy level
Signs of illness in kids: *activity, appetite, attitude (3 A's)*

HEENT: infections (how often, fever, duration): otitis, nasal discharge, colds, sore throats, coughs, nosebleeds, swollen glands, coughing or choking with feeding

Cardio:
Infants: fatigue/sweating during feedings, cyanosis, apneas/bradycardic episodes
Older kids: syncope, murmurs, palpitations, exercise intolerance

Resp: cough, wheezing, croup, snoring, respiratory infections

GI: appetite, weight gain (growth chart), nausea/vomiting, bowel habits, abdominal pains

GU: urinary: pain/frequency/urgency, sexually active, menarche/menses, discharge/pruritis/STDs

MSK: weakness, sensory changes, myalgias, arthralgias, 'growing pains'

Neuro: headaches, seizures (febrile vs afebrile, onset, frequency, type), tics, staring spells, head trauma

Skin: rashes, petechiae, jaundice, infection, birthmarks

PHYSICAL EXAMINATION

General Inspection

- Sick vs not sick?
- Toxic appearance? listlessness, agitation, failure to recognize parents, inadequate circulation (cool extremities; weak, rapid pulse; poor capillary refill; cyanotic, gray, or mottled colour), respiratory distress, purpura
- Level of consciousness
- Nutritional status – well nourished?
- Developmental status ("pulling up to stand in crib", "running around room")
- Dysmorphic features – look specifically at face, ears, hands, feet, genetalia

Vital Signs:

- Include Temperature, Heart Rate, Respiratory Rate, Blood Pressure and O_2 saturation

NORMAL PEDIATRIC VITAL SIGNS

Age	HR	SBP	RR
Newborn (<1 wk)	120-160	60-70	30-60
Neonate (<1 mos)	120-160	75-90	30-60
Infant (<1 year)	110-140	75-120	20-40
Preschool (3-5yrs)	90-120	75-125	20-25
Child (6-12 yrs)	80-110	83-120	16-24
Adolescent (>12 y)	70-100	90-130	12-18
Adult (>18 yrs)	60-100	90-130	12-18

Anthropometrics (plot on growth curves at every visit!):

- Height (supine length to 2 years, then standing height)
- Weight
- Head circumference (generally birth to 2 years, >2 yrs if specific concerns)
- Plot BMI (kg/m^2) on updated CDC growth curves for appropriate BMI for age

Hydration Status

- Comment on mucous membranes, tears, skin turgor, sunken eyes, in addition to appropriateness of vital signs, etc.
- For classification of mild, moderate, severe dehydration – see "Fluids & Electrolytes"

HEENT:

- Head: dysmorphic features, shape of skull, head circumference, fontanels in infants
- Eyes: strabismus, pupillary response, fundoscopy, red reflex in infants, conjunctivitis
- Ears & pharynx exam in any child with a fever!
- Nose: turbinates, deviation of septum, presence of polyps?
- Mouth: lips (lesions, colour), mucous membranes including gingiva, tongue, hard/soft palate,
- Dentition: presence of teeth, tooth decay
- Neck: lymphadenopathy, palpation of thyroid, webbing (Noonan, Turner syndrome), torticollis

Cardiovascular:

- HR, BP, apical beat, heaves/thrills
- Perfusion:
    - Pulses – strength/quality, femoral pulses in all infants
    - Capillary refill time
    - Skin colour: pink, central/peripheral cyanosis, mottling, pallor
- S1/S2, extra heart sounds (S3, S4)
- Murmurs:
    - Timing (systole, diastole, continuous)
    - Location of maximal intensity, radiation
    - Pitch and quality (machinery, vibratory, etc),
    - Loudness (I – VI / VI)

Respiratory:

- Audible stridor, sturtor, wheeze, snoring
- Position of child, ability to handle secretions
- Signs of distress: nasal flaring, tracheal tug, indrawing
- RR, O_2 saturation (current FiO_2), level of distress
- Able to speak in full sentences (if age appropriate)
- Depth and rhythm of respiration
- Chest wall deformities: kyphosis, scoliosis, pectus excavatum/carinatum
- Finger clubbing

Abdomen:

- For peritoneal signs: ask child to jump up and down or wiggle hips, to distend and retract abdomen “blow up your belly and then suck it in”
- Inspection: scaphoid/distended, umbilical hernias, diastasis recti
- Auscultation: presence of bowel sounds
- Percussion: ascites, liver span, Traube’s space for splenomegaly
- Palpation: hepatosplenomegaly?, tenderness, guarding (voluntary, involuntary), masses (particularly stool presence in LLQ)
- Stigmata of liver disease: jaundice, pruritis, bruising/bleeding, palmar erythema, caput medusa, telangiectasia, ascites, hepatosplenomegaly

Genito-urinary:

- Anal position, external inspection (digital rectal examination in kids ONLY with clinical indication), Sexual Maturity Rating
- Male infants: both testes descended, hypospadias, inguinal hernias
- Females: labia majora/minora, vaginial discharge, erythema/excoriation of vulvo-vaginitis (NO speculum exam if pre-pubertal), Hymenal exam if indicated.

MSK:

- Gait assessment, flat feet vs toe walking vs normal foot arches
- Standing: genu valgum “knock knee” vs genu varum “bow legged”
- Joints: erythema, swelling, position, active/passive range of motion, strength, muscle symmetry
- Back: kyphosis, scoliosis

Neurological:

- Overall developmental assessment
    - Try playing ball with younger children, or even peek-a-boo!
- Level of consciousness (Glasgow Coma Scale if appropriate)
- Newborns: primitive reflexes, moving all limbs, presence of fisting?
- Cranial nerves: by observation in infants, formal testing in older children
- Motor: strength, tone, deep tendon reflexes, coordination
- Sensory: touch, temperature, position/vibration sense
- Cerebellar: gait (heel to toe, on heels, on toes, finger-to-nose, rapid alternating movements in older children, Romberg (eyes open then closed)

Derm:

- Jaundice, pallor, mottling, petechiae/purpura
- Rashes, birthmarks, hemangiomas, stigmata of neurocutaneous disorders

For helpful physical exam videos: http://learnpediatrics.com/videos/

WHO GROWTH CHARTS FOR CANADA

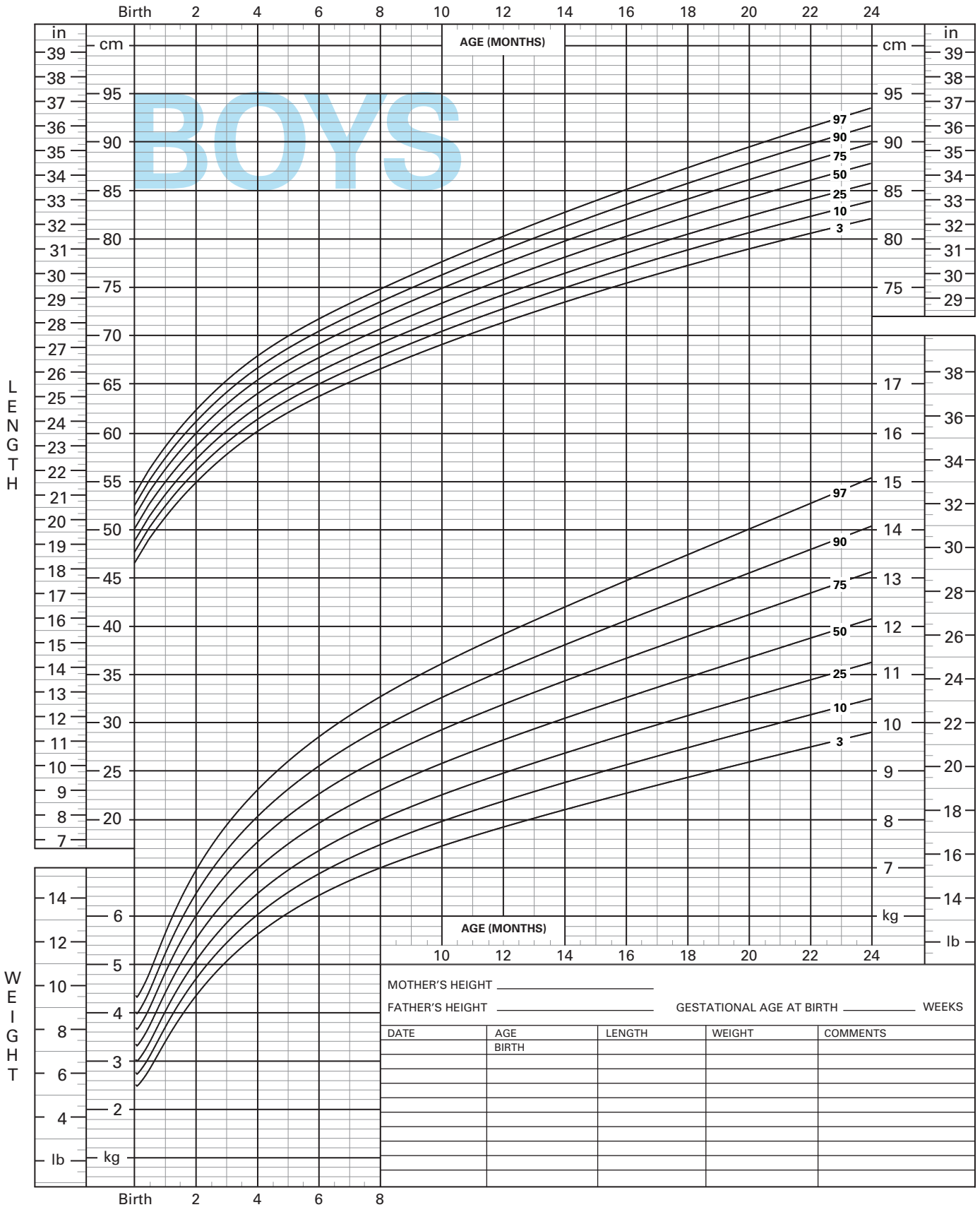
BOYS

BIRTH TO 24 MONTHS: BOYS

Length-for-age and Weight-for-age percentiles

NAME: _____

DOB: _____ **RECORD #** _____



MOTHER'S HEIGHT _____

FATHER'S HEIGHT _____ GESTATIONAL AGE AT BIRTH _____ WEEKS

DATE	AGE	LENGTH	WEIGHT	COMMENTS
	BIRTH			

SOURCE: Based on World Health Organization (WHO) Child Growth Standards (2006) and WHO Reference (2007) and adapted for Canada by Canadian Paediatric Society, Canadian Pediatric Endocrine Group, College of Family Physicians of Canada, Community Health Nurses of Canada and Dietitians of Canada.

WHO GROWTH CHARTS FOR CANADA

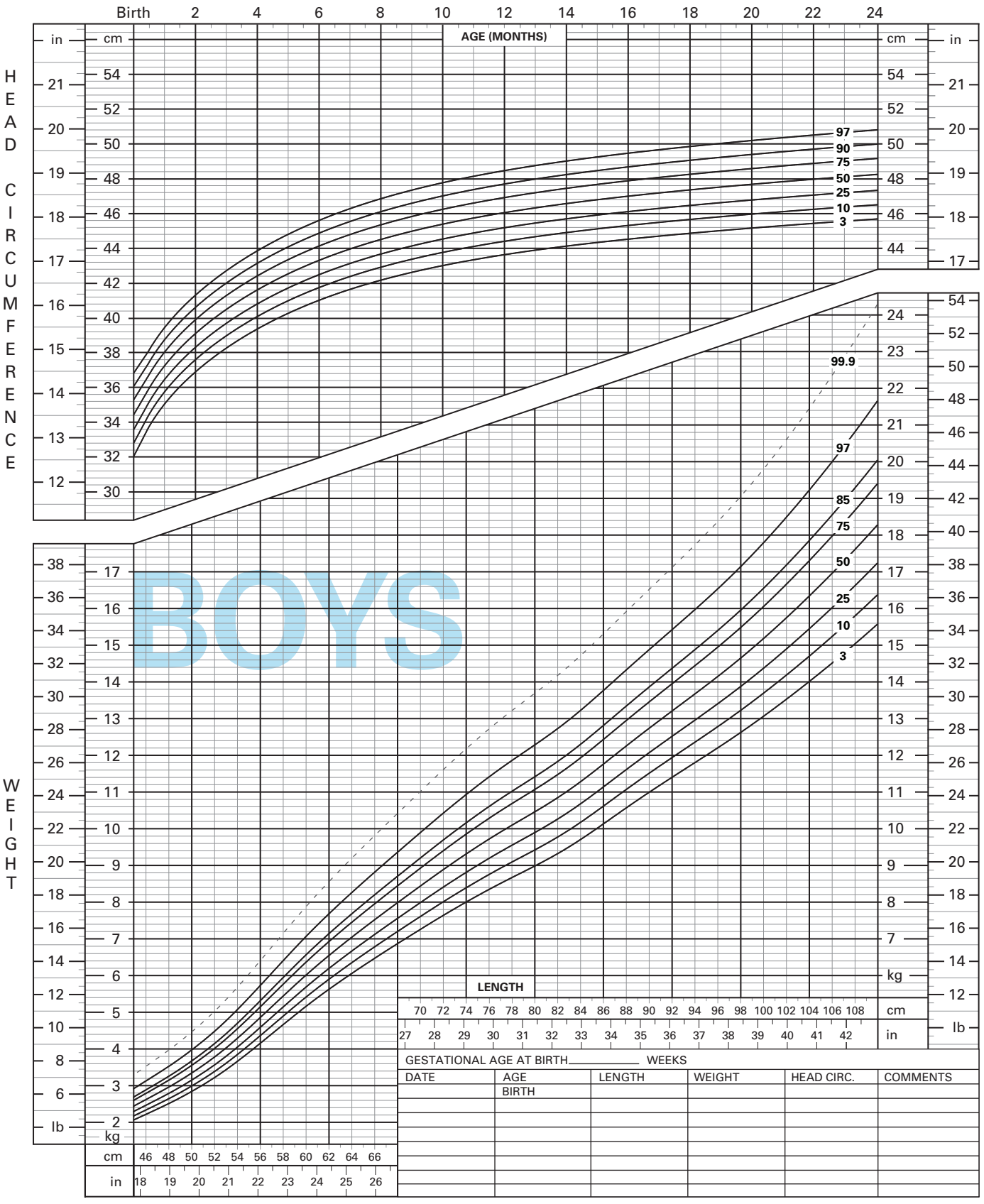
BOYS

BIRTH TO 24 MONTHS: BOYS

Head Circumference and Weight-for-length percentiles

NAME: _____

DOB: _____ **RECORD #** _____



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 www.whogrowthcharts.ca

WHO GROWTH CHARTS FOR CANADA

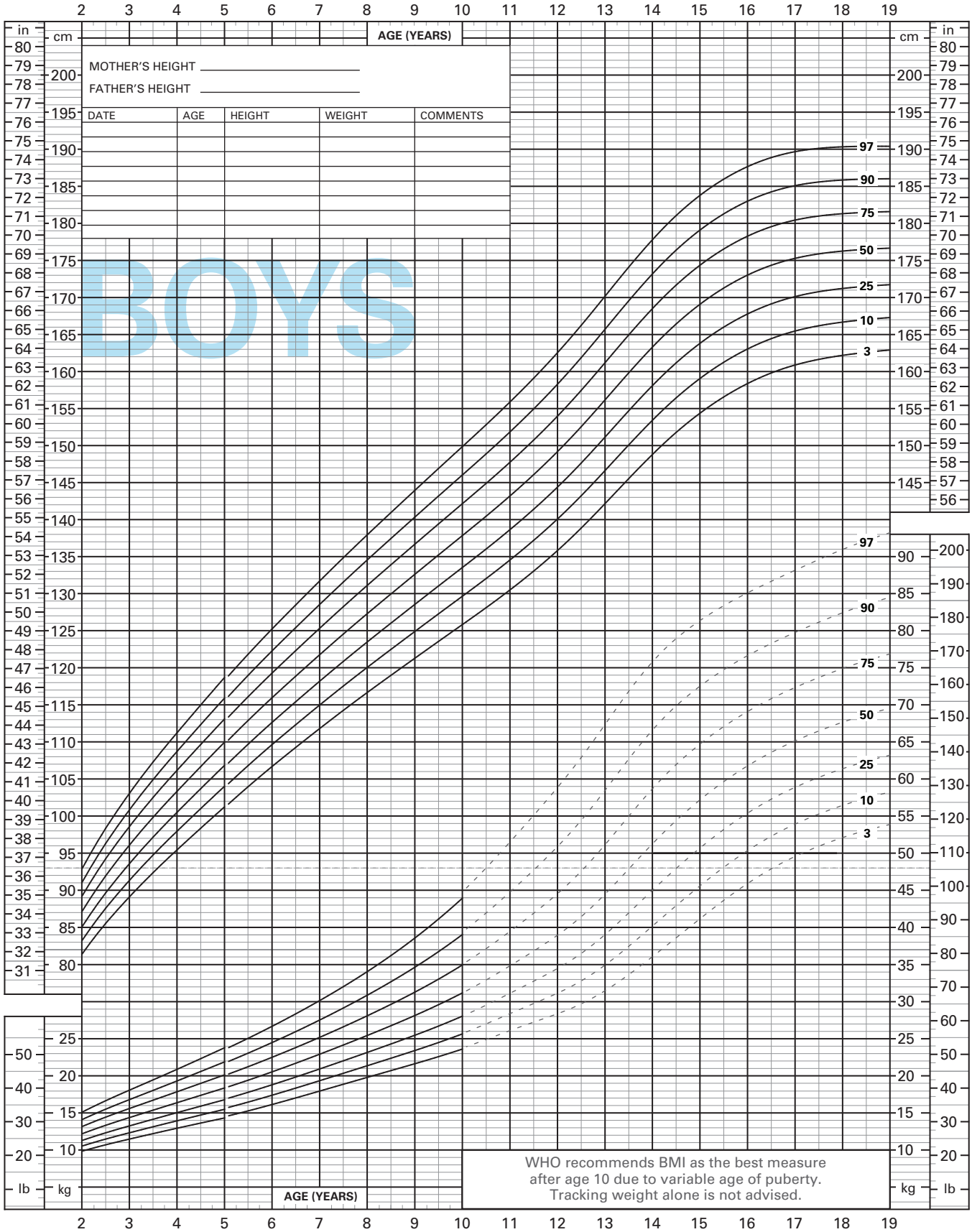
BOYS

2 TO 19 YEARS: BOYS

Height-for-age and Weight-for-age percentiles

NAME: _____

DOB: _____ **RECORD #** _____



SOURCE: The main chart is based on World Health Organization (WHO) Child Growth Standards (2006) and WHO Reference (2007) adapted for Canada by Canadian Paediatric Society, Canadian Pediatric Endocrine Group (CPEG), College of Family Physicians of Canada, Community Health Nurses of Canada and Dietitians of Canada. The weight-for-age 10 to 19 years section was developed by CPEG based on data from the US National Center for Health Statistics using the same procedures as the WHO growth charts.

 www.whogrowthcharts.ca

WHO GROWTH CHARTS FOR CANADA

BOYS

2 TO 19 YEARS: BOYS

Body mass index-for-age percentiles

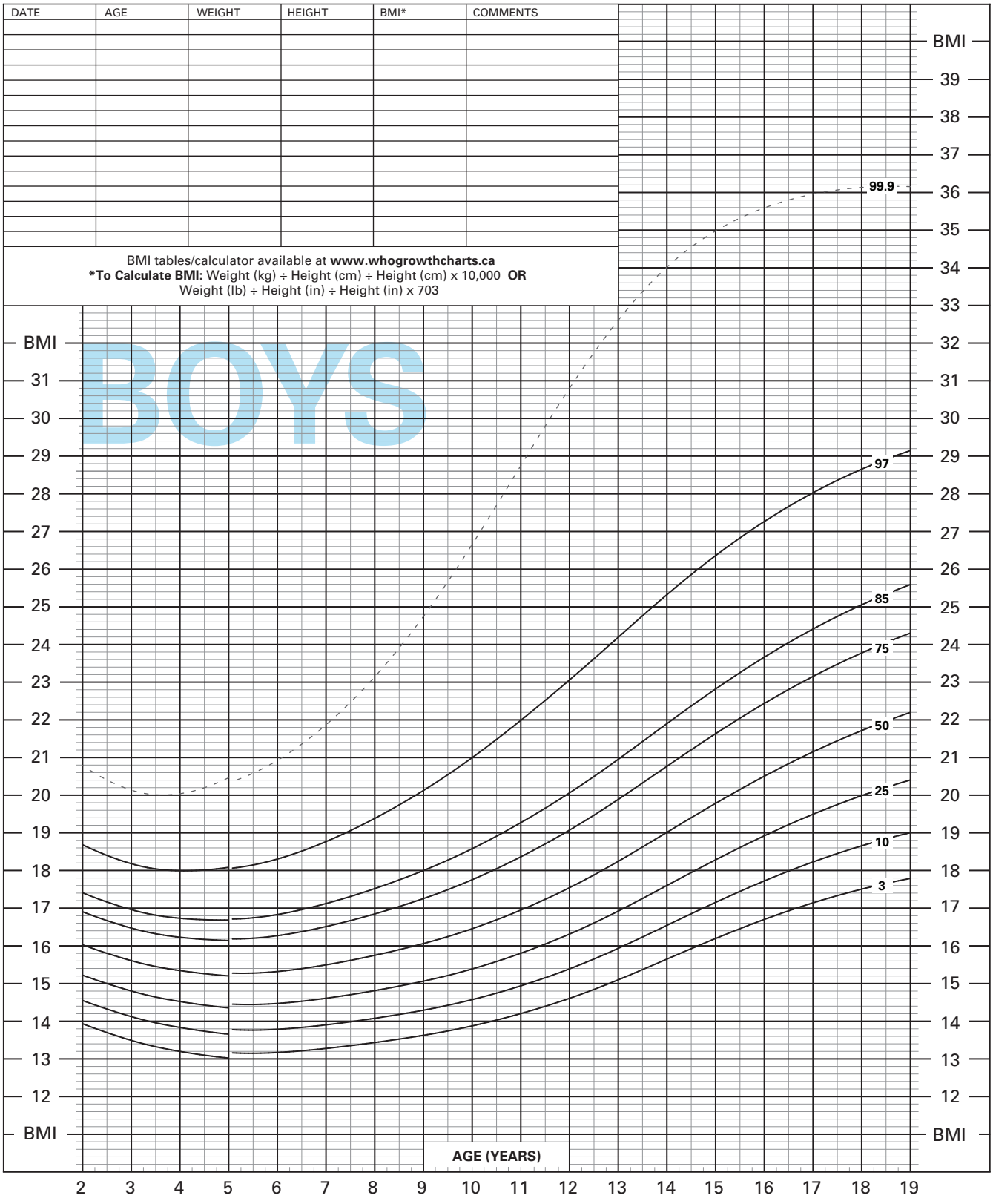
NAME: _____

DOB: _____ **RECORD #** _____

DATE	AGE	WEIGHT	HEIGHT	BMI*	COMMENTS

BMI tables/calculator available at **www.whogrowthcharts.ca**

***To Calculate BMI:** Weight (kg) ÷ Height (cm) ÷ Height (cm) x 10,000 **OR**
Weight (lb) ÷ Height (in) ÷ Height (in) x 703



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WHO GROWTH CHARTS FOR CANADA

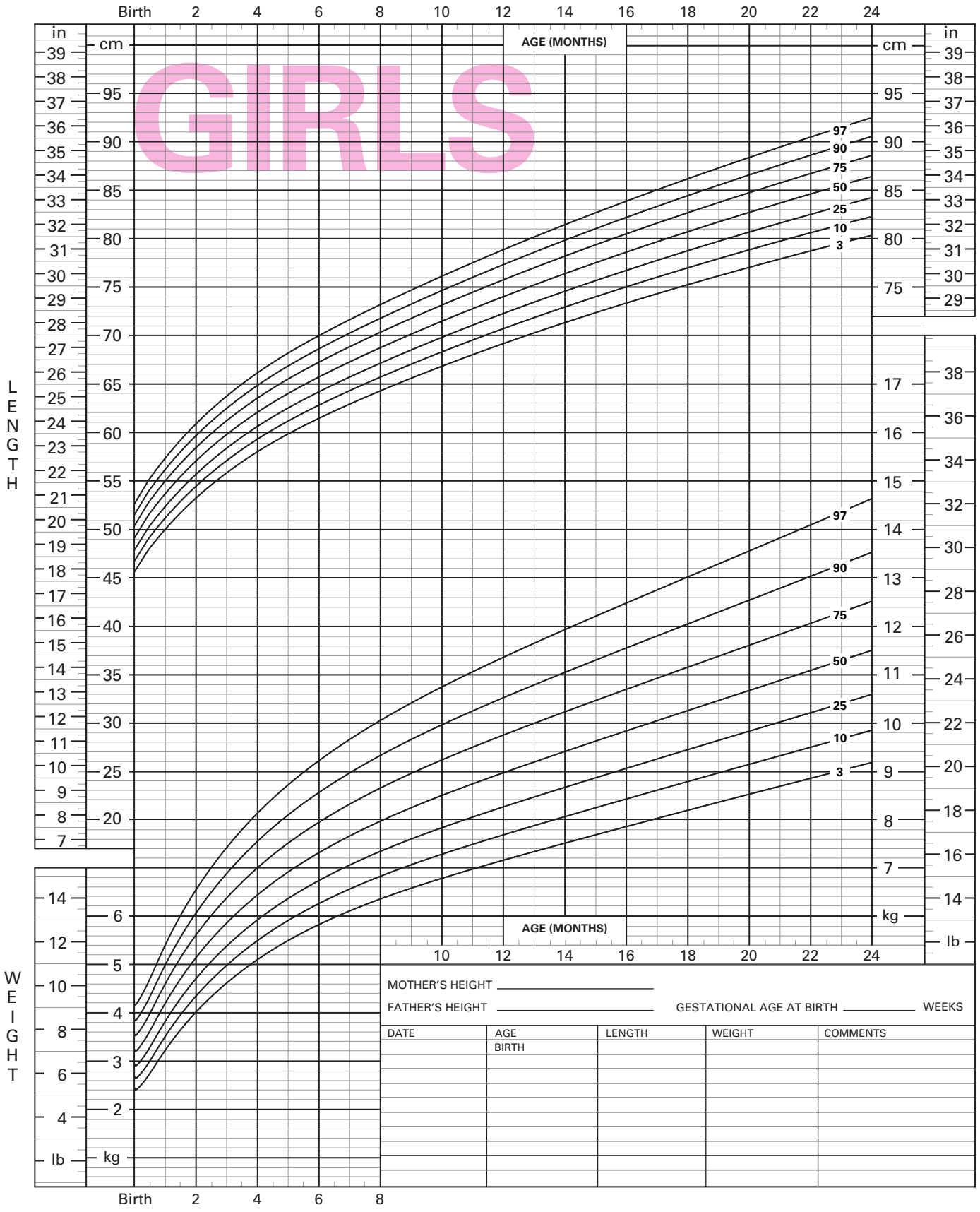
GIRLS

BIRTH TO 24 MONTHS: GIRLS

Length-for-age and Weight-for-age percentiles

NAME: _____

DOB: _____ **RECORD #** _____



MOTHER'S HEIGHT _____

FATHER'S HEIGHT _____ GESTATIONAL AGE AT BIRTH _____ WEEKS

DATE	AGE	LENGTH	WEIGHT	COMMENTS
	BIRTH			

SOURCE: Based on World Health Organization (WHO) Child Growth Standards (2006) and WHO Reference (2007) and adapted for Canada by Canadian Paediatric Society, Canadian Pediatric Endocrine Group, College of Family Physicians of Canada, Community Health Nurses of Canada and Dietitians of Canada.

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WHO GROWTH CHARTS FOR CANADA

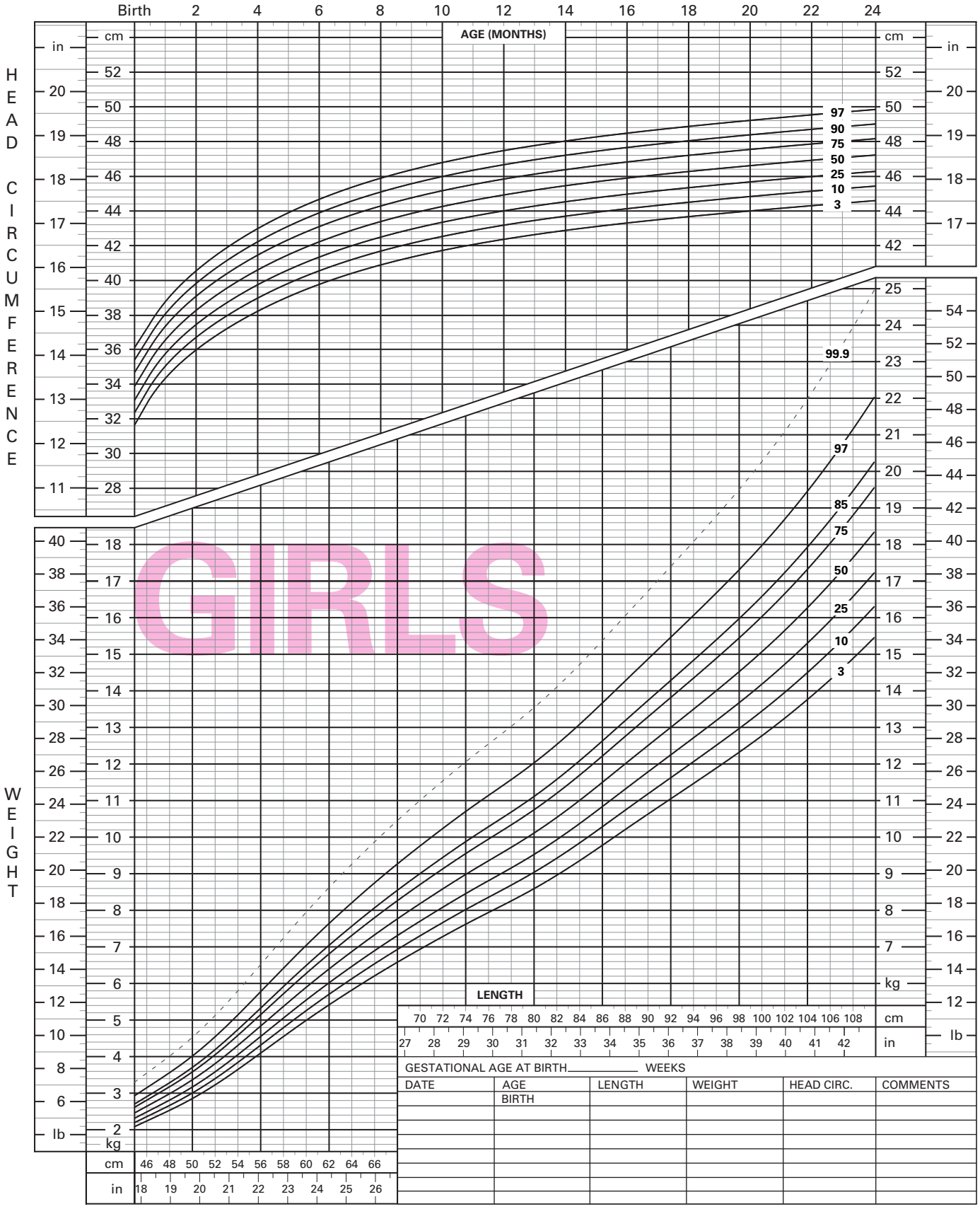
GIRLS

BIRTH TO 24 MONTHS: GIRLS

Head Circumference and Weight-for-length percentiles

NAME: _____

DOB: _____ **RECORD #** _____



GESTATIONAL AGE AT BIRTH _____ WEEKS

DATE	AGE	LENGTH	WEIGHT	HEAD CIRC.	COMMENTS
	BIRTH				

SOURCE: Based on World Health Organization (WHO) Child Growth Standards (2006) and WHO Reference (2007) and adapted for Canada by Canadian Paediatric Society, Canadian Pediatric Endocrine Group, College of Family Physicians of Canada, Community Health Nurses of Canada and Dietitians of Canada.

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WHO GROWTH CHARTS FOR CANADA

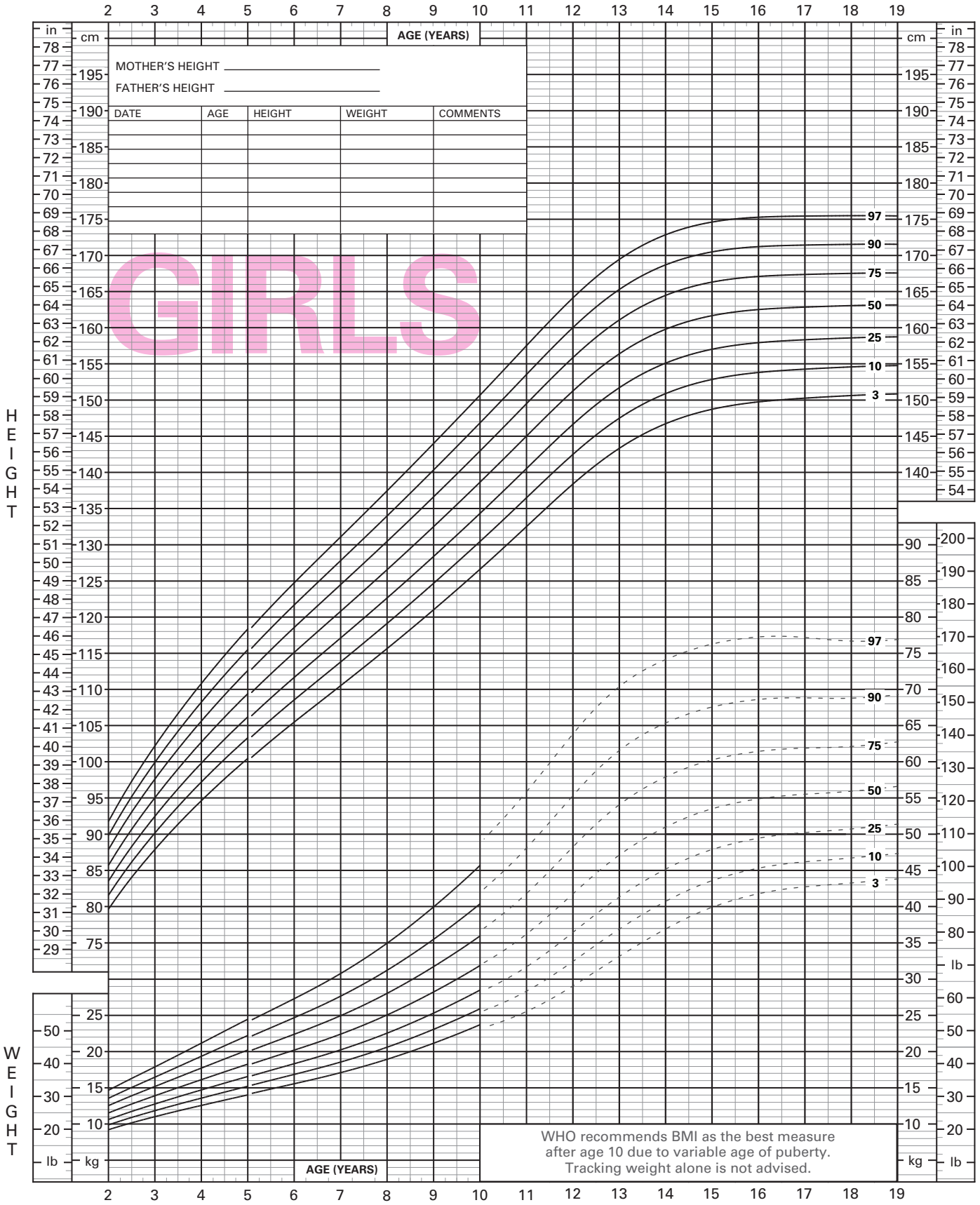
GIRLS

2 TO 19 YEARS: GIRLS

Height-for-age and Weight-for-age percentiles

NAME: _____

DOB: _____ **RECORD #** _____



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WHO GROWTH CHARTS FOR CANADA

GIRLS

2 TO 19 YEARS: GIRLS

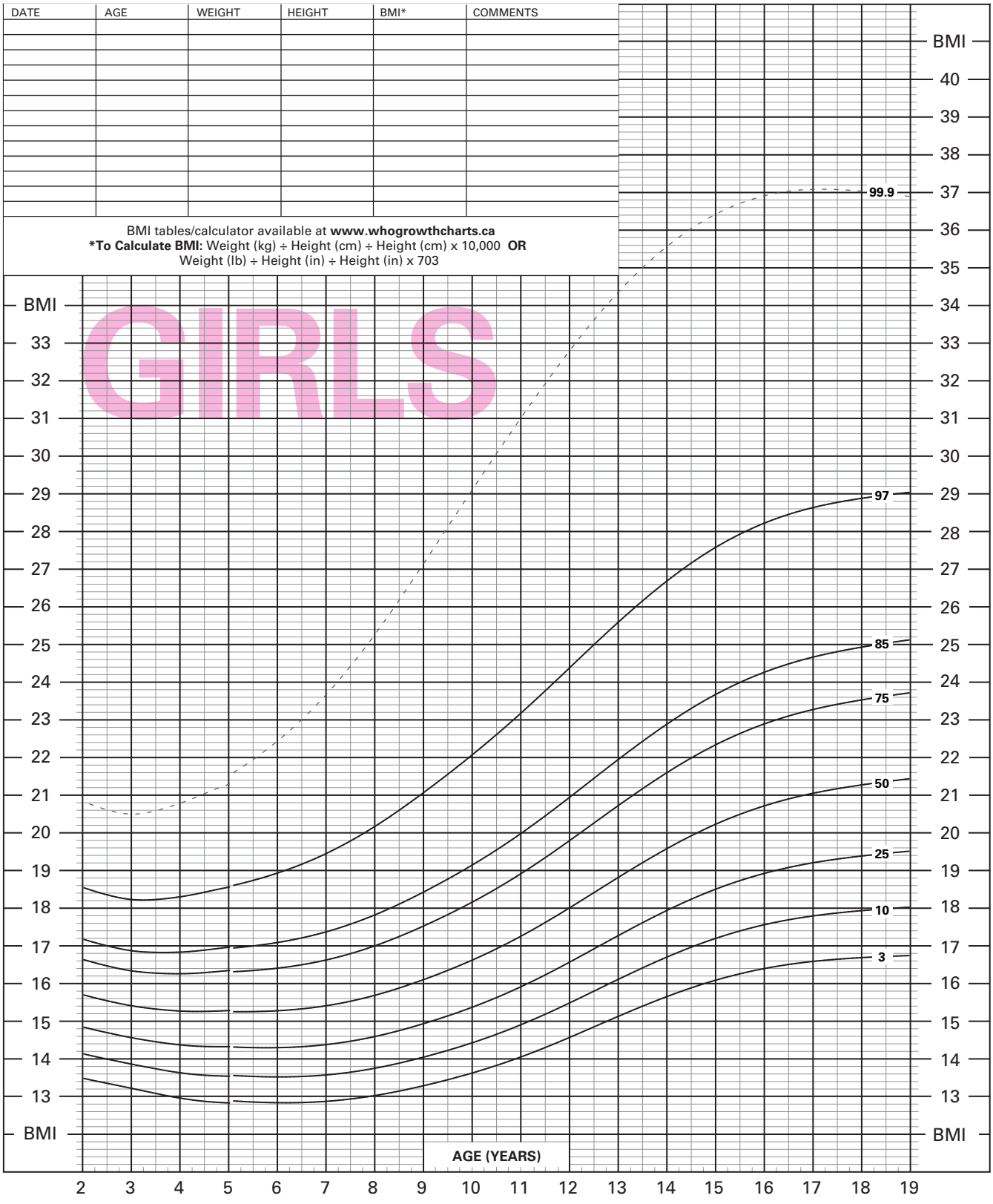
Body mass index-for-age percentiles

NAME: _____

DOB: _____ **RECORD #** _____

DATE	AGE	WEIGHT	HEIGHT	BMI*	COMMENTS

BMI tables/calculator available at **www.whogrowthcharts.ca**
***To Calculate BMI:** Weight (kg) ÷ Height (cm) ÷ Height (cm) x 10,000 **OR**
Weight (lb) ÷ Height (in) ÷ Height (in) x 703



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ADOLESCENT INTERVIEWING (SSHADESS Screen)

- Interview teens alone with parents invited to join at the end (Alternatively, you can start with the parents in the room and have them leave at some point)
- Allow adequate, uninterrupted time to inquire about all aspects of their life, and high-risk behaviours in private setting
- Assure **confidentiality** at beginning of interview, and prior to discussing drug use and sexuality. Remember caveats of confidentiality (ie. if you are at risk of harm to yourself or others, or if someone is hurting you)
- Remember to obtain routine history including: Past Medical History, Meds, Allergies and Vaccines (HPV, hepatitis, meningococcal in particular)

Strengths

- What do you like doing?
- How would you describe yourself? How would your best friends describe you?
- Tell me what you are most proud of.

School

- Name of school, grade level
- What do you enjoy most/least about school?
- How many days have you missed or arrived late to school?
- How are your grades? Any different from last year?
- Do you feel like you are doing your best at school? (If no) Why not?
- What would you like to do when you get older?

Home

- Tell me what home is like…
- Who lives at home? How does everyone get along? What do you argue about? What are the rules like at home?

- Family members – ages, occupations/education, health status, substance abuse

Activities

- What do you do for fun? On weekends?
- Do you feel you have enough friends? Who are your best friends? What do you do together?
- Do you have any extra-curricular activities?

Drugs/Substance Use

- Have you ever tried cigarettes? Alcohol? Marijuana?
- Do you drink alcohol? Binge drinking on weekends?
- For younger teens: ask about friends' use and peer pressure
- Cover all drug classes: hallucinogens, amphetamines, rave drugs, IV drugs, crack cocaine, OTC meds, anabolic steroids
- What age did you start? Frequency of use? How much?
- What do you like/dislike about X? Why do you use X ?
- Do you use alone? Any police involvement? Dealing?

Emotions/Eating/Depression

- Have you been feeling stressed? Do you feel nervous a lot?
- Do people get on your nerves more than they used to?
- Have you been having trouble sleeping lately?
- Do you have concerns about your weight/shape?
- Have you tried to change your weight/shape in any way?
- Any bingeing or purging behaviours (includes diuretics/laxatives)
- Tell me what you eat/drink in an average day…
- ***TIP: Use growth curves to estimate 'healthy weight' based on height*
- Have you been feeling down, sad, or depressed?
- Depression screen – SIGECAPS
- Have you thought of hurting yourself or someone else? Have you ever tried to hurt yourself?

Sexuality

- Are you attracted to anyone? Tell me about that person. (Using gender-neutral language)
- Are you attracted to guys, girls, or both?
- What kind of things have you done sexually? Kissing? Touching? Oral Sex? Have you ever had sexual intercourse?
- How many sexual partners have you had?
- What do you use for contraception/STI prevention (condoms, OCP, Depo-provera, Emergency Contraception etc.)
- Any history of sexually transmitted infections?
- Have you ever been pregnant or gotten someone pregnant?
- Have you ever been forced or pressured into having sex?

Safety

- Do you regularly use: seatbelts? Bike helmets? Appropriate gear when snowboarding/skateboarding or other sports?
- Do you feel safe at school? Have you ever been bullied?
- Does anyone at home own a gun?
- Have you ever been the victim of violence at home, in your neighbourhood or at school?
- Has anyone ever hurt you or touched you in a way that was hurtful or inappropriate

FLUID MANAGEMENT IN CHILDREN

Children are at high risk of dehydration:

- Higher % total body water compared to adults
- Higher body surface area : mass ratio
- Higher metabolic rates
- Higher insensible losses
- Limited access to free water

Management of Dehydration

1. Assess severity and type of dehydration
2. Deficit Replacement
3. Maintenance Fluids
4. Replace Ongoing Losses
5. Reassessment and Monitoring

1. Assess Severity and Type of Dehydration

- Severity of dehydration dictates urgency of situation and need for acute resuscitation
- Degree of dehydration represents the percentage of body weight lost due to acute loss of fluids and electrolytes
- Degree of dehydration estimated based on history and physical exam (See Table on next page)
- Type of dehydration reflects relative net losses of water and electrolytes – based on serum Na+ or osmolality

Type of Dehydration	Electrolyte Status	Clinical Features
Hypotonic or Hyponatremic	Serum Na+ < 130 mEq/L Serum Osm < 270	Exacerbated signs of dehydration Risk of seizure
Isotonic or Isonatremic	Serum Na+ 130-150 mEq/L Serum Osm 270 – 300	
Hypertonic or Hypernatremic	Serum Na+ > 150 mEq/L Serum Osm > 300	Decreased signs of dehydration Irritable, increased tone and reflexes

Assessment of Degree of Dehydration			
	Mild	**Moderate**	**Severe**
% Weight Loss (by age)	5% (< 1 year) 3% (> 1 year)	10% (< 1 year) 6% (> 1 year)	15% (< 1 year) 9% (> 1 year)
General Appearance	Alert Thirsty	Drowsy Restless	Lethargic Cold, mottled limbs
Tachycardia	Absent	Present	Present
BP	Normal	Orthostatic Hypotension	Hypotension
Respirations	Normal	Deep +/- rapid	Deep + rapid
Fontanel or Eyes	Normal	Slightly depressed	Sunken
Tears	Present	+/-	Absent
Mucous membranes	Moist	Dry	Very dry
Skin turgor	Normal	Reduced	Tenting
Cap Refill	Normal	>2 secs	>>2 secs
Pulses	Present	Weak	Not palpable
Urine output	Normal	Oliguria	Anuria

2. Deficit Replacement

- To calculate fluid deficit:

Fluid Deficit = % Dehydration x 10 x body weight

- Each 1% dehydration = 10 ml/kg fluid deficit

Oral Rehydration Therapy

- ORT is the first-line treatment for mild - moderate dehydration
- Requires close monitoring and compliance of patient and parents
- Goal is to replace the deficit over 4 – 6 hours and replace ongoing losses by oral intake
- Initial rates of ORT:
  Mild – 1 mL/kg/5 mins
  Moderate – 2 mL/kg/5 mins
- Prefer solutions with balanced amounts of sodium and glucose (see table below)
- Feeding should be continued throughout oral rehydration to help maintain gut nutrition

Solution	Glucose (mEq/L)	Na (mEq/L)	K (mEq/L)	Base (mEq/L)	Osmolality
WHO	111	90	20	30	310
Rehydrate	140	75	20	30	310
Pedialyte	*140*	*45*	*20*	*30*	*250*
Pediatric Electrolyte	140	45	20	30	250
Infantlyte	70	50	25	30	200
Naturlyte	140	45	21	48	265

Parenteral Therapy (IV)

- IV therapy indicated for severe dehydration and patients who fail ORT due to: vomiting, refusal, or difficulty keeping up with losses
- Preferable site is IV, if unable to start IV use IO

(i) Restore Intravascular Volume

- Goal: expand ECF volume to prevent or treat shock and maintain perfusion

IV Bolus 10 – 20 ml/kg of N/S or RL
run over 15-20 mins or rapid push

- NEVER use hypotonic solution for boluses
- Avoid dextrose-containing solutions
- Monitor for improvement following each bolus – assess HR, BP, mental status, etc.
- May repeat boluses until patient is hemodynamically stable – If unstable, call Peds 1000!

(ii) Ongoing Deficit Replacement

- Goal: replace remainder of fluid deficit over next 24 hours
- Subtract boluses from deficit calculation
- Replace ½ deficit in first 8 hours, second ½ deficit over next 16 hours
- Solution:
  - D5 NS + 20 mEq/L KCL in isotonic dehydration
  - D5 ½NS + 20 mEq/L KCL in hypernatremic dehydration
- Solution chosen based on type of dehydration and serum electrolytes
- IV fluid rate should include deficit replacement + maintenance fluids (see next section)

3. Maintenance Fluids

- Fluid and electrolyte requirements are directly related to metabolic rate
- All patients, regardless of degree of dehydration, should be considered for maintenance fluids if oral intake is impaired
- Holliday-Segar Rule – maintenance fluid requirements calculated based on body weight for resting hospitalized patients (based on 100 ml for each 100 kcal expended)

Body Wt (kg)	**Daily Rate (100-50-20)**	**Hourly Rate (4-2-1 rule)**
The first 10 kg (1-10 kg)	100 mL/kg/day	4 mL/kg/hr
The 2nd 10 kg (11-20 kg)	+ 50 mL/kg/day	+ 2 mL/kg/hr
Any Additional kg (>20 kg)	+ 20 mL/kg/day	+ 1 mL/kg/hr

- Insensible water losses = cutaneous + pulmonary water losses which are calculated as ~ 300 – 500 cc/m^2
- Important to assess factors affecting insensible and/or urinary fluid losses – may need higher maintenance rate
- Normal Na+ and K+ requirements 2 – 4 mEq/kg/day
- Also affect factors affecting Na and K balance – may need to include additional supplementation
- Solution:
  - D5 ½ NS + 20 mEq/L KCL
  - D5 NS + 20 mEq/L KCL
- Adding 5% dextrose to maintenance solution prevents protein catabolism (Use D10W in neonates and hypoglycemia)
- Solution chosen based on type of dehydration and serum electrolytes
- D5 ½ NS + 20 mEq/L KCl provides 4 mEq/100 mL Na+ and 2 mEq/100 mL K+
- Only add K+ if patient is voiding

4. Replace Ongoing Losses

- Assess patient for additional fluid losses – diarrhea, vomiting, polyuria, drains, etc
- Estimate output over 4-6 hours then replace volume
- Replacement fluid dependent on source of losses

Replace…	**With…**
Gastric Losses (Vomiting)	½ NS + 10 – 20 mEq/L KCl
Stool or Intestinal losses (Diarrhea)	Add HCO_3^- to ½ NS + 10 – 20 mEq/L KCl
CSF losses	0.9% NS
Urine Output	As indicated
Losses due to Burns	Increase fluid administration (Parkland formula)

5. Reassessment and Monitoring

- Important to continually assess patient's hydration status and fluid requirements
- Monitor HR, BP, Cap refill, mental status and urine output
- Accurate INS and OUTS, repeat weight measurements
- May require cardiorespiratory monitor, CVP, ECG
- Check serum electrolytes routinely while patient on maintenance fluids
- Other labs as indicated: BUN, Cr, serum osmolality, urine specific gravity, urine osmolality
- Adjust type and rate of IV fluids depending on clinical and biochemical indicators of volume status
- Discontinue IV fluids once patient has returned to normal status and tolerating normal feeding

Comparison of IV Solutions

IV Solution	Na^+ (mEq/L)	K^+ (mEq/L)	Cl^- (mEq/L)	Dextrose (g/L)	Osmolarity (mOsm/L)
Sodium Chloride 0.45%	77			0	154
Sodium Chloride 0.9% (0.9 NaCl, NS)	154		154	0	308
Sodium Chloride 3%	513			0	1030
Dextrose 5%	0			50	250
Dextrose 5% Sodium Chloride 0.2%* (D5 0.2NS)	39			50	320
Dextrose 5% Sodium Chloride 0.45% (D5 ½NS)	77		77	50	405
Dextrose 5 % Sodium Chloride 0.9%	154			50	560
Dextrose 10%	0			100	505
Dextrose 10% Sodium Chloride 0.2%*	39			100	575
Dextrose 10% Sodium Chloride 0.45%*	77			100	660
Dextrose 10% Sodium Chloride 0.9%*	154			100	813
Dextrose 3.3% Sodium Chloride 0.3% (⅔ * ⅓)	51		51	33.3	273
Lactated Ringers†	130	4	109	0	273

†Also contains Calcium (Ca^{2+}) 1.5 mmol/L, and Lactate (HCO_3^-) 28 mmol/L
*These solutions are not commercially available
Commonly used solutions are highlighted

Guidelines for Prescribing Maintenance IV Fluids in Children

- These are general guidelines for ordering maintenance IV fluids (IVF) only, and do not apply to resuscitation or complicated fluid and electrolyte disorders. ***Seek additional advise/appropriate consultation in the event of fluid and electrolyte abnormalities.***
- Consider IV fluids as DRUGS - individualize prescriptions *daily* according to objectives, and monitor for potential side effects.
- Be aware that the commonest side effect of IVF therapy is HYPONATREMIA, particularly in patients at risk, and if hypotonic solutions are used

Step 1:

Determine IV fluid rate, according to "maintenance fluid" requirements, and replacement of deficit or ongoing losses (Total Fluid intake (TFI). In general maintenance fluid rate is calculated by the "4:2:1" guideline, but should be individualized according to the clinical condition and patient assessment

Weight (kg)	ml/hour
0-10	4/kg/hour
11-20	40 + (2/kg/hr)
>20	60 + (1/kg/hr)

Step 2: The choice of fluid is dependent the individual patient.

Consider **ISOTONIC** IVF for the following patients:

- CNS disorder, Diabetic ketoacidosis
- Patients at risk of hyponatremia: acute infection, post-operative patients and burns, Plasma Na < 138

Add K^+ to provide 1-2 mEq/kg/day, if patient has urine output

Add Dextrose to prevent hypoglycemia/ketosis (exceptions: hyperglycemia,brain injury)

Consider **HYPOTONIC** IVF for the following patients:

- Patients with an EFW deficit - e.g. hypernatremia, ongoing EFW losses (renal, GI, skin)
- Patients with established 3rd space overload - e.g CHF, nephrotic syndrome, oliguric renal failure, liver failure
- Limited renal solute handling indicated - e.g. neonatal population, hypertension

IV solution		Na (mEq/L)	K (mEq/L)	Cl (mEq/L)	% Electrolyte Free Water (EFW)*
Hypotonic	0.2% NaCl in D5W	34	0	34	78
	0.45% NaCl in D5W	77	0	77	50
	Lactated Ringers	130	4	109	16
0.9% NaCl in D5W (ISOTONIC)		154	0	154	0

*Based on a sodium plus potassium concentration in the aqueous phase of plasma of 154mEq/L, assuming that plasma is 93% water with a plasma sodium of 140 mEq/L and a potassium concentration of 4 mEq/L

Step 3: MONITORING while on IV fluid	Measure and record as accurately as possible	
Clinical status: hydration status,urine output, ongoing losses, pain, vomiting, peripheral edema, and general well-being. **Daily weights** ***Reassess TFI, indications for and fluid prescription at least every 12 hours.*** Version date : April 2011	**Fluid balance:** must be assessed at least every 12 hours Intake: All IV *and* oral intake (including medication). Ensure this matches desired TFI. Output: all losses (urine, vomiting, diarrhea etc.)	**Labs:** Serum Electrolytes - at least daily if primary source of intake remains IV, or more frequently depending on clinical course, or in the presence of documented electrolyte abnormality. Urine osmolarity/sodium and plasma osmolarity as indicated, for determining etiology of hyponatraemia.

ST. JOSEPH'S HOSPITAL PEDIATRICS

Hospital Contact Numbers

Auto attendant	(905) 522-1155
Switchboard	(905) 522-4941
Labour and Delivery	x33251, x34157
NICU	x36050
3 OBS (Well Baby Nursery)	x33314
Paging	x33311
Dr Kelly Fitzpatrick *Deputy Chief St Joes (Clinical)*	x36039 kfitz@mcmaster.ca
Dr. Rocio Monroy *Education Representative CTU4*	36039 monroyr@mcmaster.ca
Rosy Evered *Program Secretary*	36039 revered@stjoes.ca

Paging (33311) and Pagers:

- All paging done via switchboard attendant at extension **33311**
- Resident on-call usually carries pager **# 8412**
- Page staff pediatrician on-call through paging (**33311**)
- McMaster assigns most pagers, check with program area
- Clerk and other pagers often available from switchboard desk

Library Services:

- 2nd Floor of Juravinski Tower
- Hours: MON, WED, FRI 8:00 AM – 6:00 PM
  TUES, THURS 8:00 AM – 8:00 PM

- X33440 or library@stjosham.on.ca

St Joseph's Hospital - Accommodation Services

On-Call Rooms:

- *Key*: sign out from Front Desk/ Switchboard, must be returned by 11:00 AM the next day
- *Location*: 2nd floor Martha Wing, Resident call room # 213
- *Additional Key*: unlock Washrooms + Showers or Code 2 4 3
- *Residents' Lounge* (Microwave & TV): Code 2 4 3
  → on 2nd floor before call rooms
- *Problems*: communicate to Switchboard or Phil Valvasori x33812

Cafeteria Hours:

Charlton Cafeteria 2nd Floor, Mary Grace Wing	MON – FRI: 7:30 AM – 6:30 PM SAT – SUN: Closed
Garden Café @ CMHS	MON – FRI: 9:30 AM – 10:30 PM & 11:30 AM – 1:30 PM
Tim Hortons	Daily: 7:00 AM – 11:30 PM

Information Services

Clinical Browser Passwords & Training:

- Passwords obtained from: Computer Room
  2 nd Level Tower
  x33040 for Passwords
- Must accept password and confidentiality agreements by signature
- For additional information on Clinical Browser or training call:
  x33040

Dovetale:

Please contact x33040 for any questions regarding Dovetale 24/7

PACS Passwords & Training:

- PACS passwords same as Clinical Browser, except all UPPERCASE
- You may change your password once you have logged on
- PACS training is only offered at the Monthly Medical Learner Orientation Sessions. For session dates and times contact:
  x34077

St Joseph's NICU common terms and definitions list

Some useful definitions and normal values for term newborns:

Neonate: less than or equal to 28 days
Infant: 28 days to 1 year
Child: >1 year

Birth
-Average birth weight: 3.5 kg
-Average birth length: 50 cm
-Average birth head circumference: 35 cm

Weight loss
-Average weight loss in first week is 5-10% of birth weight
-Max weight loss in first 48 hrs: 7%
-Max weight loss in first week: 10%

Growth
-Return to birth weight by 14 days
-Infants double their birth weight by 5-6 months
-Infants triple their birth weight by 12 months
-Head circumference increases by 12 cm in first year of life

A's and B's- (apnea and bradycardia) defined as a cessation of breathing >20 sec or pause in breathing associated with decrease in oxygen saturation <85% or HR <100 or change in color or tone. Or just the presence of bradycardia.
Will be reported as self resolved or requiring stimulation.
Common in preterm infants however must always rule out sepsis.

B/R- Breast feeding.

BLES- Bovine surfactant, medication give for treatment of RDS (Respiratory distress syndrome) given via ETT (endotracheal tube) dose 5cc/kg. May also be used in MAS (meconium aspiration syndrome) or severe pneumonia.

CPAP- Continuous positive airway pressure, non invasive form of ventilation providing continuous PEEP (positive end expiratory pressure) used to keep airways open and prevent airway collapse. Used in a multitude of settings.

CLD (chronic lung disease) - formerly known as BPD (bronco pulmonary dysplasia) - CLD is usually defined as oxygen dependency at 36 weeks' postmenstrual age (PMA) or 28 days' postnatal age (PNA), in conjunction with persistent clinical respiratory symptoms and compatible abnormalities on chest radiographs .

Developmental care (Neuroprotective care: Medical and nursing care is a necessity for the survival of the ill infant. Caregivers must understand that every interaction with the infant affects brain development. There is a large body of work that incorporates the concept of core measures for age-appropriate care in the NICU. These concepts include: Healing Environment, Partnering with Families, Positioning & Handling, Safeguarding Sleep, Decreasing Pain & Stress, Protecting Skin, Optimizing Nutrition

Gavage- form of feeding, by where an OG tube is inserted into the stomach (placed clinically) and a feed is given by gravity or over a period of time by pump. Prior to the feed the nurse will generally draw back to see if there is any residual feed in the stomach. Reported as 0/37, scant/37 or 5/37 where the first number represents the volume of the residual and the second number the volume of the feed given. Colour of the residual is important especially when evaluating for NEC (necrotizing enterocolitis)

GBS – (group B streptococcus) organism that is a common cause of neonatal infection, all women should be screened at 35-37 weeks and important to note at deliveries or on evaluation of infants < 7 days of age.

Histogram- continuous monitoring of oxygen saturations over 1-2 hrs, done in either prone or supine position. Reported as an average of the time period.
Reported as greater than 90 over 90, first number represents the saturation the second the percentage of the time that baby's actual O2 saturation is over that saturation.
Normal for preterm's 90 over 90
For preterm's greater than 30 days and diagnosed with CLD 85 over 90.
*Normal values may vary with new research.

IDDM- infant of a diabetic mother. Maternal diabetes can cause a multitude of neonatal complications, most commonly hypoglycemia.

I/T ratio- immature to total ratio, used in the evaluation of sepsis. Calculated by taking the total number of immature WBC's seen on manual differential (bands, myelocytes, metomyleocytes, and/or promyelocytes) divided by the total number of neutrophils plus the immature WBC's. *Immature WBC's/total neutrophils + immature WBC's*

IUGR (intrauterine growth restriction) - defined as symmetric or asymmetric, if symmetric both head circumference and weight are less than the 3rd percentile if asymmetric only the weight is <3rd percentile.

NEC (necrotizing enterocolitis) - Gut infection, characterized by feeding intolerance, bilious residuals, abdominal distension, bloody stools, with other signs and symptoms of sepsis.

Nippling- synonymous with bottle feeding, reported as "infant nippled 20" (i.e. infant took 20mL by bottle) ** see feeding readiness scale on next page**

OIT: Oral immune therapy: Oral Immune Therapy (OIT) is the practice of administering a drop of fresh colostrum/mothers own milk between the cheek and gum to be absorbed in the oropharyngeal cavity. Infants unable to feed by breast or bottle will receive oral immune therapy, unless breast milk is contraindicated.

RDS- (Respiratory Distress syndrome) common in preterm infants or infants of IDDM (infant of a diabetic mother) due to surfactant deficiency.

TPN- (Total Parenteral Nutrition)- form of nutrition given by IV, contains glucose and varying amount of Na^+, K^+, Ca^{2+} PO_4^{3-} , lipids and amino acids, generally used when infants cannot tolerate feeds.

TFI- (Total fluid index) volume of fluid that an infant receives per day, either enteral or parenteral. Reported in cc/kg/day. i.e. TFI of 60 mL/kg/day in a 3.0 kg term infant is:

60 x 3/24= 10 mL/hr or 30 mL q3h

FEEDING READINESS SCALE	
Score	Description
1	Alert or fussy prior to care. Rooting and/or hands to mouth behaviour. Awakens at or before scheduled feeding times. Good muscle tone.
2	Alert once handled. Some rooting or takes pacifier. Adequate tone.
3	Briefly alert with care. No hunger behaviours (i.e. Rooting, sucking). Adequate tone.
4	Sleeping throughout care. No hunger cues. No changes in tone.
5	Significant change in HR, RR, O2 saturations, WOB outside safe parameters.

Quality of Nippling Scale	
Score	Description
1	Nipples with a strong coordinated suck, swallow, breathe (SSB) throughout feed.
2	Nipples with a strong coordinated SSB but fatigues with progression.
3	Difficulty coordinating SSB despite consistent suck.
4	Nipples with a weak and/or inconsistent suck. Little to no rhythm.
5	Unable to coordinate SSB pattern. Significant change in HR, RR, O2 saturations, WOB outside safe parameters.

Ampicillin

Pharmacology

- broad spectrum penicillin
- bactericidal
- penetrates CSF
- renally excreted therefore dose adjusted in severe renal failure

Indications

- gram positive and gram negative bacteria -- group B Strep
- Listeria, Neisseria, Haemophilus, susceptible Ecoli

Dosage

- 100-200 mg/kg/day divided q12h, in premature; q8h in term (38 weeks or higher)
- Given q8h in premature infants once greater than 1200 grams and 3 weeks of age
- 400 mg/kg/day in proven meningitis

Side Effects

- red rash

Special Considerations

- dilute 250 mg vial with 1 mL sterile H_20 = 250 mg/mL
- dilute 500 mg vial with 1.8 mL sterile H_20 = 250 mg/mL

Gentamicin

Pharmacology
- bactericidal aminoglycoside - inhibits protein synthesis
- polar molecule
  - not orally absorbed
  - poor CSF penetration
  - renally excreted
- not metabolized
- high conc. in renal cortex

Indications
- gram neg. E coli, Kleb. Serratia, Enterobact. Proteus Pseudomonas
- gram pos strept and staph
- no anaerobic coverage

Dosage
- 2.5 mg/kg/dose given in following intervals:

≤ 10 days		> 10 days	
< 28 weeks	q24h	< 28 weeks	q18h
28-34 weeks	q18h	28-34 weeks	q12h

- **for 35 weeks or greater, give 4 mg/kg once a day INFUSE OVER 20 MINUTES**
- as babies mature (ie 4 weeks of age) dose as gestational age
- Oral dose for bacterial overgrowth in GI tract 2 mg/kg/dose q8h

Side Effects
- nephrotoxicity - reversible monitor urine output
- ↑ interval between doses if urine function decreases, Cr increases or level high
- ototoxicity - not reversible - follow levels to avoid accumulation
- potentiation of neuromuscular blockade

Special Considerations:

- hold during Indomethacin treatment course
- DO NOT hold for Indomethacin prophylaxis if urine output ≥ 2 ml/kg/hr
- monitor pre-gentamicin levels before 4th or 5th dose (many babies will not require level as receive only 48 hours of gentamicin) (pre 3rd dose if q24h, q18h)
- pre level < 2 but for once daily dosing in the >35 wk age group level should be 1 or less
- may give gentamicin before prelevel back if urine output ≥ 2 ml/kg/hr
- always hold gentamicin if urine output < 2 ml/kg/hr

Tobramycin

Pharmacology

- bactericidal aminoglycoside
- inhibits protein synthesis
- polar molecule
- not orally absorbed
- poor CSF penetration
- renally excreted
- not metabolized
- high conc. in renal cortex

Indications

- gram neg. E coli, Kleb. Serratia, Enterobact. Proteus Pseudomonas
- gram pos. strept and staph
- no anaerobic coverage

Dosage

- 2.5 mg/kg/dose given in following intervals:

	≤ 10 days of age	> 10 days of age
<28 weeks GA	q24h	q18h
28-34 weeks GA	q18h	q12h

- **for 35 weeks or greater, give 4 mg/kg once a day INFUSE OVER 20 MINUTES**
- as babies mature (ie 4 weeks of age) dose as gestational age
- Oral dose for bacterial overgrowth in GI tract 2 mg/kg/dose q8h

Side Effects

- nephrotoxicity - reversible monitor urine output
- ↑ interval between doses if urine function decreases, Cr increases or level high
- ototoxicity - not reversible - follow levels to avoid accumulation
- potentiation of neuromuscular blockade

Special Considerations:

- hold during Indomethacin treatment course
- DO NOT hold for Indomethacin prophylaxis if urine output ≥ 2 ml/kg/hr
- monitor pre-tobramycin levels before 4th or 5th dose (many babies will not require level as receive only 48 hours of tobramycin) (pre 3rd dose if q24h, q18h)
- pre level < 2, but for once daily dosing in the >35 wk age group level should be 1 or less
- DO NOT give tobramycin until pre-level has resulted
- an order may be written by the medical team to give tobramycin before the pre-level is back if urine output ≥ 2 ml/kg/hr
- always hold tobramycin if urine output < 2 ml/kg/hr
- Tobramycin is a SINGLE use vial. Discard vial after use.

Cefotaxime

Pharmacology

- third generation cephalosporin
- broad spectrum bactericidal
- penetrates CSF -- (good coverage)
- metabolized

Indications

- meningitis or sensitivity specific sepsis

Dosage

- 50 mg/kg/dose
- q12h in VLBW and poor renal function; q8h after 10 days if > 1200gm
- q8h in term and almost term

Side Effects

- none reported in this age group

Special Considerations

- stable for 48 hours refrigerated
- if IV volume of drug is greater than 1 mL -- may use IM dilution
- IV dilution add 10 mL sterile water = 95 mg/mL
- IM dilution add 3 mL sterile water = 300 mg/mL
- in severe renal impairment, increase dosage interval

Neonatal Sepsis in the Neonatal Intensive Care Unit (NICU)

- Early (< 7 days of life) versus late (≥ 7 days of life) sepsis
- Empiric coverage against slightly different pathogens depending on timing of sepsis
- Need to review prior microbiologic history (i.e. colonization with resistant organisms?)

Diagnostic workup (ideally before initiation of antibiotics):

- Blood cultures
- Urine analysis and culture
- Lumbar puncture (if clinically indicated)

Early-onset sepsis:

- Empiric organisms include GBS, gram negative bacilli (e.g. *E.coli, Klebsiella* species), *Listeria* (rare)
- Suggested regimen (to be reassessed in 48-72 hours upon results of microbiologic and other diagnostic workup)
    - **Ampicillin + gentamicin**
      (see Neonatal drug book for dosing guidelines)

Late-onset sepsis:

- Empiric organisms: GBS, *S.aureus,* CoNS (especially in the presence of indwelling lines) gram negative bacilli (e.g. *E.coli, Klebsiella* species)
- Suggested regimen (to be reassessed in 48 – 72 hours upon results of microbiologic and other diagnostic workup)
    - **Cloxacillin + gentamicin**
      (see Neonatal drug book for dosing guidelines)
- Please note the above will not be appropriate if neonate has confirmed or suspected NEC

In clinical scenarios where a neonate has:

- Septic shock requiring multiple fluid boluses or inotropic support
- CSF pleocytosis
- Renal insufficiency where continuation of aminoglycoside is deemed to be unsafe

Consider: **Cefotaxime + vancomycin**

In clinical settings where a neonate has (please check all that apply)

☐ Septic shock requiring multiple fluid boluses or inotropic support

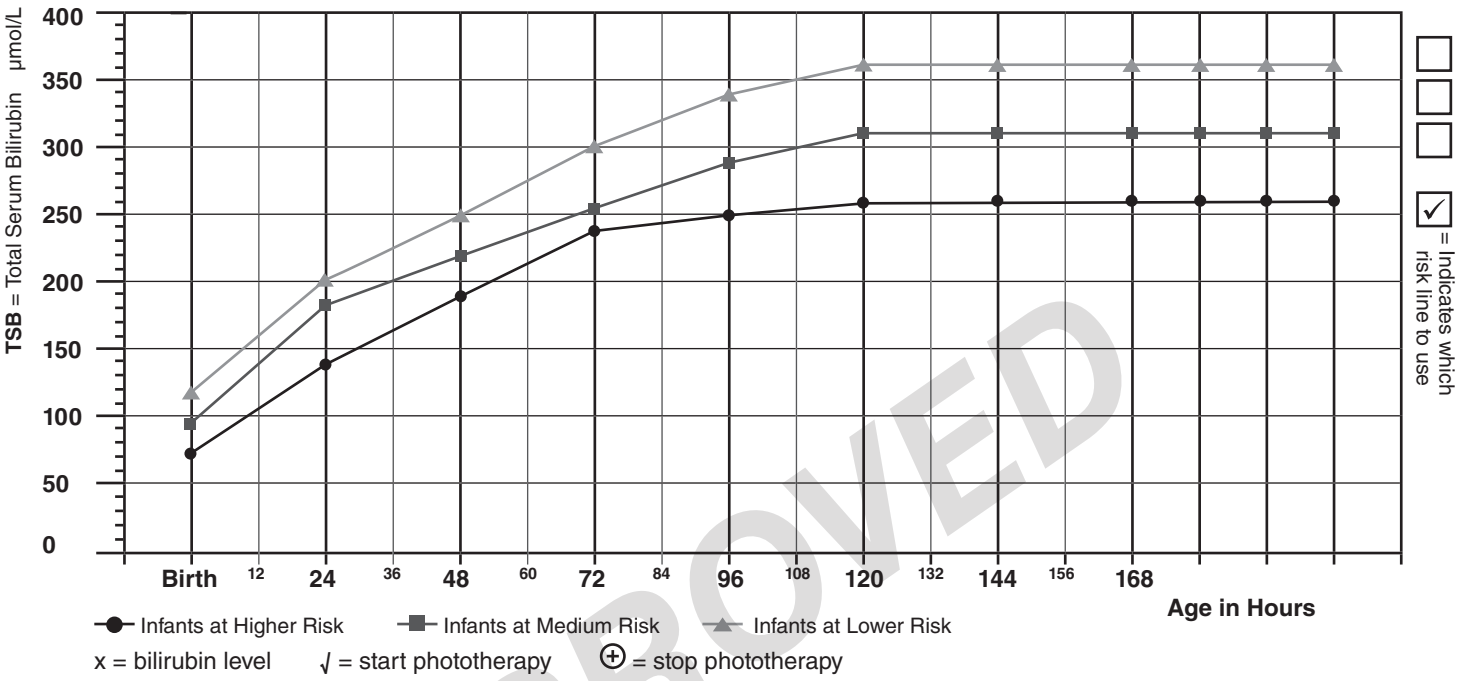
☐ CSF pleocytosis

☐ Renal insufficiency where continuation of aminoglycoside is deemed to be unsafe

St. Joseph's
Healthcare Hamilton

Hyperbilirubinemia Phototherapy
Assessment Sheet for Newborns

35 Weeks or More Gestation on Mother-Baby unit



Guidelines for the Initiation of Phototherapy:

- ❑ Infants at Lower Risk: greater than or equal to 38 weeks and no risk factors
- ❑ Infants at Medium Risk: greater than or equal to 38 weeks with risk factors OR 35-37 $^{6}/_{7}$ weeks and no risk factors
- ❑ Infants at Higher Risk: 35–37 $^{6}/_{7}$ weeks with risk factors

	Irradiance Reading µW/cm2/nm	Initials
BiliBlanket		
Light Source		

Risk Factors for Encephalopathy for Initiation of Phototherapy:

(Adjust Risk Line accordingly)

- ❑ ABO or Rh incompatibility – hemolysis due to maternal isoimmunization, e.g. positive Coombs (some other causes of hemolysis to consider if there is a positive family hx of: G6PD deficiency, pyruvate kinase deficiency, congenital spherocytosis)

Jaundice occurring before 24 hours of age is considered "pathologic" **– a Pediatric consult should be considered.**

Date (yyyy/mm/dd)	Time (hh:mm)	Age in hours	TSB µmol/L	Name of MD/MW notified	Printed Name	Signature & Designation

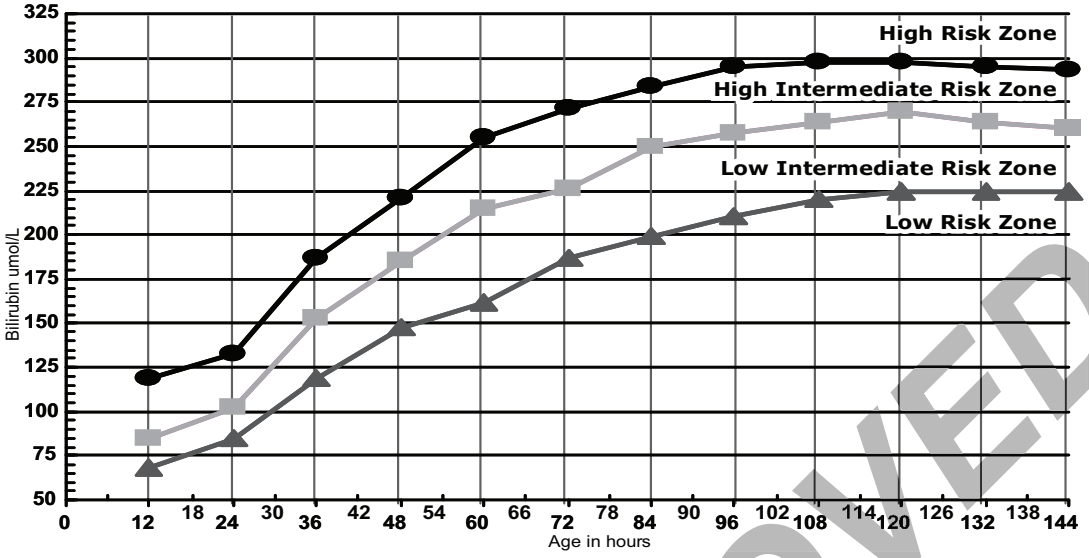
St. Joseph's Healthcare Hamilton

Hyperbilirubinemia Screening Assessment for Newborns

35 - 37 $^{6}/_{7}$ Weeks Gestation

(This form is not valid for babies who have received or are receiving phototherapy)

BILIRUBIN NOMOGRAM **X = Bilirubin Level**



Gestational Age: _____ weeks

Mother's Blood Group: _____

Baby's Blood Group: _____

COOMBS TEST/DAT
(see reverse for Algorithm)

Coombs Test / DAT is indicated if baby is LIZ or higher

Coombs Test (DAT)

❑ **NEGATIVE**

❑ **POSITIVE**

Risk Factors for Severe Hyperbilirubinemia: *Please check any that apply*

❑ Coombs positive

❑ Previous sibling requiring phototherapy

❑ Cephalohaematoma or significant bruising

❑ Asian race

	Date (yyyy/mm/dd)	Time (hh:mm)	Age in hours	TSB µmol/L	Screening Follow-Up Code (see below)	Name of MRP / Midwife notified	Init.
X							
X							
X							
X							

Screening Follow-Up Codes

These follow-up codes apply only to the initial screening TSB

Nomogram Risk Zone	CODE	NR = No Risk Factors for Hyperbilirubinemia	CODE	R = Risk Factors present for Hyperbilirubinemia
Low **R**isk **Z**one	LRZ-NR	Follow-up within 48 hours	LRZ-R	Follow-up within 48 hours
Low-**I**ntermediate Risk **Z**one	LIZ-NR	Follow-up within 48 hours	LIZ-R	Follow-up within 48 hours. Consider TSB at follow-up
High-**I**ntermediate Risk **Z**one	HIZ-NR	Follow-up assessment including TSB within 24 hours	HIZ-R	Repeat TSB in 4-8 hours
High **R**isk **Z**one	HRZ-NR	Repeat TSB in 4-24 hours	HRZ-R	Repeat TSB in 4-8 hours

Initial all applicable responses **TSB = Total Serum Bilirubin**

Initials	Printed Name	Signature & Designation

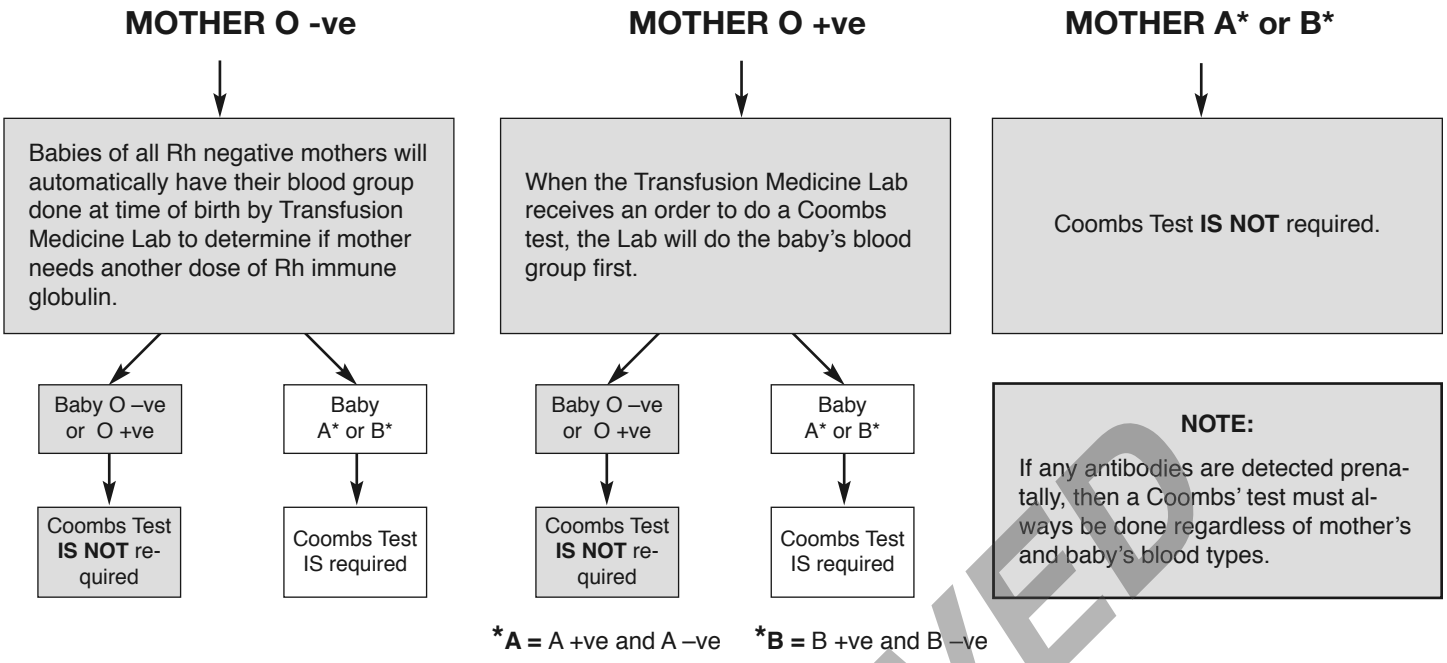
PD 8764 (2014-09)

Distribution: **White Copy** - Patient Chart **Yellow Copy** - Family Physician / Midwife upon discharge
Pink Copy - Parent / Guardian

Labs – Labs

HYPERBILIRUBINEMIA – COOMBS TEST ALGORITHM

When a Coombs test needs to be done as part of the newborn hyperbilirubinemia assessment, please follow the algorithm below based upon the mother's blood group:



***A =** A +ve and A –ve ***B =** B +ve and B –ve

Risk Factors for Severe Hyperbilirubinemia:

- Coombs positive
- Previous sibling requiring phototherapy
- Cephalohaematoma or significant bruising
- Asian race

Standard Follow-up Care

Follow-up appointment within 48 hours after discharge with MD or MW if baby is greater than 48 hours of age at time of discharge.

or

Follow-up appointment within 24 hours after discharge with MD or MW if baby is less than 48 hours of age at time of discharge.

If the baby is in the **LRZ-R/LRZ-NR** or **LIZ-NR** (**L**ow **R**isk **Z**one-**R**isk/**L**ow-**R**isk **Z**one-**N**o **R**isk or **L**ow **I**ntermediate Risk **Z**one with **N**o **R**isk factors) and there is no clinical concern, then the TSB result does not need to be reported to the MD/MW and the baby may be discharged as per **Standard Follow-up Care** outlined above.

Bilirubin Risk Zone	Predictive Bilirubin Risk Zone Levels at Follow-Up
Low **R**isk **Z**one	▪ 94% remain in **L**ow **R**isk **Z**one ▪ 6% may jump to **L**ow-**I**ntermediate Risk **Z**one
Low-**I**ntermediate Risk **Z**one	▪ 2% may jump to **H**igh **R**isk **Z**one ▪ 5% may jump to **H**igh-**I**ntermediate Risk **Z**one
High-**I**ntermediate Risk **Z**one	▪ 13% may jump to **H**igh **R**isk **Z**one
High **R**isk **Z**one	▪ 57% remain in **H**igh **R**isk **Z**one

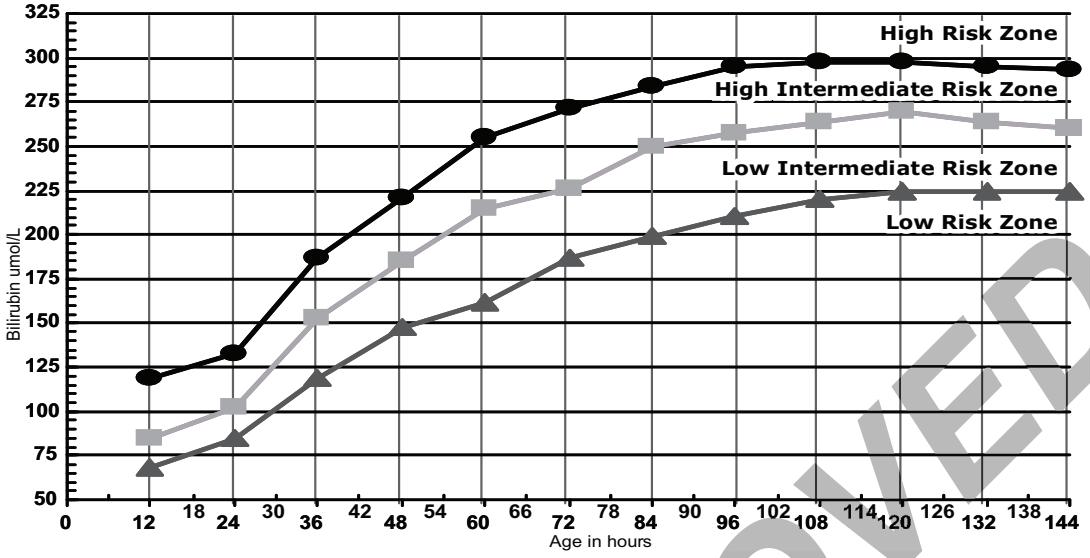
St. Joseph's Healthcare Hamilton

Hyperbilirubinemia Screening Assessment for Newborns

38 or More Weeks Gestation

(This form is not valid for babies who have received or are receiving phototherapy)

BILIRUBIN NOMOGRAM **X = Bilirubin Level**



Gestational Age: _____ weeks

Mother's Blood Group: _____

Baby's Blood Group: _____

COOMBS TEST/DAT
(see reverse for Algorithm)

Coombs Test / DAT is indicated if baby is HIZ or higher

Coombs Test (DAT)

❑ **NEGATIVE**

❑ **POSITIVE**

Risk Factors for Severe Hyperbilirubinemia: *Please check any that apply*

❑ Coombs positive

❑ Previous sibling requiring phototherapy

❑ Cephalohaematoma or significant bruising

❑ Asian race

	Date (yyyy/mm/dd)	Time (hh:mm)	Age in hours	TSB µmol/L	Screening Follow-Up Code (see below)	Name of MRP / Midwife notified	Init.
X							
X							
X							
X							

Screening Follow-Up Codes

These follow-up codes apply only to the initial screening TSB

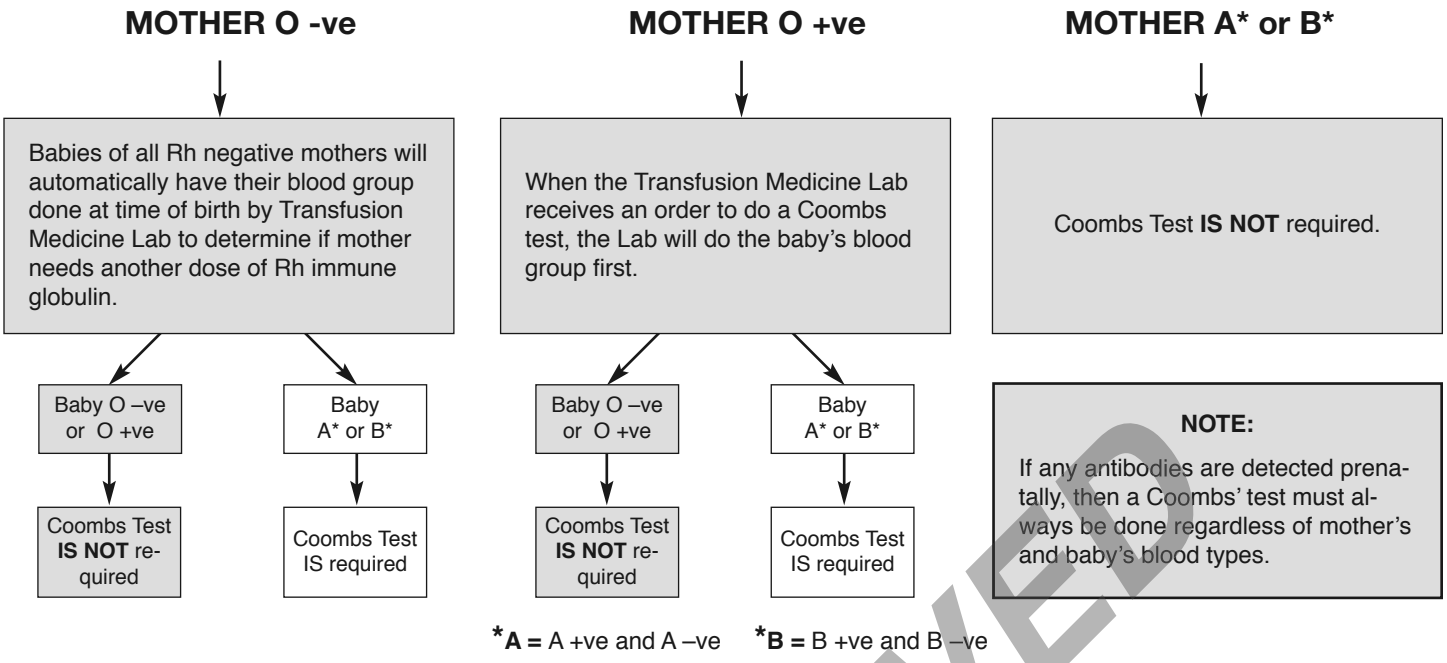
Nomogram Risk Zone	CODE	NR = No Risk Factors for Hyperbilirubinemia	CODE	R = Risk Factors present for Hyperbilirubinemia
Low **R**isk **Z**one	LRZ-NR	Follow-up within 48 hours	LRZ-R	Follow-up within 48 hours
Low-**I**ntermediate Risk **Z**one	LIZ-NR	Follow-up within 48 hours	LIZ-R	Follow-up within 48 hours
High-**I**ntermediate Risk **Z**one	HIZ-NR	Follow-up within 48 hours. Consider TSB at follow-up	HIZ-R	Follow-up assessment including TSB within 24 hours
High **R**isk **Z**one	HRZ-NR	Repeat TSB in 4-24 hours	HRZ-R	Repeat TSB in 4-24 hours

Initial all applicable responses **TSB = Total Serum Bilirubin**

Initials	Printed Name	Signature & Designation

HYPERBILIRUBINEMIA – COOMBS TEST ALGORITHM

When a Coombs test needs to be done as part of the newborn hyperbilirubinemia assessment, please follow the algorithm below based upon the mother's blood group:



***A =** A +ve and A –ve ***B =** B +ve and B –ve

Risk Factors for Severe Hyperbilirubinemia:

- Coombs positive
- Previous sibling requiring phototherapy
- Cephalohaematoma or significant bruising
- Asian race

Standard Follow-up Care

Follow-up appointment within 48 hours after discharge with MD or MW if baby is greater than 48 hours of age at time of discharge.

or

Follow-up appointment within 24 hours after discharge with MD or MW if baby is less than 48 hours of age at time of discharge.

If the baby is in the **LRZ-R** or **LIZ-NR** (**L**ow **R**isk **Z**one-**R**isk or **L**ow **I**ntermediate Risk **Z**one with **N**o **R**isk factors) and there is no clinical concern, then the TSB result does not need to be reported to the MD/MW and the baby may be discharged as per **Standard Follow-up Care** outlined above.

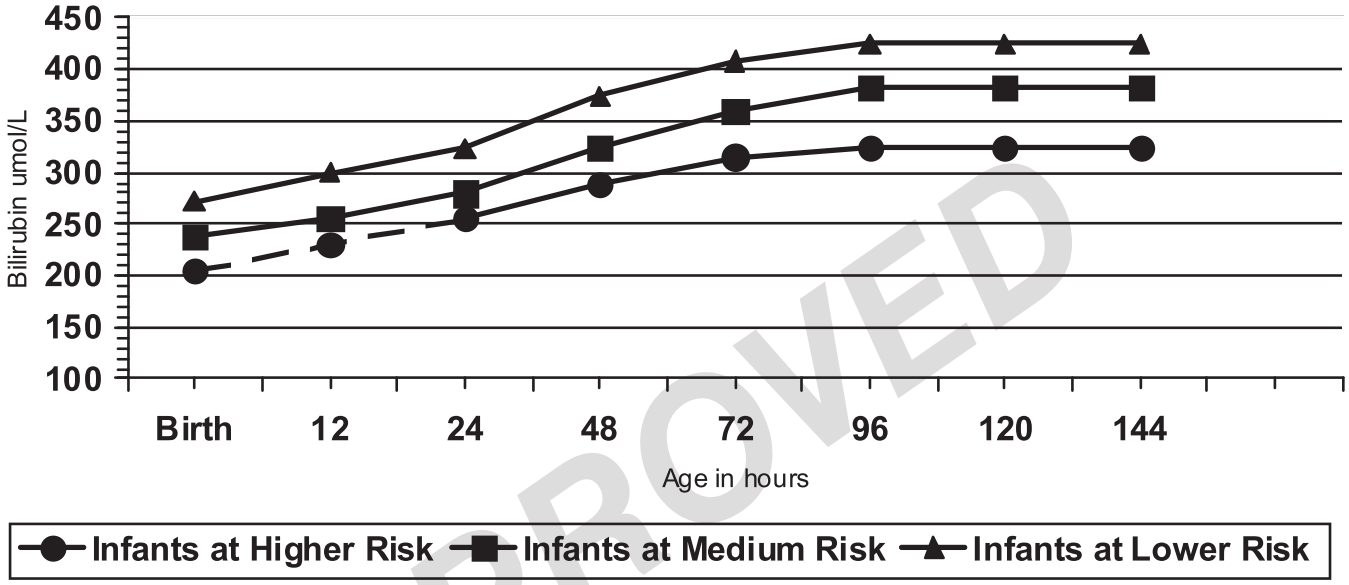
Bilirubin Risk Zone	Predictive Bilirubin Risk Zone Levels at Follow-Up
Low **R**isk **Z**one	▪ 94% remain in **L**ow **R**isk **Z**one ▪ 6% may jump to **L**ow-**I**ntermediate Risk **Z**one
Low-**I**ntermediate Risk **Z**one	▪ 2% may jump to **H**igh **R**isk **Z**one ▪ 5% may jump to **H**igh-**I**ntermediate Risk **Z**one
High-**I**ntermediate Risk **Z**one	▪ 13% may jump to **H**igh **R**isk **Z**one
High **R**isk **Z**one	▪ 57% remain in **H**igh **R**isk **Z**one

Risk Factors for Severe Hyperbilirubinemia

(Do **NOT** adjust phototherapy risk line based on these risk factors)

- Previous sibling with newborn jaundice requiring phototherapy
- Cephalhematoma or significant bruising
- Asian race (as defined by mother's description)

Exchange Transfusion Nomogram



If phototherapy is indicated, determine if the Total Serum Bilirubin (TSB) is within 50 µmol/L of the exchange transfusion line on the Exchange Transfusion Nomogram.

Plot the TSB on the Exchange Transfusion Nomogram using the same risk line as was used for the phototherapy nomogram.

If baby is within 50 µmol/L of exchange, intensify phototherapy and consider other interventions such as optimizing hydration and consider IV Immune Globulin if Coombs/DAT positive. May consider exchange.

Reference: Provincial Council for Maternal Child Health. February 2014. Quality-Based Procedure Hyperbilirubinemia in Term and Late Pre-Term Infants (≥ 35 weeks) TOOLKIT www.pcmch.org.

Infant Formulas – Indications for Specific Formulas

Standard Formulas For Term Infants

Enfamil A+ 20
Similac Advance 20
- Alternative to breastmilk for healthy term infants
- Cow's milk based
- Iron fortified
- 20 kcal/oz. in stock (concentrates provided by Nutrition Services)

Enfamil Soy A+
- Alternative to breastmilk for healthy term infants whose parents request soy
- NOT routinely fed to premature infants
- 20 kcal/oz. in stock; concentrates provided by Nutrition Services

Enfamil Lactose Free A+
- Alternative to breastmilk for healthy term infants requiring lactose free formula (NOT for galactosemia)
- 20 kcal/oz. in stock; concentrates provided by Nutrition Services

Premature Infant Formulas

Enfamil Premature A+ 24
- Alternative to breastmilk for preterm infants
- 24 kcal/oz. formula for preterm infants < 2-2.2 kg birth weight
- in stock

Enfamil Human Milk Fortifier
- Supplement for mother's milk for premature infants < 1800 g birth weight
- In stock

Enfamil Enfacare A+
- 22 kcal/oz. formula for preterm infants after term corrected age or hospital discharge
- 22 kcal/oz. in stock; concentrates provided by Nutrition Services

Specialty Formulas

Nestle Goodstart
- Partially hydrolysed protein for term infants at risk for allergy
- Term infants with gastroesophageal reflux
- 20 kcal/oz in stock; concentrated formulas prepared by nutrition services

Nutramigen A+
- Term infants at risk for allergy
- Term infants with cow's milk protein allergy
- 20 kcal/oz formula in stock; concentrated formulas prepared by nutrition services

Pregestimil/Alimentum
- Term infants with cow's milk protein allergy
- Fat malabsorption
- Short Bowel Syndrome
- 20 kcal/oz. in stock; concentrates prepared by Nutrition Services

Puramino/Neocate
- Term infants with severe cow's milk protein allergy
- Short bowel syndrome
- Prepared by Nutrition Services
- Alternative - Neocate with ARA/DHA

Portagen
- Chylothorax
- Severe fat malabsorption
- Prepared by Nutrition Services

Enfamil A+ Thickened for Babies who spit up
- Thickened feed for term infants with GERD and vomiting, or dyphagia
- Prepared by Nutrition Services

GUIDELINES FOR MANAGEMENT OF HYPERNATREMIA IN A BREAST FED BABY

sodium level 140-145 mmol/L = no medical intervention
review breast feeding technique for appropriateness and monitor weight, urine and stool output

sodium level 145-149 mmol/L = if weight loss is < 7% in 48-72 hours or <10% in five days, provide breast feeding support and monitor daily as above with sodium levels until normalization. If weight loss is >7% in 48-72 hours and >10% in five days, supplement with expressed breast milk/formula using appropriate aids to support breast feeding success.

sodium level of 150-155 mmol/L = supplement with expressed breast milk/formula using appropriate baby friendly maneuvers regardless of weight loss and repeat blood work in 6-8 hours. It is recommended that a pediatric consult should be sought by the family doctor.

sodium level of 155-160 mmol/L = consider transfer to NICU - continue with breast feeding and supplement with expressed breast milk/ formula. Repeat blood work in 4-6 hours and watch urine output and stool frequency.

sodium level of >160 mmol/L = IV saline bolus 10-20 mL/kg and replace fluid deficit slowly. Correction of hypernatremia is dependent on serum sodium levels.

- follow clinically including urine output
- repeat blood work in 6 and 12 hours, may continue with breast feeding and monitor the baby closely
- avoid rapid rehydration
- lower serum sodium by 10-15 mmol/L using attached guidelines [ref 3 below] (table 5)

Integral to each step of the management guidelines is the provision of breast feeding support and the proper evaluation of the breast feeding technique to ensure success. **Resolution of hypernatremia** in breast fed infants is associated with:

- a good breast latch
- an expectation that the infant will feed at least every three hours or a minimum of eight times a day
- improvement in hydration status
- at least six wet diapers a day
- at least three stools (minimum) a day
- a plateau in weight pattern with subsequent weight gain

(Refer to guideline "breast feeding in the first few days" for the assessment of stool and voiding patterns in the first six days of life [5,6].)

References

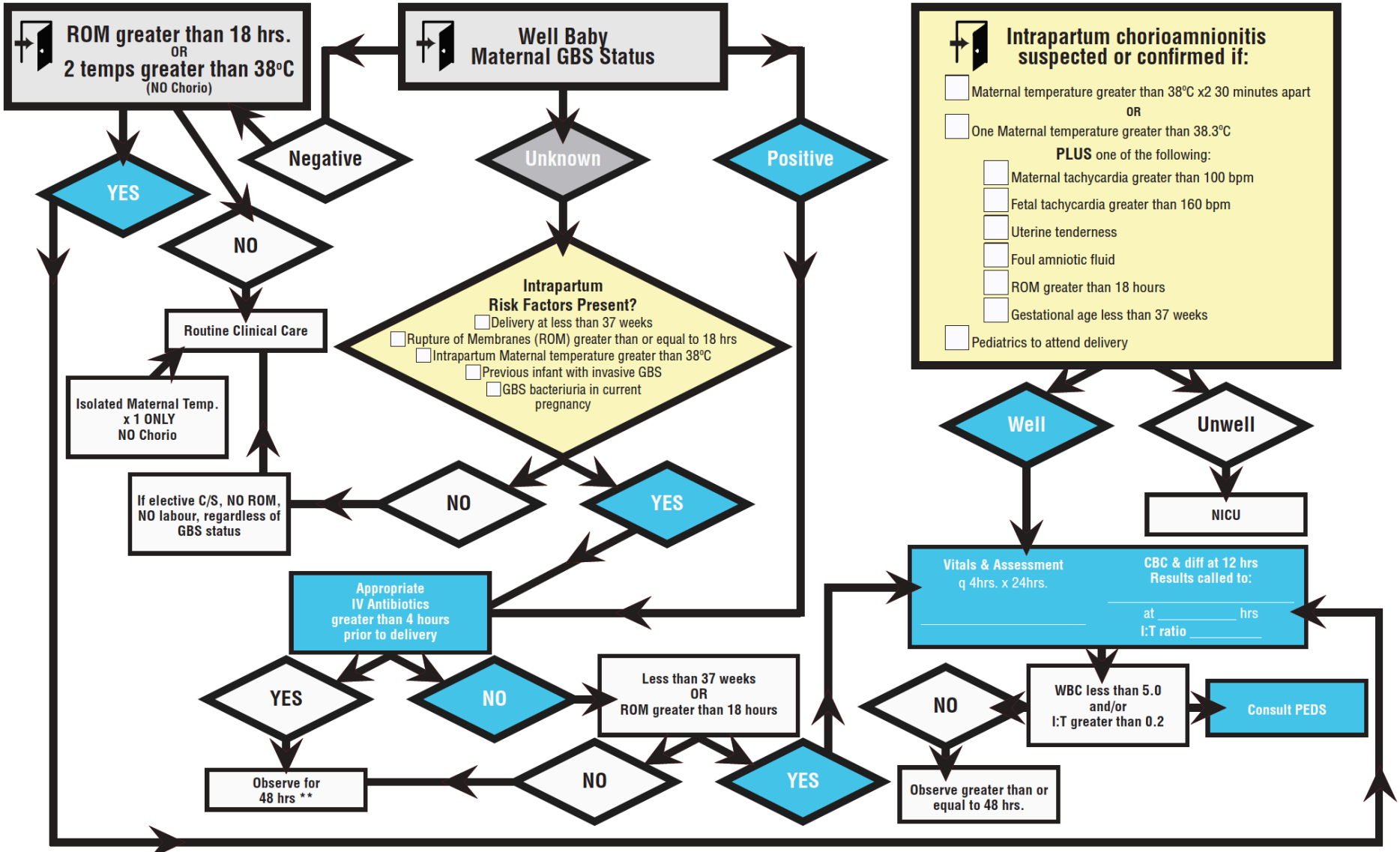
1. Lawrence R: Early Discharge Alert Pediatrics, 1995:96(5):966
2. CPS. Early Discharge of Newborn Infants - a guide for parents. Paediatric Child Health 1(2); fall 1996
3. Molteni KH. Initial Management of Hypernatremic Dehydration in the Breast Fed Infant. Clinical Pediatrics 33(12):731-40, 1994
4. Fleisher, GR. Textbook of Pediatric Emergency Medicine p.817. 2000.
5. Health Canada Fairly Centred Maternity and Newborn Care 7.5;2000
6. Hamilton-Wentworth Regional Lactation Committee. PD3910-07/2001 July 3rd, 2001, Breast feeding in the first few days.

Guidelines for the assessment of adequate hydration in breast-fed infants

	frequency of breast-feeding	urine output	stool pattern / characteristic	red flags
day 1	• minimum 6-8 times in 24 hours	• at least one wet diaper in 24 hours	• at least one meconium in 24 hours	• no voiding • sore nipples
day 2	• minimum 8 times in 24 hours	• 2-4 wet diapers	• transitional stool to seedy yellow stool	• decreased voiding • decreased stooling • sore nipples
day 3	• minimum 8 times in 24 hours	• 4-6 wet diapers	• transitional stool to seedy yellow stool	• baby too sleepy to feed • decreased voiding • decreased stooling • sore nipples • weight loss greater than 7% of birth weight
day 7	• 8 times per day, every 2-4 hours • baby satisfied between feeds	• 6 or more wet diapers • urine pale yellow • no odour	• seedy yellow stools	• baby too sleepy to feed • decreased voiding • weight loss > 10% of birth weight • sore nipples

When red flags occur, mother and infant should be seen by a family physician/pediatrician as well as a lactation consultant.
Feeding should be visualized by health professional trained in breast-feeding assessment.

ASSESSMENT AND MANAGEMENT GUIDELINES FOR NEWBORNS 35 WEEKS GESTATION AND GREATER AT RISK OF NEONATAL SEPSIS



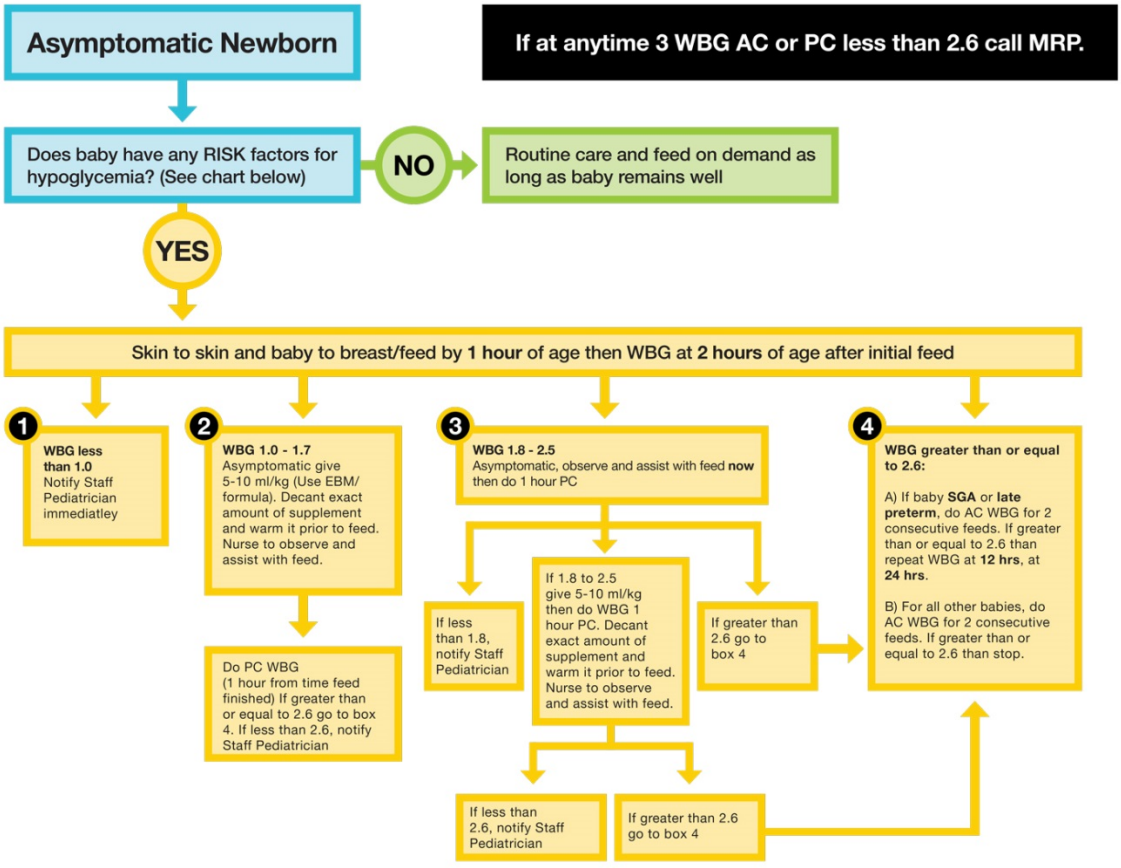
FOOTNOTES

★ The ** denote 'if greater than 37 weeks gestation, observation may occur at home after 24 hours if other discharge criteria have been met and the caregivers are able to comply fully with instructions for home observation. If any of these conditions are not met, the baby should be observed until at least 48 hours and until discharge criteria are met. ©2015

= Entryway

Screening for Hypoglycemia Guidelines of the asymptomatic at-Risk Newborn

St. Joseph's Healthcare Hamilton



If at anytime AC WBG is not greater than or equal to 2.6 go to box 1, 2 or 3.

Risk Factors for Hypoglycemia:

- Maternal hypertension treated with beta blockers, inluding single dose
- Any maternal diabetes (gestational, Type I, or II, with or without insulin)
- SGA – less than 5th percentile
- LGA – greater than 95th percentile
- Preterm – less than 37 0/7 weeks
- Cold stress – Hypothermia – axilla temperature less than 36.5˚ C
- Newborns with medical conditions, eg. respiratory distress, sepsis

References:

- ACoRN - Acute Care of at-Risk Newborns (2005)
- Canadian Pediatrics Society. Screening Guidelines for Newborns at Risk for Low Blood Glucose. Pediatrics and Child Health (2004).

Legend:

WBG = Whole Blood Glucose
MRP = Most Responsible Physician
AC = Before Feeds
EBM = Express Breast Milk
SGA = Small for Gestational Age
MD = Medical Doctor
MW = Midwife
PC = After Feeds
IDM = Infant to a Diabetic Mother
LGA = Large for Gestational Age

Gestation (complete weekly)	Male Weight in gm		Female Weight in gm	
	SGA	LGA	SGA	LGA
36	Less than or equal to 2144	Greater than or equal to 3604	Less than or equal to 2052	Greater than or equal to 3523
37	Less than or equal to 2384	Greater than or equal to 3857	Less than or equal to 2286	Greater than or equal to 3752
38	Less than or equal to 2605	Greater than or equal to 4065	Less than or equal to 2502	Greater than or equal to 3931
39	Less than or equal to 2786	Greater than or equal to 4232	Less than or equal to 2680	Greater than or equal to 4076
40	Less than or equal to 2927	Greater than or equal to 4382	Less than or equal to 2814	Greater than or equal to 4212
41	Less than or equal to 3025	Greater than or equal to 4512	Less than or equal to 2906	Greater than or equal to 4330
42	Less than or equal to 3070	Greater than or equal to 4631	Less than or equal to 2954	Greater than or equal to 4423

SGA = less than 5th percentile for birth weight and gestational age
LGA = greater than 95th percentile for birth weight and gestational age

MacPeds
2020-2021
PEDIATRIC FORMULARY

For drugs prescribed in the NICU, please refer to the handbooks available in unit at both McMaster and St Joseph's Healthcare.
There is a separate PICU handbook with a drug formulary specific to the PICU.

This document is intended for use at McMaster Children's Hospital (MCH) only and may not be applicable elsewhere. While this document is intended to reflect the practice at MCH at the time of writing, new information may become available. Every attempt has been made to ensure accuracy but these recommendations should be used in conjunction with good clinical judgment, and in consultation with a Pharmacist as needed.
For any questions related to the information contained in this document please email:
druginfo@hhsc.ca

Navigating HHSC Pharmacy Services

Drug Information Service
Call ext 76019

- Questions about drug literature when no application to or evaluation of patient is required
- Drug formulation, chemical, or compatibility questions
- Route of administration questions (eg can a drug be given intrathecally?)
- Drug infusion rate questions/Guardrail questions

Outpatient Pharmacy
Call ext 76106
Fax: 905-521-4984

- Drug availability for a patient at discharge
- Questions about EAP medications and coverage
- Questions about outpatient prescribing/prescriptions

Clinical Pharmacist Questions
ED: Page Claudiu at 6949
3C/3Y/3Z : Page Nicole (1423) or Sara (4509)
3B2 : Page Paula (4582), John (1096) or Anita (1413)
PICU: Page Jon at 1525
NICU: Page Lauren (5026) or Vivian (1051)

- Drug dosing or optimization
- Questions about evidence for a medication as it pertains to a specific patient
- Evaluation of an adverse drug event, or management of an adverse drug event
- Drug interactions, Drug levels/therapeutic drug monitoring
- Pharmacokinetic or pharmacodynamic properties of medications
- Drug allergies
- Patient/family medication discharge counselling, if needed

Limited Use (LU) Codes – for ODB eligible patients

Medication	LU Code	Comments
GI Medications		
Lansoprazole	**293**: GERD, failed H2RA (ranitidine) **295**: H.Pylori positive ulcers (7 days) **297**: peptic ulcers, NSAID-ulcer prophylaxis **401**: Crohn's, short gut, scleroderma, pancreatitis **402**: severe GI conditions (erosive esophagitis, zollinger-ellison, strictures, hospital discharge post-GI bleed)	15mg, 30mg delayed release (DR) capsules Lansoprazole liquid compounded from capsules (not fast tabs) Prevacid Fastabs ***NOT*** covered under ODB
Omeprazole	As above for Lansoprazole	Liquid formulation must be compounded from tablets/capsules
Pantoprazole	As above for Lansoprazole	40mg enteric coated Pantoprazole sodium tablets
Ondansetron	N/A	Only covered for clinical criteria of chemotherapy/radiation induced nausea/vomiting (NOT gastroenteritis)
Pancrealipase	**124**: Pancreatic insufficiency secondary to pancreatic resection **125**: Pancreatic insufficiency due to chronic pancreatitis **225:** Replacement therapy for pancreatic insufficiency due to cystic fibrosis (Cotazym and Creon only).	
Ursodiol	**273**: For the treatment of primary biliary cirrhosis. Authorization Period: Indefinite **534**: For the treatment of primary sclerosis cholangitis	250mg Tab or 500mg DS tab Compounded suspension 50mg/ml can be made from tabs
Antimicrobials		
Ciprofloxacin (oral liquid only)	**533**: oral liquid, when tablets cannot be tolerated	100mg/mL oral suspension Tabs now covered under ODB
Fluconazole	**235**: vaginal candidiasis (150mg PO once, only reimbursed once in 25 day period) **528:** oral liquid, when tablets/capsules cannot be tolerated	150mg capsule *50 mg and 100 mg tablets no longer require LU codes* 10 mg/mL oral liquid
Permethrin 5% cream	**311**: failure on cheaper, alternative therapy	5% Nix Dermal topical cream for scabies; Kwellada-P 5% **lotion** does not require LU code
Vancomycin (C.difficile infection, or CDI)	*Please refer to ODB e-formulary for more details* **557**: Initial, mild infection CDI and no response or intolerance to metronidazole **558**: Initial, moderate to severe infection but uncomplicated infection **559:** Recurrent Clostridium difficile infection (CDI), first	125mg capsules only For patients who require IV vancomycin to be given orally (i.e. patients with G-tubes), a telephone request still needs to

	recurrence, mild to moderate* or severe, uncomplicated **560**: Recurrent CDI (regardless of severity)	be completed through EAP
Anticonvulsants		
Levetiracetam	**473:** As adjunctive therapy in the treatment of seizure disorders where control by other listed anticonvulsants has been unsatisfactory.	Commercially available suspension marketed June 2020
Clobazam	**23:** As adjunctive therapy in the treatment of seizure disorders where control by other listed anticonvulsants has been unsatisfactory.	1 mg/mL compounded solution can be made from tabs
Lacosamide	**430:** As adjunctive therapy in the treatment of partial onset seizures who have had an inadequate response or have significant intolerance to at least 3 less costly anticonvulsant therapies; AND Patients are under the care of a physician experienced in the treatment of epilepsy.	No suspension available 50mg, 100mg, 150mg, 200 mg tablets available
Topiramate Sprinkle cap 15mg or 25mg	**321:** In children age 16 and under, as adjunctive therapy in the treatment of seizure disorders where control by other listed anticonvulsants has been unsatisfactory.	25mg, 100mg, 200mg tabs covered Topamax liquid 6mg/mL can be compounded from covered tablets.
A**nticoagulants**		
Dalteparin	**186**: DVT treatment, maximum duration 3 weeks **187**: DVT treatment in pregnancy/lactation **188**: DVT treatment when warfarin not tolerated/contraindicated **189**: DVT treatment when failed on warfarin	PFS in 2500,5000,7500,10000 unit
Enoxaparin	As above for Dalteparin, ***PLUS*** **323**: treatment of PE, maximum duration 3 weeks	PFS in 30mg,40mg,60mg,80mg and 100mg available as well as 100mg/mL multidose vial
Tinzaparin	As for enoxaparin	PFS in 2500, 3500, 4500, 8000, 10000, 12000, 14000, 16000 and 18000 units available, as well as 10,000 unit/mL and 20,000 unit/mL multidose vials
Respiratory		
Salbutamol Resp Sol	256: Patients who have a tracheostomy 257: Patients with CF in whom nebulizer indicated 258: Patients with severe mental or physical disabilities 259: Previously used nebulizer therapy within the last 12 months.	Bulk solution 5mg/mL (10mL bottle)

Not covered:
Septra (Trimethoprim/Sulfamethoxazole) compounded suspension (commercially available suspension on backorder)-consider denominations of Septra 400/80 tabs or Septra DS 800/160 tabs
Tamiflu: Only covered with LU for outbreak in nursing homes

Mometasone (Nasonex)/Fluticasone Propionate (Flonase)/Fluticasone Furoate (Avamys), Triamcinolone (Nasacort): Can attempt EAP for coverage (see next page). Only covered nasal corticosteroids include: beclomethasone, budesonide, flunisolide.
Feramax: Use Palafer (ferrous fumarate) or Fer-in-Sol (ferrous sulfate)-order in mg elemental iron
Ondansetron: See above

Exceptional Access Program (EAP):

The Exceptional Access Program (EAP) facilitates patient access to drugs available in Canada that are not included on the Ontario Drug Benefit (ODB) Formulary, or where no listed alternative is available. In order to receive drug coverage, the patient must be eligible to receive benefits under the Ontario Drug Benefit (ODB) program.

- EAP useful when patient requires treatment with drug product that is not a general benefit under ODB, but either meets criteria pre-specified by EAP for drug funding, or has compelling clinical circumstance for which EAP may consider funding the medication
- Common medications requested via EAP include dapsone, inhaled aztreonam, montelukast, infliximab, sildenafil
- For drugs that are not time-sensitive: Form can be obtained from the ministry website, or by google searching “EAP form Ontario filetype:PDF.” Form is entitled “Request for an Unlisted Drug Product”
- Prescriber should include on the completed request their contact information to receive confirmation of approval, and after completing the form, fax to number on the top of the form
- For time sensitive drugs, or for attainment of drug-product prior to hospital discharge: EAP expedited request form can be found on HHSC Intranet.
- Requests may also be expedited by prescriber phoning 1-866-811-9893, in high urgency situations.
- The Telephone Request Service (TRS), exists for specified drugs commonly requested in time-sensitive situations. The TRS supports prescribers in ensuring timely access for their patients, by reviewing the patient’s clinical background and drug criteria with the prescriber. They can likewise be reached at 1-866-811-9893.

Unapproved Abbreviations, Symbols and Dose Designations and Acceptable Corrections

Unapproved Abbreviation	Intended Meaning	Problem	Acceptable Correction
U	Unit	Mistaken for “0” (zero), “4” (four), or cc.	Use 'unit'.
IU	International unit	Mistaken for “IV” (intravenous) or “10” (ten).	Use 'unit'.
Abbreviations for Drug Names		Misinterpreted because of similar abbreviations for multiple drugs; e.g., MS, MSO4 (morphine sulphate), MgSO4 (magnesium sulphate) may be confused for one another.	Do not abbreviate drug names. (exceptions: ASA, KCl, Humulin R)
QD QOD	Every day Every other day	QD and QOD have been mistaken for each other, or as ‘qid’. The Q has also been misinterpreted as “2” (two).	Write “daily” and “every other day” in full
OD	Every day	Mistaken for “right eye” (OD = oculus dexter)	Write “daily”
OS, OD, OU	Left eye, right eye, both eyes	May be confused with one another.	Use “left eye”, “right eye” or “both eyes”.
AS, AD, AU	Left ear, right ear, both ears	May be confused with one another.	Use “left ear”, “right ear” or “both ears”
D/C	Discharge or discontinue	Premature discontinuation of medications if D/C (intended to mean “discharge”) has been misinterpreted as “discontinued” when followed by a list of discharge medications	Use “discharge” and "discontinue".
SC, SQ, or sub q	Subcutaneous	SC mistaken as SL (sublingual); SQ mistaken as “5 every;” the “q” in “sub q” has been mistaken as “every” (e.g., a heparin dose ordered “sub q 2 hours before surgery” misunderstood as every 2 hours before surgery)	Use "subcut" or "subcutaneous"
cc	Cubic centimetre	Mistaken for “u” (units).	Use “mL” or “millilitre”.
µg	Microgram	Mistaken for “mg” (milligram) resulting in one thousand-fold overdose.	Use “mcg or microgram”.
Unapproved Symbol	**Intended Meaning**	**Potential Problem**	**Acceptable Correction**
@	At	Mistaken for “2” (two) or “5” (five). Use “at”.	Write out “at” in full
> **<**	Greater than Less than	Mistaken for “7”(seven) or the letter “L” . Confused with each other.	Write out “greater than” in full Write out “less than” in full
Unapproved Dose Designation	**Intended Meaning**	**Potential Problem**	**Acceptable Correction**
Trailing zero	X.0 mg Or 10.0 mg	Decimal point is overlooked resulting in 10-fold dose error.	Never use a zero by itself after a decimal point. Use “X **mg** or 10 mg”
Lack of leading zero	. X mg	Decimal point is overlooked resulting in 10-fold dose error.	Always use a zero before a decimal point. Use “**0**.X mg”

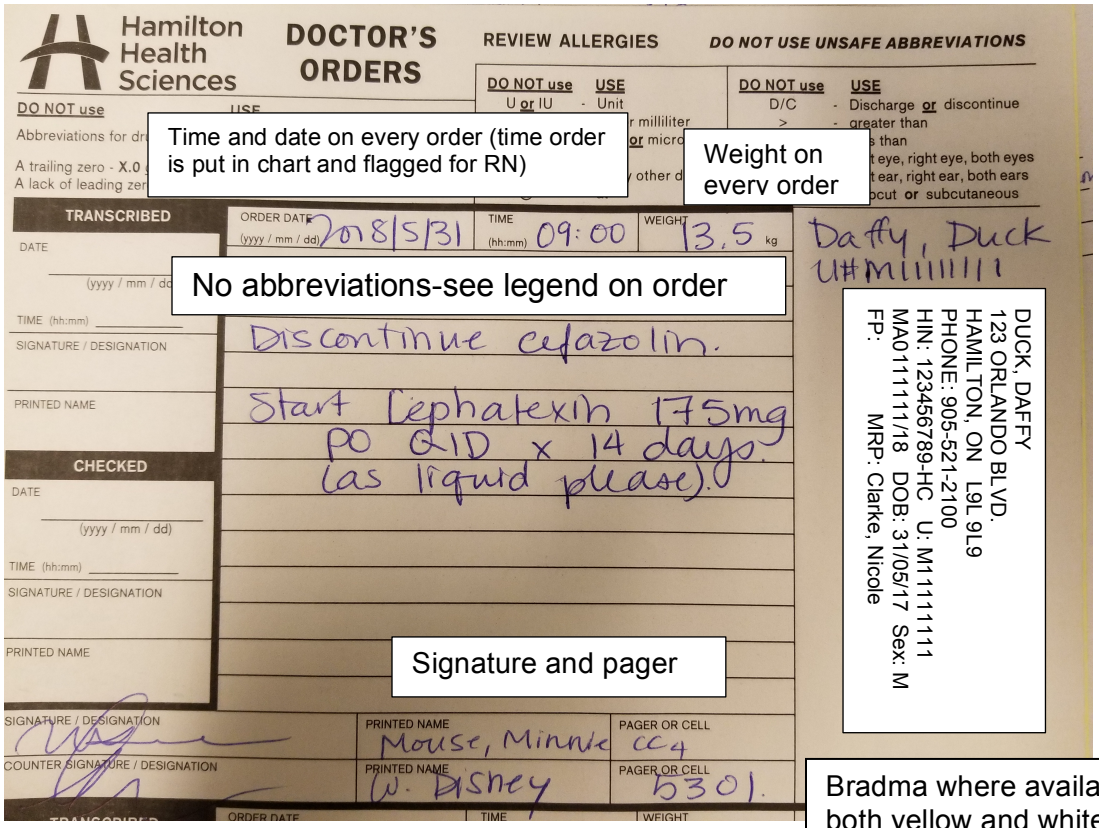
Adapted from ISMP’s List of Error-Prone Abbreviations, Symbols, and Dose Designations (2010) and ISMP Canada’s Do Not Use – Dangerous Abbreviations, Symbols and Dose Designations (2006)

Safer Order Writing

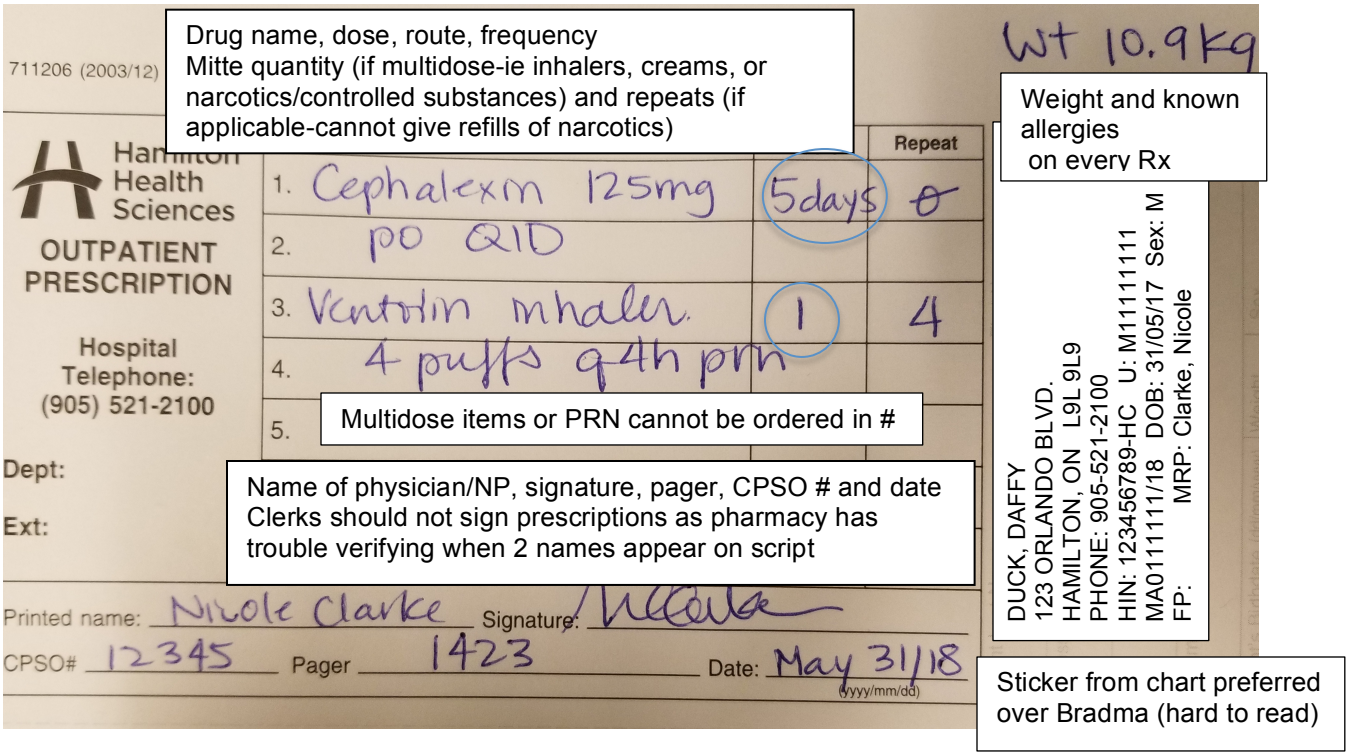
To reduce the potential for medication errors:

- Write orders clearly and concisely.
- Write medication orders using generic drug names only.
- Be careful with mg/kg/DAY vs mg/kg/DOSE.
- Include the intended dose per kilogram on each order.
- Write the patients weight on each order sheet.
- Never place a decimal and a zero after a whole number (4.0 mg should be 4 mg) and always place a zero in front of a decimal point (.2mg should be 0.2 mg). The decimal point has been missed and tenfold overdoses have been given.
- Never abbreviate the word unit. The letter U has been misinterpreted as a 0, resulting in a 10 fold overdose.
- Always order medications as mg, not mL as different concentrations may exist of a given medication. There are a few exceptions such as co-trimoxazole (Septra®).
- QD is not an appropriate abbreviation for once daily, it has been misinterpreted as QID. It is best to write out “once daily” or “q24h.”
- Do not abbreviate drug names (levo, 6MP, MSO4, MgSO4, HCTZ, CTX).
- Do not abbreviate microgram to μg, use mcg, or even safer, write out microgram or use milligrams if possible (0.25 mg instead of 250 micrograms)

Examples of appropriate order writing:

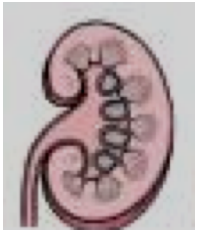


Discharge prescriptions should include:



Legend:

GAS	Group A Streptococcus
GP	Gram Positive
GPC	Gram Positive Cocci
GN	Gram Negative
GNB	Gram Negative Bacilli
MAX	Maximum
MIN	Minimum
NF	Non-Formulary At HHS
BID	Twice daily
TID	Three times daily
div	divided



Adjust dosing for patients with renal impairment.

PEDIATRIC FORMULARY

5-Aminosalicyclic Acid (see Mesalamine)

Acetaminophen

Analgesic and antipyretic.

PO: Refer to table for weight based dosing standardization
Can be dosed q4-6h prn

Weight (kg)	Single Dose (mg)
2.5 - 3.9	40
4.0 - 5.4	60
5.5 - 7.9	80
8.0 - 10.9	120
11.0 - 15.9	160
16.0 - 21.9	240
22.0 - 26.9	320
27.0 - 31.9	400
32.0 - 43.9	480
44 – over	650

PR: 10-20 mg/kg/dose q4-6h (neonates may require higher doses-refer to Neonatal Drug Cards)

For doses less than 80mg, can administer acetaminophen drops 80mg/mL (not suspension) rectally.

AcetaZOLAMIDE 

Diuretic used for idiopathic intracranial hypertension

PO: 25mg/kg/day divided BID-TID

Can increase to 100 mg/kg/day (MAX 2000mg/day). Administer with food (to decrease GI upset). Monitor electrolytes, acid-base balance
Supplied as 250mg tabs or compounded 25 mg/mL suspension

Acetylsalicylic Acid

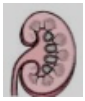
Antiplatelet:

PO: 5 mg/kg/DOSE q24h
Minimum 20 mg, usual maximum 325 mg.

Kawasaki disease:

PO: 3-5 mg/kg/DOSE q24h (round to nearest 20mg denomination)

Supplied as 80 mg chewable tablets and 325 and 650 mg tablets. Round dose to nearest ¼ tab.

Acyclovir 
Antiviral
Neonatal HSV:
IV: Infants 1-3 months: 20mg/kg/DOSE q8h

Treatment duration typically 21 days for CNS and disseminated disease; 14 days for skin and mucous membrane involvement

Suppressive therapy following NEONATAL herpes simplex disease:
PO: 300mg/m^2/DOSE TID x 6 months

HSV encephalitis:
IV: 3 months to 12 years*:10-15 mg/kg/DOSE Q8H (MAX: 1 g/DOSE)
Greater than 12 years: 10 mg/kg/DOSE Q8H (MAX: 1 g/DOSE)

*based on expert opinion due to lack of efficacy data of using 60mg/kg/DAY in patients outside neonatal period and increased risk of nephrotoxicity. Ref: Red Book (2015) and Long SS. J Infection 2016;72:S91-97.

Mucocutaneous HSV infection:
Mild to moderate
PO: 30-50 mg/kg/DAY div 3 TO 5 TIMES DAILY
Severe e.g. eczema herpeticum or immunocompromised hosts
IV: 5-10 mg/kg/DOSE Q8H
PO (following IV therapy): 60-80 mg/kg/DAY div 3 TO 5 TIMES DAILY

HSV Prophylaxis in selected hematology-oncology patients:
PO: 40mg/kg/DAY div 2 to 3 TIMES DAILY

Chronic suppressive therapy for recurrent mucocutaneous or genital HSV episodes:
PO: 30-50mg/kg/DAY div 3 TIMES DAILY (usual max is 400mg/DOSE)

Varicella or zoster in immunocompromised hosts:
IV: 10mg/kg/DOSE Q8H
PO: 80 mg/kg/DAY div 3 TO 5 TIMES DAILY *note that therapy not always indicated in immunocompetent host*

Need to monitor kidney function and ensure adequate hydration (especially on high dose IV therapy). Dosing adjustment is necessary in patients with impaired renal function

Suspension available as 40mg/mL; tablets as 200mg, 400mg and 800mg

Alfacalcidol

Vitamin D analogue (1 hydroxy vitamin D)

PO: 0.01-0.02 microgram/kg/DOSE BID (max 1 mcg/DOSE)

Available as 2mcg/mL oral liquid (1 drop = 0.05 mcg) and 0.25, 0.5 mcg caps. May be titrated to PTH.

Alteplase

Thrombolytic

Unblocking of occluded catheters

Intracatheter: 1 mg/mL: Less than 30 kg: 110% of lumen volume (max 2 mL)
Greater than 30 kg: 2 mL

Instil appropriate volume into occluded lumen. Leave in place for 1-2 hours, then aspirate solution. Do not infuse.
May repeat once if ineffective.

Empyema/Parapneumonic effusions

Intrapleural: 0.1 mg/kg/DOSE (usual max 4-6 mg/DOSE) x 3 d

Dilute in 20-100 mL of saline and clamp thoracostomy tube for 1 hour after administration.

amLODIPine

Calcium channel blocker

PO: 0.1-0.3 mg/kg/DAY (max 15 mg/day)

Due to long half life of drug, dose adjustments should be made every 3-5 days only

Commercially available 1mg/mL liquid available, 2.5mg, 5mg and 10mg tabs

Amoxicillin
Targeting against *Streptococcus pneumoniae* (including empiric therapy for community-acquired pneumonia (CAP) or acute otitis media (AOM):

PO: 80-90 mg/kg/DAY div q8h for pneumonia
div q12h for otitis media
(usual MAX: 3g/DAY)

Standard dose:
PO: 40-50 mg/kg/DAY div q8h
GAS pharyngitis (x 10 days)
PO: 50 mg/kg daily OR 25 mg/kg BID (MAX: 1000 mg/DAY)
Prophylaxis in asplenics (e.g. if suspension is required):
PO: 10mg/kg/dose BID (MAX: 250 mg/DOSE)

Amoxicillin + Clavulanate (Clavulin)

Targeting against *Streptococcus pneumoniae* (i.e. sequential oral therapy in complicated CAP, AOM, sinusitis):
PO: 80-90 mg/kg/DAY of amoxicillin component ÷ q8-12h (usual max: 875mg/DOSE of amoxicillin)**BID dosing may be adequate for AOM, but TID dosing is recommended for pneumonia**

Other gram positive, gram negative, anaerobic infections:
PO: 30-50 mg/kg/DAY of amoxicillin component ÷ q8-12h (MAX: 875 mg/DOSE)

*One major side effect with clavulanate (esp at high doses) is GI intolerance
*Limit clavulanate to < 10mg/kg/day if possible (high risk for diarrhea)
**When writing discharge prescription and if suspension is required, please indicate the formulation (esp. if high dose amoxicillin used)
Example:
Amoxicillin- clavulanate suspension - Please dispense as 7:1 formulation (80 mg/mL amoxicillin + 11.4 mg/mL clavulanate)
480 mg (of amoxicillin component) PO TID x 10 days

Available as tablets (amoxicillin/clavulanate): 250/62.5mg (4:1); 500/125 mg(4:1); 875/125 mg(7:1), suspension (supplied at HHS): 1 mL = 80 mg amoxicillin and 11.4 mg clavulanate (7:1). Community may stock the 4:1 formulation (1mL = 50mg amoxicillin and 12.5mg clavulanate)

Amphotericin B-Liposomal (Ambisome)

** Requires ID endorsement **
Coverage against many *Candida* species, *Aspergillus* and most *Mucor*
IV: 3 – 5 mg/kg IV once daily. Can be increased to 10 mg/kg/DAY in selected cases.

Monitor renal function and electrolytes (particularly potassium and magnesium). Infusion-related adverse effects (e.g. fever, rigors etc) may require pre-treatment with acetaminophen and diphenhydrAMINE

Ampicillin

Typically used in uncomplicated community-acquired pneumonia, empiric early onset neonatal sepsis (along with gentamicin) and empiric treatment for febrile UTI in older children (along with tobramycin). Activity against *Streptococcus pneumoniae*, beta-hemolytic Streptococci, *Enterococcus faecalis*, Listeria, limited gram negative activity

Neonates (less than 1 month of age):
Meningitis: IV: 300-400mg/kg/DAY div q6h
Other infections: 100-200mg/kg/DAY div q8h

Infants and older children:
Meningitis and severe infections (e.g. endocarditis):
IV: 300-400 mg/kg/DAY div q6h (MAX: 3 g/DOSE; 12 g/DAY)
*q4h may be used in older children or adolescents
Other infections:
IV: 100-200 mg/kg/DAY div q6h (MAX: 2 g/DOSE)

Artesunate (SAP)
Anti-malarial for severe malaria caused by *P.falciparum* (please refer to criteria from Canadian Malaria Network)
IV: Treatment course is often up to 4 doses. Patients who meet criteria for severe malaria should receive a minimum of 24 hours (i.e. 3 doses) of artesunate before switching to oral follow-on therapy (ref: CMN guidelines 2019)

Patient Weight (kg)	Dose	Timing
Less than 20	3mg/(kg*dose) IV	0, 12, 24, 48h
Greater than 20	2.4mg/(kg*dose) IV	0, 12, 24, 48h

4h following dose at 48h: stepdown to oral Malarone
*CBC to be done q week for 4 weeks following dose to monitor for artesunate-associated hemolysis

Atovaquone/Proguanil see Malarone

Atropine
Anticholinergic used for sialorrhea
SL: 1-2 drops q4-6h
Supplied as 1% ophthalmic drops (pharmacy can prepare 0.25% and 0.5% as needed). Watch for anticholinergic side effects

Azithromycin
Macrolide antibiotic. Covers atypical pathogens such as Mycoplasma, Legionella, and Chlamydia. Use in atypical respiratory infections and bacterial enteritis. *AVOID USING TO TREAT INFECTIONS PRESUMED TO BE CAUSED BY GROUP A STREPTOCOCCUS OR PNEUMOCOCCUS.*
PO/IV: 10 mg/kg (MAX: 500 mg) once,
then 5 mg/kg (MAX: 250 mg) q24h for 4 days
Pertussis:
PO/IV: Less than 6 months: 10 mg/kg q24h for 5 days
6 months or older: 10mg/kg x 1 (maximum 500 mg) then
5mg/kg once daily (maximum 250 mg/day)
Chlamydia trachomatis urethritis or cervicitis:
Chlamydial conjunctivitis (infants): 20 mg/kg IV/PO once daily x3days
Children less than 9 years: 20mg/kg (maximum 1000mg) PO x 1
Children greater than 9 years of age: 1,000 mg PO x 1
Supplied as 250 mg tablet or 40 mg/mL suspension

BisACODYL

PR: ages 2-6 years: 5 mg DAILY
Greater than 6 years: 10 mg DAILY
10 mg suppositories (can be cut)-15-60 minutes to desired effect
PO available only as delayed release 5 mg tablets (taken whole, cannot be split/crushed)-can take 6-12 hours for effect

Botulinum Toxin A (Botox)
Siallorrhea
25 units injected into salivary glands to max 100 units
Requires special approval and paperwork. Contact pharmacy.

Budesonide
Corticosteroid
Acute asthma:
NEB: 0.25-0.5 mg nebulized BID
Eosinophilic esophagitis
PO: Less than 10 years: 1 mg DAILY (may divide BID)
Greater than 10 years: up to 2 mg daily (may divide BID)
Slurry to be made using 5 packets Splenda for every 0.5 mg
Distal ulcerative colitis
PR: 2.3 mg HS
Supplied as 2.3 mg/115ml rectal enema (delivers 2mg budesonide per enema), for inhalation: 0.25mg/2mL or 1mg/2mL

Buscopan (see Hyoscine butylbromide)

Calcium salts
Electrolyte.
Treatment of hypocalcemia:
PO: 50-150 mg elemental calcium/kg/day div QID
IV: 50-100 mg calcium GLUCONATE/kg
(usual max 3 g/DOSE)
OR 0.05-0.1 mmol/kg/hr infusion
SEE Pediatric Calcium GLUCONATE Continuous Infusion Order Set
(usual max 1 gram/hr or 2.32 mmol/hr to start)

IV available as calcium GLUCONATE (1 gram calcium GLUCONATE = 2.3 mmol calcium.) Please refer to Pediatric IV monograph for further prescribing details and limitations.

PO available as: **Order in mg elemental calcium**
1) calcium carbonate
- liquid as 80 mg elemental calcium/mL],
- chewable tabs (Tums) 500 mg(200 mg elemental calcium/tab,
- oyster shell tabs 1250 mg (containing 500 mg elemental calcium/tab)

2) sugar-free calcium lactogluconate 20 mg elemental calcium/mL.

Calcitriol
Vitamin D analogue (1,25-OH Vitamin D)
PO: 0.01-0.02 mcg/kg/day div BID
Titrate to 0.5-1 mcg/day
Available as 0.25 mcg and 0.5 mcg gelatin capsules. Each liquid filled capsule contains 0.17 ml. No suspension available.

Captopril
Angiotensin converting enzyme inhibitor (ACE-I).
PO: 0.1-0.3 mg/kg/DOSE q8h initially
(usual maximum 6 mg/kg/DAY or 200 mg/DAY).
Monitor blood pressure closely after first dose, may cause profound hypotension. Cough is a common side effect. Not available as liquid formulation-consult pharmacist for administration directions.

carBAMazepine
Anticonvulsant.
PO: 10-20 mg/kg/DAY initially, usual maintenance dose is 20-30 mg/kg/DAY. Divide daily dose q8-12h.
Available as 20mg/mL suspension, 100mg chew tab, 200mg regular tab and CR 200mg tab in hospital.

Caspofungin (IV)

Antifungal-active against many candida species; not first line for aspergillosis and no activity against Mucor
** Requires ID endorsement **
Loading dose: 70 mg/m^2/DAY IV x 1 dose (MAX: 70 mg) then
Maintenance dose: 50 mg/ m^2/DAY IV once daily (MAX: 50 mg)

Prophylaxis (in selected hematology patients): 50 mg/m^2/DAY IV once daily (maximum dose of 50 mg).

ceFAZolin (Ancef)

First-generation cephalosporin: methicillin sensitive *S. aureus* (MSSA), group A Streptococcus and other beta-hemolytic streptococcus*, E. coli, Klebsiella.* Empiric therapy for cellulitis, osteomyelitis, bacterial adenitis.
IV: 75-150 mg/kg/DAY div q8h (MAX: 2g/DOSE and 6 g/DAY)
Higher doses needed for infections such as osteomyelitis
Poor CNS penetration
See cephalexin for step down

Cefixime (Suprax)
Oral third-generation cephalosporin
No longer indicated for empiric treatment of gonorrhoea. Main indications are treatment of UTI pathogens resistant to first-line antimicrobials and typhoid fever. Poor coverage of *S. pneumoniae* and no *Pseudomonas* coverage.
Other infections:
PO: 8 mg/kg/DAY div q12-24h (MAX: 400 mg/DAY)
Salmonella infection (off-label dosing): 10mg/kg/DOSE PO BID

Supplied as 400mg tablet or 20mg/mL suspension

cefOTAXime

reserved for neonates less than 1 month old
Third generation cephalosporin. Similar spectrum as ceftriaxone. Excellent coverage against *Streptococcus pneumonia* and good coverage of MSSA. Broad spectrum against gram negatives (except *Pseudomonas* and other resistant gram negatives such as ESBL). Useful for CNS infections.

Neonates (term):
0 – 7 days of age: 50mg/kg/DOSE IV q8h
Greater than 7 days: 50mg/kg/DOSE IV q6h (meningitis) and q8h (non-meningitis)
May dose higher in severe infections in consultation with Infectious Diseases service

Infants and older children (please note that ceftriaxone is often used in this age group – see Ceftriaxone):
Meningitis:
IV: 200mg/kg/DAY div q6h (doses up to 300mg/kg/day in complicated meningitis. MAX: 2g/DOSE; 12 g/DAY)
Other infections:
IV: 100-200 mg/kg/DAY div q6-8h (MAX: 6 g/DAY)

Cefprozil (Cefzil)

Second generation cephalosporin. As a class, these agents offer no benefit compared to ampicillin / amoxicillin against *Streptococcus pneumoniae.* Main benefit is coverage against *H.influenzae* and Moraxella
Otitis media unresponsive to high-dose amoxicillin or acute sinusitis
PO: 15-30 mg/kg/DAY div BID (MAX: 1 g/DAY)
Supplied as 250 mg, 500 mg tablet or 50mg/mL suspension

cefTAZidime

Third generation cephalosporin. Gram negative bacilli, including *Pseudomonas aeruginosa*. Good CNS penetration
IV: 75-150 mg/kg/DAY div q8h (MAX: 2 g/ DOSE; 6 g/DAY)

Meningitis, CF exacerbation and severe infections:
IV: 200mg/kg/day div q8h

cefTRIAXone
for infants and children greater than 1 month old
Third generation cephalosporin. Coverage similar to cefotaxime. Excellent coverage against *Streptococcus pneumonia* and good coverage of MSSA. Broad spectrum against gram negatives (except *Pseudomonas* and other resistant gram negatives such as ESBL).

Meningitis:
IV/IM: 100 mg/kg/DAY div q12h or q24h (Max: 2 g/DOSE; 4 g / DAY)
Other infections:
IV/IM: 50-75 mg/kg q24h (MAX: 2 g/DAY)
STI (gonococcal infection):
Less than 9 years: 50mg/kg IM x 1 (maximum 250mg) x 1
Greater than 9 years of age: 250 mg IM x 1

Cefuroxime
Second generation cephalosporin
IV/IM: 100-150 mg/kg/DAY div q8h (MAX: 2 g/DOSE)

Cefuroxime Axetil
Oral second generation cephalosporin
PO: Poor oral bioavailability; unlikely to achieve optimal concentrations in severe infections

Cephalexin (Keflex)

Oral first-generation cephalosporin. Activity against MSSA, group A Streptococcus and other beta-hemolytic streptococcus*, E. coli, Klebsiella.*
Treatment: PO: 25-100 mg/kg/DAY div QID
Osteomyelitis following IV therapy: 100-150 mg/kg/DAY div QID (MAX: 1g/DOSE and 4 g/DAY)
Available as 250mg, 500mg tablets and 50 mg/mL suspension

Cetirizine
Antihistamine
PO: 6 months-2 years: 2.5 mg/DOSE
2-5 years: 5mg/DOSE
6 years and greater: 10mg/DOSE
For allergic reactions, may give BID
Available as 1mg/mL liquid and 5mg, 10mg tablets

Charcoal
Adsorbent used in toxic ingestions.
PO: 1-2 g/kg once (max 50 g/DOSE).
PO: Multiple dose therapy 0.5 g/kg q4-6h.
Give via NG if necessary, consider antiemetics.

Chloral Hydrate
Sedative and hypnotic.
Procedural Sedation:
PO/PR: 80 mg/kg 20-45 mins before procedure may repeat half dose if no effect in 30 minutes (maximum 2 g/dose).
Sedation:
PO/PR: 25-50 mg/kg/DOSE q6-8h (max 500 mg q6h or 1 g hs).
Avoid in liver dysfunction. Tolerance develops & withdrawal may occur after long-term use. Can cause respiratory depression, use with caution. For PR, dilute with water.

Ciprofloxacin
** REQUIRES ID ENDORSEMENT**

Pseudomonas aeruginosa or other resistant gram negative bacilli. Can be used in intra-abdominal infections (in combination with metronidazole) or bacteremia.

IV/PO: 20-30 mg/kg/DAY div q12h (MAX: 400 mg/DOSE IV or 750 mg/DOSE PO)

Excellent oral absorption, use IV only if PO contraindicated
NO feeds, dairy products, vitamins (containing calcium, magnesium, iron) 1 hour before OR 2 hours after ciprofloxacin as drug absorption will be impaired.
Tablet: 250 mg, 500 mg, 750 mg Suspension: 100 mg/mL (tablets are preferable if dose is given via enteral tubes)
consider LU on discharge script for liquid formulation only

Clarithromycin
Macrolide antibiotic. Covers atypical pathogens such as Mycoplasma, Legionella, Chlamydia and *H.pylori*. Can be used in mild bacterial pneumonia (adolescents) or atypical mycobacterial infections.
PO: 7.5 mg/kg/DOSE BID (Max: 500 mg/DOSE)

Need to think about drug interactions (clarithromycin inhibits CYP3A4). May include potential interactions with theophylline, carBAMazepine, cisapride, digoxin, cycloSPORINE, tacrolimus
Supplied as 250mg, 500mg tablets, and 25 mg/mL suspension in hospital (50 mg/mL not available at HHS, available in community)

Clindamycin
Covers oral anaerobes, Group A Streptococcus; increasing resistance in *Staphylococcus aureus* (including MRSA). Useful for GAS or *Staphylcoccus aureus* toxic shock syndromes, anaerobic infections involving head and neck (NB: not for CNS infection) and osteomyelitis with known susceptible pathogens.
IV: 20-40 mg/kg/DAY div q8h (usual MAX: 600 mg/DOSE; 600-900 mg IV q8h is usually prescribed as adjunct therapy in toxic shock or necrotizing fasciitis)
PO: 10-30 mg/kg/DAY div q6-8h (MAX: 450 mg/DOSE)
May potentiate muscle weakness with neuromuscular blockers or conditions affecting neuromuscular junction. Oral suspension (15mg/mL) is very poorly tolerated, avoid if possible, use 150mg, or 300mg capsules or an alternative antibiotic

Clobazam
Anti-convulsant used as monotherapy or adjunct
PO: 0.25 mg/kg/day divided daily-BID
May titrate to 1mg/kg/day or 80mg/day

Available as 1mg/mL compounded suspension, 10mg tablet (can be split, but not dissolve and dosed). Requires LU code for OHIP+

CloNIDine
Alpha adrenergic agent (with effects in analgesia, ADHD, withdrawal management)
Withdrawal prevention (while on benzodiazepines, opioids)
PO: 2-5 mcg/kg q6h. Wean over several days after benzodiazepine/opioid discontinuation to avoid rebound hypertension (wean depends on length of time on sedation)
ADHD:
PO: 0.05-0.1 mg/DAY (max 0.4 mg/day), may divide BID-TID
Neuropathic pain:
PO: 2 mcg/kg/DOSE q4-6h (titrate to effect)

Available as compounded 100mcg/mL suspension, 0.025 mg (25mcg) and 0.1 mg (100mcg) tablets.

Cloxacillin
Methicillin-sensitive *Staphylococcus aureus* (MSSA) infections
IV: 100-200 mg/kg/DAY ÷ q4-6h (MAX: 2g/DOSE and 12 g/DAY); up to 300 mg/kg/DAY may be used in select cases (please consult Infectious Diseases) ***has CNS penetration***
PO: Suggest to use cephalexin (1st generation cephalosporin) for stepdown as low oral bioavailability and poorly tolerated (GI side effects) and needs to be taken on an empty stomach

Codeine: replaced with Morphine as the preferred oral narcotic analgesic for acute pain due to better safety profile. See morphine.

Cotrimoxazole (trimethoprim-sulfamethoxazole) (Septra)

UTI treatment with a known susceptible pathogen, cutaneous abscess/cellulitis (empiric MRSA coverage – don't forget to drain!!), *Pneumocystis jiroveci* pneumonia, Toxoplasma, Nocardi, Stenotrophomonas

Order in mg of trimethoprim component and mL of suspension (or number of tablets – need to specify whether it is single strength or double strength tablets)

Bacterial infections (UTI)
PO/IV: 8-10 mg/kg/DAY (of Trimethoprim component) div q12h
MRSA bacterial infections:
PO/IV: 8-12 mg/kg/DAY (of Trimethoprim component) div q12h (higher doses may be needed depending on site of infection)
Pneumocystis jiroveci pneumonia (PJP):
PO/IV: 15-20 mg/kg/DAY (of Trimethoprim component) div q6-8h
If PJP is severe (i.e. hypoxia), consider adding IV methylPREDNISolone 1 mg/kg q24h
PJP prophylaxis (Hematology/Oncology, HIV):
PO/IV: 3-5 mg/kg/day (of Trimethoprim component) div bid on Monday, Wednesday, Friday

Formulation:	Trimethoprim	Sulfamethoxazole
Suspension	8 mg/mL	40 mg/mL
Injectable	16 mg/mL	80 mg/mL
SS (single strength) Tablet	80 mg	400 mg
DS (double strength) Tablet	160 mg	800 mg

Excellent oral absorption, use IV only if PO contraindicated. Maintain good fluid intake and urine output. Monitor CBC and LFTs. Do not use in patients with G-6-PD deficiency. Commercially available suspension on long-term backorder. Consider denominations of tabs for discharge if able (for coverage)

Desmopressin (DDAVP)

Antidiuretic hormone

Diabetes Insipidus:

Nasal: 5-20 mcg/day intranasally daily or div BID

PO (tab): 50-100 mcg/dose daily to TID (to max 1200 mcg/day)

Sublingual (DDAVP Melt): 60-120 mcg/dose daily to TID (max 720mcg/day)

Subcut: Test dose: 0.005mcg/kg/dose; titrate up by 50% until response achieved

Usual starting: 2-5 years: 0.05-0.1 mcg
6-12 years: 0.1-0.2 mcg
13-18 years: 0.2-0.4 mcg

Coagulopathy:

IV/SUBCUT: 0.3 mcg/kg/DOSE

Dexamethasone

Corticosteroid.

Acute Asthma:

IV/PO: 0.3 mg/kg/DOSE x 2 days (usual max 10 mg/ DOSE)

Croup:

IV/PO: 0.6 mg/kg ONCE (usual max 10 mg)

Cerebral Edema:

IV/PO: 1-2 mg/kg then 1-1.5 mg/kg/DAY div Q6H (usual maximum 16 mg/DAY)

Antiemetic for antineoplastic regimens:

IV/PO: 0.25mg/kg/DOSE q8h

Discontinuation of therapy greater than 10 days of hydrocortisone 10mg/m^2/day equivalent requires gradual tapering. Consider supplemental steroids at times of stress if patient has received long-term or frequent bursts of steroid therapy.

Dextrose

Treatment of hypoglycemia:

IV: 0.5-1 g/kg/DOSE:

Less than 10 kg: 5mL/kg D10W

10-25 kg: 1 mL/kg of D50W or 2mL/kg D25W

Greater than 25 kg: 1mL/kg D50W

1 mmol of dextrose (0.2 g of dextrose) provides 2.8 kJ (0.67 kcal).

Diazepam
Benzodiazepine sedative, anxiolytic and amnestic.

Status epilepticus:
IV: 0.1-0.5 mg/kg/DOSE
(usual maximum 5 mg for children less than 5 yrs
10 mg for children greater than 5yrs)
PR: 0.5 mg/kg/DOSE (maximum 20 mg/DOSE).
For PR route, use IV formulation

Skeletal muscle spasms:
PO: 0.12-0.8 mg/kg/DAY divided q6-8h
IV: 0.04-0.2 mg/kg/DOSE Q2-4h
(max 0.6mg/kg in 8 hours)

Usual max IV: 5 mg for children less than 5 years
10 mg for children greater than 5 years

Fast onset and short duration of action with single doses, duration of action prolonged with continued use. Withdrawal may occur if discontinued abruptly after prolonged use. Not recommended for continuous infusion due to poor solubility.

Dicitrate (see sodium citrate)

dimenhyDRINATE (Gravol®)
Antihistamine used to treat nausea and vomiting.
IV/IM/PO: 0.5 -1 mg/kg/DOSE q4-6h prn
(maximum 50 mg/DOSE).
Available as 3 mg/mL liquid. *Please round to nearest 2.5mg dose.*
Not indicated for infants less than 2 years of age (causes parydoxical reactions)-consider ondansetron

diphenhydrAMINE (Benadryl®)
Antihistamine used primarily to treat urticaria.
IV/IM/PO: 0.5-1 mg/kg/DOSE q4-6h prn
(maximum 50 mg/DOSE).
Available as 2.5mg/mL elixir, and 25mg, and 50mg capsules. *Please round to nearest 2.5mg dose for liquid.*

Docusate (Colace)
Removed from HHS formulary February 2019

Doxycycline
Typically not used in children under the age of 8 years due to permanent teeth discolouration, although American Academy of Pediatrics has recently revised their recommendations that can be used for short durations (< 21 days) regardless of age [ref Red Book 2018]
Can be used in MRSA infections, pelvic inflammatory disease
PO: 2 – 4mg/kg/day div q12h
Available as 100mg capsules and tablets. 5mg/mL suspension needs to be extemporaneously compounded. Patients should be counseled to avoid excessive sun exposure due to photosensitivity related to drug

Domperidone
Prokinetic agent.
PO: 1.2-2.4 mg/kg/DAY div q6h (usual maximum 30 mg/DAY due to risk of QTc prolongation-Health Canada)
Give 15- 30 mins prior to feed/meals and at bedtime. Baseline ECG and ECG 48 hours after initiation recommended if risk factors (consult pharmacy).

Enoxaparin
Anticoagulant, low-molecular weight heparin.
Treatment:
Subcutaneous:
Less than 2 months of age: 1.5 mg/kg/DOSE q12h.
Greater than 2 months of age: 1 mg/kg/DOSE q12h.
Prophylaxis:
Subcutaneous:
Less than 2 months of age: 0.75 mg/kg/DOSE q12h
or 1.5 mg/kg q24h

Greater than 2 months of age: 0.5 mg/kg/DOSE q12h
or 1mg/kg q24h
Maximum prophylactic dose 30mg q12h, or 40mg q24h

Monitor platelets and hemoglobin. Avoid in severe renal dysfunction. Anti-factor Xa level drawn 4 hours post subcut injection should be 0.5-1 unit/mL for treatment and 0.2-0.4 unit/mL for prophylaxis. Available as prefilled syringes for 30mg, 40mg, 60mg, 80mg and 100mg strengths. For all other doses, pharmacy to prepare.
requires LU code on discharge for OHIP+

EPINEPHrine (1mg/mL)

NEB: Less than 10 kg: 2.5 mg/DOSE in 0.9% NS inh q1h prn
10 kg or greater: 5 mg/DOSE in 0.9% NS inh q1h prn

Bronchiolitis:
NEB: 1.5 mg in 4 mL of 3% Hypertonic saline q8h

Anaphylaxis:
IM: 0.01mg/kg/dose q20min prn (MAX 0.5mg/dose)

On discharge, epinephrine available as prefilled auto-injectors (Less than 30kg: 0.15 mg and greater than 30kg: 0.3 mg)

Ertapenem

IV: 3 months - 12 years : 15 mg/kg q12h (max: 500 mg/DOSE)
Greater than 13 years: 1 gram q24h

*please note that ertapenem has poor activity against *Pseudomonas aeruginosa* and has no CNS penetration

Famotidine (non-formulary-use only when ranitidine on backorder)
H_2 receptor antagonist.

GERD:
PO: 1-3 months: 0.5 mg/kg/dose DAILY
Greater than 3 months: 0.5 mg/kg/dose BID (MAX 40mg/DOSE)
IV: Infant up to 3 months: 0.25 mg/kg/dose DAILY
Greater than 3 months 0.25 mg/kg/dose BID (to max 20mg/DOSE)

Supplied as 20mg and 40 mg tablets, 8mg/mL compounded suspension and 10mg/mL IV formulation

fentaNYL
Narcotic analgesic

Continuous infusion:
Continuous infusion: 0.5-2 mcg/kg/hr
Initial bolus (loading) dose: IV: 0.5-1 mcg/kg
PRN Breakthrough dose: 0.5-1 mcg/kg q1-2 h prn
(refer to continuous infusion electronic order set)

Please note: **fentaNYL is 100 x more potent than morphine**
To prevent withdrawal, avoid abrupt cessation following high doses or long duration of therapy (greater than 5 days). Common adverse effects are pruritus, nausea and constipation.
**For severe pain or non-opioid naïve patients, some children/youth may require substantially higher doses for adequate analgesia. Please speak with staff physician or pharmacist to titrate to effect **

Ferrous Sulfate : See iron

Fluconazole
Anti-fungal – covers many *Candida* species (excluding *C.krusei* and has unreliable activity against *C.glabrata*) and has activity against Cryptococcus. No mold activity

Oropharyngeal candidiasis:
IV/PO: 3 mg/kg q24h (usual max: 200mg/DAY)
Esophageal candidiasis:
IV/PO: 6 mg/kg q24h (usual max: 400 mg/DAY)
Doses as high as 12mg/kg/day may be used in selected patients depending on Candida species isolated and/or clinical response
Systemic candidiasis:
IV/PO: 12 mg/kg once daily (usual max: 800 mg/day for severe or CNS infections)

Excellent oral absorption, use IV only if PO contraindicated.
May increase serum levels of cycloSPORINE, midazolam, cisapride, phenytoin.
Dosage adjustment is required in patients with impaired renal function
Tablet: 50mg, 100mg Suspension: 10mg/mL

Fluticasone (Flovent®)
Inhaled corticosteroid.

INH: 1-5 years: Low dose: 100-125 mcg/day
Medium dose: 250-500 mcg/day
6-11 years: Low dose: Less than 250mcg/day
Medium dose: 250-500 mcg/day
High dose: Greater than 500mcg/day

Available as 50 mcg, 125 mcg, 250 mcg /inhalation metered dose inhaler, orders must specify strength as well as number of puffs. During acute exacerbations, may require higher doses.

Furosemide
Loop diuretic.

PO: 1-2 mg/kg/DOSE q6h-q24h (usual max 80 mg/DOSE)
IV: 0.5-2 mg/kg/DOSE q6h-q24h (usual max 80 mg/DOSE)
or
begin at 0.1 mg/kg/hour and titrate to clinical effect (maximum 0.5 mg/kg/h).

Available as 10 mg/mL oral solution (*please round to nearest 1mg dose) or 20mg, 40mg tablets*

Ganciclovir (IV)
Consult ID
Need to monitor renal function (and dose adjust if renal impairment)
CBC (neutrophils)
For PO: see valganciclovir

Gabapentin
Neuropathic pain agent

PO: 20 – 75mg/kg/day div. TID (max 2400-3600 mg/day)
Titrate to effect. Starting dose: 5mg/kg QHS
Then increase every 2–4 days by 5–6 mg/kg per day until:
1. Effective analgesia achieved (may be noted at 30–45 mg/kg/day)
2. Side effects experienced (nystagmus, sedation, tremor, ataxia, swelling)
3. Maximum total dose of 50–75 mg/kg/day reached (2400–3600 mg/day)

Note: Younger children (<5 years) may require a 30% higher mg/kg per day dosing, such as a total dose of 45–60 mg/kg per day. Half of the total daily dose may be given as the evening dose if symptoms occur mostly in the evening and overnight. Consider titrating more rapidly for severe pain or as tolerated, titrate more gradually if sedation noted.

Gentamicin

Reserved for 1) Neonates 2) Synergy in gram positive infections (e.g. complicated Group B Streptococcal infections, Enterococcus endocarditis)

Neonates (term):

IV: Less than 7 days: 4mg/kg once daily
Greater than 7 days: 5mg/kg once daily

Infants and Older Children (greater than 1 month of age)

Treatment of Gram Negative Infections **– use Tobramycin as per hospital formulary**

Synergy with beta-lactams for severe gram positive infection (e.g. complicated Group B Streptococcal infection):

IV: 1mg/kg/DOSE q8h

Extended frequency dosing (i.e. once daily dosing) is preferred in patients without renal impairment to maximize pharmacokinetics and dynamics of drug

Monitoring and toxicity profile similar to tobramycin. *Ototoxicity* and *nephrotoxicity* may occur, consider monitoring trough levels pre-2nd dose (target less than 1 mg/L) in patients at risk for nephrotoxicity (e.g. septic shock, concurrent nephrotoxins, fluctuating renal function or extended treatment courses). Prolonged therapy (i.e. greater than 2 weeks) generally not warranted and needs to be reassessed. May potentiate muscle weakness with neuromuscular blockers or conditions that affect the neuromuscular junction.

Glycerin
Laxative
Age 6 months-1 year: glycerin “tip” (tip of adult glycerin suppository)
Age 1-5 years: ½ Glycerin Adult suppository
Age 6+: Glycerin Adult suppository

Hyaluronidase
Enzyme for interstitial IVs causing tissue damage (Calcium, TPN, Potassium etc.)

SUBCUT: 6 months or younger: 3 units per site x 5
Over 6 months of age: 30 units per site x 5

Available as 1,500 unit ampoule. Must be diluted by RN according to IV monograph (depending on age). Special Access drug, pharmacy requires notice that drug given. Best results if injected within 1 hour of IV going interstitial. See Pediatrics IV Extravasation Order Set.

HydrALAZINE
Anti-hypertensive
IV: 0.1-0.4 mg/kg/DOSE q4h (max 20mg/DOSE)
PO: 0.25 mg/kg/DOSE (MAX 25 mg/dose) q6-8h
Available as 20mg/mL ampule and 25mg tablets.

Hydrochlorothiazide
Thiazide diuretic.

PO: 1-4 mg/kg/DAY div q12h

Available as 5 mg/mL suspension. *Please round to nearest 0.5mg or 1mg.* Unable to be dissolve and dosed.

Hydrocortisone
Corticosteroid.

Acute asthma:
IV: 1-2 mg/kg/DOSE q6h for 24-48 hours then reassess.
(usual max is 5 mg/kg/DOSE)
Colitis:
PR: 100mg/60mL enema HS
Anaphylaxis:
IV: 5-10 mg/kg/DOSE.
Stress dosing:
IV: 100 mg/m^2 load (max 100mg) then 25mg/m^2/dose q6h

Discontinuation of therapy greater than 10mg/m^2/day hydrocortisone for greater than 10 days requires gradual tapering (refer to protocol). Consider supplemental steroids at times of stress if patient has received long-term or frequent bursts of steroid therapy.
Supplied as 1mg/ml suspension, or denominations of 10mg tablets (can be halved and quartered, cannot dissolve and dose)

HYDROmorphone
Narcotic analgesic ***avoid range dosing in pediatrics***

Analgesia :
PO: 0.03-0.08 mg/kg/DOSE q4-6h prn
(usual initial max 3 mg/DOSE **)
IV: 0.01-0.02 mg/kg/DOSE q2-4h prn (usual initial max 1mg)
Sedation/analgesia :
Continuous infusion: 2-8 microgram/kg/hr
Initial bolus (loading) dose: IV: 0.01-0.02 mg/kg
PRN breakthrough dose: 0.01-0.02 mg/kg q3h prn
(refer to HYDROmorphone infusion electronic order set)

To prevent withdrawal, avoid abrupt cessation following high doses or long duration of therapy (Greater than 5 days). Common adverse effects are pruritus, nausea and constipation
**For severe pain or non-opioid naïve patients, some children/youth may require substantially higher doses for adequate analgesia. Please speak with staff physician or pharmacist to titrate to effect **

HydrOXYzine

Anti-pruritic:

PO: 2 mg/kg/DAY div TID or QID

Available as a 2 mg/mL suspension or 10 mg, 25 mg capsules

Hyoscine Butylbromide (Buscopan)

Anti-spasmotic (For acute relief of GI, GU and gallbladder tract spasms)

IV: 0.25-0.5 mg/kg/dose TID-QID (maximum 20mg/dose)

PO: 6-12 years: 10 mg TID

12+ years: 20mg TID

Use with caution in patients with myasthenia gravis, unstable cardiac disease, GI obstruction or angle closure glaucoma

Hypertonic Saline 3%:

Bronchiolitis

NEB: 4 mL of 3% saline q8h (with EPINEPHrine 1.5mg)

Ibuprofen

Analgesic and anti-inflammatory (NSAID).

Dosed q6-8h prn

PO:

Weight (kg)	Single Dose (mg)
2.5 - 3.9	20
4 - 5.4	30
5.5 - 7.9	40
8. - 10.9	60
11. 15.9	100
16. - 21.9	150
22 - 26.9	200
27. - 31.9	250
32. - 43.9	300
44 – over	400

Do not administer within 6 hours of Parenteral or PO Ketorolac (duplicate NSAIDs).

Administer with food, if able, to minimize GI upset.

Avoid in patients with renal impairment or increased risk of bleeding

Use acetaminophen preferentially for pain/fever in infants less than 3 months of age if possible.

Insulin (regular)-HumuLIN R or NovoLIN Toronto
Recombinant human insulin.

Diabetic ketoacidosis:

IV: 0.05-0.1 units/kg/h initially. (add 25 units of regular insulin to 250mL NS) then titrate to patient's response

For IV administration MUST use regular insulin.

Hyperkalemia:

IV: 0.1 units/kg (add 100 units of regular insulin to 100 mL NS) AND dextrose 0.5 g/kg.

Ipratropium (Atrovent®)
Inhaled anticholinergic bronchodilator.

Severe asthma:

NEB: 250 microgram (0.5-1 mL) q4-6h.
INH: 2-4 puffs q4-6h (1 puff = 20 mcg)

Iron

Treatment of iron deficiency anemia:

PO: 4-6 mg/kg/DAY (of elemental iron) div q8-24h (usual max: 180 mg/day = 60 mg elemental iron TID)

Prevention of iron deficiency anemia:

PO: 2-3 mg/kg/DAY (of elemental iron) div q8-24h.

Give with food if GI upset occurs. Liquid does stain teeth, rinse mouth well. Vitamin C enhances absorption.

Available in hospital as:
-Ferrous sulfate 75 mg/mL solution (15 mg/mL elemental iron),
-Ferrous sulfate 300mg tablets (60 mg elemental iron)
-Ferrous gluconate 300 mg tablets (35 mg elemental iron)
(Round to nearest 12.5 mg dose (2.5 mg elemental iron) for liquid.
Ferrous fumarate (Palafer) and Feramax not available in hospital.
Ferrous sulphate liquid, ferrous gluconate tablets and ferrous fumarate tablets covered by ODB.

Kayexelate® (Sodium Polystyrene Sulfonate)
Cation exchange resin.

Treatment of hyperkalemia:

PO/PR: 1 g/kg/DOSE may be repeated q4-6h prn (usual maximum 30-60 g/DOSE).

May be added to feeds to chelate potassium **see Pediatric Hyperkalemia Management with Sodium Polystyrene Sulfonate (Kayexalate®) in Formula/Breast Milk Order Set**

Serum potassium 5.2 – 6.1 mmol/L: 1.2 g per 120 mL EBM/formula
Serum potassium greater than 6.2 mmol/L: 2.4 g per 120 mL EBM/Formula

Give in water or juice, do not mix with fruit juices with high potassium content such as orange juice. Available overnight as 1.2 g doses to be added to feeds.

Ketorolac (Toradol®)
Analgesic and anti-inflammatory (NSAID).

Recommended for max 5 days total

IV/IM: 0.5 mg/kg/DOSE q6h (maximum 120 mg/DAY). Some adult studies have shown ceiling dose of 10mg/dose IV

PO: Adolescents: 10 mg q6h (max 40 mg/DAY). No weight based dosing available for children. Available as 10 mg tablets.

IV dosing not equal to PO

Adverse effects include renal dysfunction, GI irritation and ulceration.
****do not administer within 6 hours of ibuprofen (duplicate NSAIDs)****

Lacosamide
Anticonvulsant

IV/PO: 0.5 mg/kg/DOSE BID

May titrate weekly by 1mg/kg/day to 2.5-5 mg/kg/dose BID
Available as 50mg, 100mg tablets. Baseline ECG recommended for long-term treatment. Requires LU code for OHIP +

Lactulose
Osmotic laxative.

PO: infants: 2.5-5 mL q8-24h.
children: 5-10 mL q8-24h.
adolescents: 15-30 mL q8-24h.

Often causes cramping.

Lansoprazole
Inhibitor of gastric acid secretion (proton pump inhibitor).

PO: Less than 10 kg: 7.5 mg DAILY
10-30 kg: 15 mg DAILY
Greater than 30 kg: 30 mg DAILY

Supplied in hospital as orally disintegrating (ODT) tablets 15 mg, 30mg (cannot dissolve and dose).

Levofloxacin
** REQUIRES ID ENDORSEMENT**
Penicillin-resistant *Streptococcus pneumoniae* or mycobacterial infections.

IV/PO: Less than 5 years of age: 10mg/kg BID
IV/PO: Greater than 5 years: 10mg/kg once daily (MAX: 750mg/DAY)

Based on pediatric pharmacokinetic study

NO feeds, dairy products, vitamins (containing calcium, magnesium, iron) 1 hour <u>before</u> OR 2 hours <u>after</u> levofloxacin as drug absorption will be impaired.
Tablet: 250 mg, 500 mg, 750 mg Suspension not available commercially; use dissolve and dose

levETIRAcetam:

Anticonvulsant
Loading dose: 20-40 mg/kg/dose
Maintenance PO/IV: 5-10 mg/kg/DAY (Daily or BID)

May titrate dose to effect (max 3,000mg/DAY), may require dosage adjustment in renal impairment. Available as 250mg, 500mg tablets and 100mg/mL commercially available suspension
LU code required for OHIP+ covered patients

LORazepam
Benzodiazepine sedative, anxiolytic and amnestic.

Status epilepticus:
IV: 0.1 mg/kg/DOSE, (usual maximum 4 mg/DOSE).
May repeat 0.1 mg/kg in 5 mins if needed
PR: 0.2 mg/kg/DOSE (usual maximum 8 mg/DOSE)
Pre-op/procedural sedation:
PO/SL: 0.05 mg/kg/dose (max 2 mg /DOSE)
IV: 0.03-0.05 mg/kg/dose (max 4 mg/DOSE).

Intermediate duration of action and no active metabolites. Withdrawal may occur if discontinued abruptly after prolonged use. Not recommended for continuous infusion due to poor solubility. May give parenteral preparation rectally.

Magnesium salts
Electrolyte.

Treatment of hypomagnesemia:
PO (see below): 20-40 mg/kg/day elemental magnesium div TID-QID
IV (magnesium sulfate): 25-50 mg/kg (maximum 5 g) over 4-5 hours
Severe acute asthma:
IV (Mag sulfate): 25-75 mg/kg/DOSE once (usual maximum 2g/DOSE)

PO available as:
- magnesium glucoheptonate liquid 100 mg/mL (5mg/mL elemental Mg)
-magnesium oxide 420 mg tablet (252 mg elemental Mg)
Enteral magnesium often causes diarrhea.

IV available as:
- magnesium sulfate

Malarone

Please note there are two formulations of Malarone.

	Atovaquone (mg/tablet)	Proguanil hydrochloride (mg/tablet)
Malarone Pediatric	62.5mg	25mg
Malarone (Adult)	250mg	100mg

Should be taken with food to optimize absorption

Treatment of active malaria:

Patient Weight (kg)	Dose
5 to 8	2 pediatric tabs po daily x3 days
8.01-10	3 pediatric tablets po daily x3 days
10.01 to 20	1 adult tablet po daily x3 days
20.01 to 30	2 adult tablets po daily x3 days
30.01 to 40kg	3 adult tablets po daily x3 days
Greater than 40	4 adult tablets po daily x3 days

[1]Griffith KS, Lewis LS, Mali S, Parise ME. Treatment of Malaria in the United StatesA Systematic Review. *JAMA.* 2007;297(20):2264–2277. doi:10.1001/jama.297.20.2264
[2] Centres for Disease Control : Malaria Treatment (United States). https://www.cdc.gov/malaria/diagnosis_treatment/treatment.html. Accessed 25May2018.
[3] John E. Bennett, Raphael Dolin, Martin J. Blaser. Mandell, Douglas, And Bennett's Principles and Practice of Infectious Diseases. Philadelphia, PA: Elsevier/Saunders, 2015.

Melatonin

Natural Sleep/Wake regulator

PO: Infants: 1.5 mg HS
Children: 3 mg HS
Adolescents: 6-9 mg HS

Must be given 30-60 min prior to desired bedtime. Children with special needs may need doses up to 10mg. Available in hospital as 3mg sublingual tablets. In community, available also as 5mg, 10mg tabs and 1mg/mL liquid

Mesalamine (5-Aminosalicyclic Acid)

Ulcerative colitis, Crohn's disease:

PO: 30-50 mg/kg/day divided BID-QID

Dose limit: 4.8 grams/day (Asacol) or 4 grams (Pentasa)

Asacol deposits in terminal ileum torectum, available as 400mg EC tabs

Pentasa works from duodenum to rectum, available as 500mg ER tabs which can be split or dispersed in water due to microgranule formulation – do not crush/chew granules

PR: 1-4 grams HS

Available as Salofalk 500mg suppository and Salofalk enema (2g/4g) in hospital. Other formulations/brands available on discharge.

methylPREDNISolone

Corticosteroid.

Severe acute asthma:

IV: 0.5-1 mg/kg/DOSE q12h (usual max 40 mg/DOSE)
OR: 1-2 mg/kg/DOSE q6h until improvement seen (usually 24-48 hours) then q24h or switch to PO prednisone.

Anti-inflammatory:

IV: 1-2 mg/kg/DOSE q24h.

High dose/pulse therapy:

IV: 10-30 mg/kg/DOSE q24h

Discontinuation of therapy greater than 10 days of hydrocortisone 10mg/m^2/day equivalent requires gradual tapering. Consider supplemental steroids at times of stress if patient has received long-term or frequent bursts of steroid therapy.

Metoclopramide

Antiemetic, gastrointestinal prokinetic agent.

IV/PO: 0.1-0.2 mg/kg/DOSE q6h
(usual maximum 40 mg/DAY).

Extrapyramidal reactions occur more commonly in children and may be treated with diphenhydrAMINE. Contraindicated in children less than 1 year and use with caution in children greater than 1 year

Metoprolol
Beta-blocker
PO: 0.5-2.5 mg/kg/DOSE BID
Available as 10mg/mL compounded suspension. Tablets are dissolve and doseable.

metroNIDAZOLE
Anaerobic infections:
PO/IV: 20-30 mg/kg/DAY div q8-12h (usual MAX: 500 mg/DOSE; 1500 mg/DAY).
Doses as high as 50 mg/kg/DAY (in 3 divided doses) may be used in certain infections (including amoebiasis)
C. difficile colitis: (Enteral preferred but IV can be used)
IV/PO: 30mg/kg/DAY div q6-8h (usual MAX: 500 mg/DOSE; 1500 mg/DAY)
Excellent oral absorption, use IV only if PO contraindicated or not tolerated. Supplied as 250mg tablets and 15 mg/mL suspension in hospital (500 capsules available in community). Consider crushing/halving tablets in place of suspension.

Midazolam
Benzodiazepine
Seizure termination:
IN: 0.2 mg/kg/DOSE (max 5mg/nare-split doses above 5mg)
Dose can be repeated in 5 minutes PRN
Onset within 5 minutes, peak within 10 minutes and duration 30-60 minutes following intranasal administration.

Morphine
Narcotic analgesic.
Analgesia : ***avoid range dosing in pediatrics***
PO: 0.2-0.5 mg /kg/DOSE q4-6h prn
(usual initial max is 10-15 mg/ DOSE**)
IV: 0.05-0.1 mg/kg/DOSE q2-4h prn (initial max 5mg) and increase as required
Sedation/analgesia:
Continuous infusion: 10-40 microgram/kg/hr infusion
Initial bolus (loading) dose IV: 0.05-0.1 mg/kg
PRN breakthrough dose: 0.05-0.08 mg/kg q3h PRN
(refer to continuous infusion electronic order set)

Please note: Morphine has now replaced codeine as the preferred oral narcotic analgesic for acute pain at HHSC due to better safety profile. Reduced doses may be required if used in combination with benzodiazepines. To prevent withdrawal, avoid abrupt cessation following high doses or long duration of therapy (over 5 days). Common adverse effects are pruritus, nausea and constipation.
**For severe pain or non-opioid naïve patients, some children/youth may require substantially higher doses for adequate analgesia. Please speak with staff physician or pharmacist to titrate to effect **

Naproxen

Analgesic and anti-inflammatory (NSAID).

PO: 10-20 mg/kg/DAY div q8-12h (maximum 1 g/DAY).

Adverse effects include renal dysfunction, GI irritation and ulceration.
Available as 25mg/mL liquid preparation or 125mg and 250mg tablets in hospital.
In community, also available as enteric coated 250mg, 500mg, and 375mg tablets. Liquid and most non-enteric coated tabs covered by ODB..

Nifedipine

Anti-hypertensive.

PO: 0.125-0.25mg/kg/DOSE (max 10mg/DOSE).
May repeat doses of 0.25-0.5 mg/kg every 4-6 hours (up to 2mg/kg/day)

Use immediate release capsules. Each 10mg liquid filled capsule contains 0.3mL.

Nitrofurantoin

Cystitis (should never be used for pyelonephritis)
Treatment:
PO: 5-7 mg/kg/day divided q6h (maximum 400 mg/DAY)
Prophylaxis:
PO: 1-2 mg/kg/DAY once daily (usual adult dose is 50-100 mg qhs)

Macrobid (nitrofurantoin monohydrate/macrocrystals) commonly used in adults or children over 12 y.o. and dosed as 100 mg po BID. This formulation should not be used in younger children, or those who require administration through a tube.

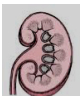
Generally to be avoided in GFR less than < 50 mL/min
Macrobid® – macrocrystals/monohydrate 100 mg capsule
Suspension: 10 mg/mL, 50 mg, 100 mg TABLETS

Nystatin
Antifungal
Oral candidiasis:
PO: infants: 100 000 Units swish and swallow QID
children: 250 000 Units swish and swallow QID
adolescents:500 000 Units swish and swallow QID

Octreotide
Bleeding gastoesophageal varices or gastrointestinal bleed:
IV: 1 mcg/kg bolus then 3 mcg/kg/day div Q8H X 24 – 48 hrs
(may be continued up to 5 days if needed)

Omeprazole
Inhibitor of gastric acid secretion (proton pump inhibitor).
PO: 1-2mg/kg/DAY div q12-24h (maximum 40 mg/DAY).
A 2 mg/mL oral suspension is available. *Please round to nearest 1mg dose.* For solid dosage form, consider pantoprazole 20mg/40mg
LU code required for ODB
See also PPI table at end of formulary listing for alternatives

Ondansetron
Antiemetic.
Post-op N/V
IV/PO: 0.05-0.1mg/kg/DOSE q8h prn (usual max 4 mg/DOSE, may increase to 8mg as needed)
Chemotherapy-induced nausea and vomitting:
IV/PO: 0.15 mg/kg/DOSE (max 8mg/dose)
Available as 2mg/mL injectable, 4, 8 mg film coated tablets and orally disintegrating tablets, as well as 0.8 mg/mL oral solution. Not covered on provincial drug plan except for specific indications (ie oncology)

Oseltamivir
Anti-viral (influenza)
dosage adjustment is necessary in renal impairment

***NOTE:** *Consult Infectious Diseases for premature infants & neonates (Less than 1 month of age). Important to note that there is limited safety and efficacy data in children < 1 year in general.*

Infants- 1 month to 12 months (dose banding as per weight):

WEIGHT	Term Infants 1 to < 12 months based on 3mg/kg/DOSE*
3 – 3.5 kg	9 mg BID
3.6 – 4.5 kg	12 mg BID
4.6 – 5.5 kg	15 mg BID
5.6 – 6.5 kg	18 mg BID
6.6 – 7.5 kg	21 mg BID
7.6 – 8.5 kg	24 mg BID
8.6 – 9.5 kg	27 mg BID
9.6 kg and over	30 mg BID

*AAP recommends 3.5mg/kg/dose twice daily in infants aged 9 – 11 months, although this has not been endorsed in the Canadian AMMI guidelines (Aoki FY et al JAMMI 2019).

Children greater than 12 months:

WEIGHT	DOSE (if suspension is used)	DOSE (if capsules are used)
Less than 15kg	30mg BID	--
15 – 23 kg	48mg BID	--
23 – 40 kg	60mg BID	--
> 40 kg	75mg BID	75mg BID

Usual treatment duration is 5 days only

Chemorophylaxis in children > 3 months: same dose as treatment, but given ONCE DAILY (instead of BID). Usual course is 10 days for this indication.
Available as 30mg and 75 mg capsules and 6mg/mL suspension in hospital

OXcarbazepine
Anticonvulsant
PO: Age greater than 6 years: 4-5 mg/kg/DOSE BID, titrate every 3 d
Maintenance: 20-29 kg: 450 mg/DOSE BID
29.1-39 kg: 600 mg/DOSE BID
Greater than 39 kg: 900 mg/DOSE BID
Available as 60mg/mL suspension, 150mg, 300mg and 600mg, 900 mg tablets. Not covered under ODB.

Oxybutynin (Ditropan)
Urinary antispasmotic agent.
PO: 1-5 years: 0.2 mg/kg/DOSE BID-QID (max 5mg)
Greater than 5 years: 5 mg/DOSE BID-QID
Available as 1 mg/mL syrup or 5 mg tablets

Pantoprazole
Inhibitor of gastric acid secretion (proton pump inhibitor).
PO/IV: 1-1.5 mg/kg/DAY div q12-24h (usual max 40 mg/DOSE)
GI bleed (infusion):
IV: 5 – 15 kg: 2 mg/kg/DOSE x 1, then 0.2 mg/kg/h
16 – 40 kg: 1.8 mg/kg/DOSE x 1, then 0.18 mg/kg/h
Greater than 40 kg: 80 mg x 1 DOSE, then 4 - 8 mg/h
No liquid formulation available. Intravenous and oral pantoprazole provide equivalent acid suppression. Tablets are enteric coated - do not crush tablets or administer tablets via gastric tubes.
preferred formulary alternative for adult doses

PEG-3350 (Polyethylene Glycol)
Osmotic Laxative
PO: 0.5-1.5 g/kg/DOSE
Suggested initial dose:
4 – 8 kg: 4.25 g PO daily
9 – 16 kg: 8.5 g PO daily
Equal to or greater than 17 kg: 17 g PO daily

Available as 17 gram sachet in hospital. Onset 2-4 days. If no effect in 48 hours, can increase to BID dosing. Mix in 125-250 mL of suitable beverage (water, juice, soda). Odorless and tasteless.

Penicillin G
Active against *Streptococcus pneumoniae* and beta-hemolytic streptococcus (e.g. GAS). Narrow spectrum

Moderate to Severe Infections:
IV: 100 000 - 400 000 Units/kg/DAY div q4-6h (MAX: 24 million Units/DAY)
Meningitis: IV: 400 000 Units/kg/DAY div q4h (MAX: 24 million Units/DAY)
Penicillin V 500 000 units is equivalent to Penicillin VK 300 mg

Penicillin V Potassium
Mild/moderate Group A Strep infection:
PO: 25-50 mg/kg/day PO div q8-12h x 10 days
- IDSA (GAS pharyngitis)– Children: 300 mg PO BID-TID; Adolescents & adults: 600 mg PO BID x 10 days

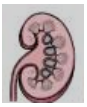
Rheumatic fever (treatment):
PO: Less than/equal to 27 kg: 300 mg PO BID x 10 days;
Greater than 27 kg: 600 mg PO BID x 10 days
Rheumatic fever (prophylaxis AND greater than 5 yrs)
PO: 300 mg PO BID
Prophylaxis in asplenics:
PO: 6 months – 5 yrs: 150 mg PO bid (as penicillin suspension is no longer available, may need to consider amoxicillin liquid for those who cannot swallow tablets)
Greater than 5 yrs: 300 mg PO bid

PHENobarbital
Barbiturate anticonvulsant.
Status epilepticus:
IV: 20 mg/kg over 20-30 minutes.
Maintenance:
IV/PO: 3-5 mg/kg/DAY ÷ q12-24h.

Compounded as 10mg/mL solution, round to nearest 5mg dose if possible.

Phenytoin

Anticonvulsant



Status epilepticus:

IV: 20 mg/kg over 20 minutes.

Maintenance:

IV/PO: 5 mg/kg/DAY (range 3-10 mg/kg/DAY) div q8-12h.

May require higher doses for patients with head injuries. Must be diluted in saline only and requires in-line filter (0.22 micron). Hold feeds 1 hour before and 2 hours after enteral administration as feeds may decrease bioavailability of phenytoin. Significantly increased free fraction in patients with hypoalbuminemia and impaired renal function may result in underestimation of effective drug concentration and difficulty in interpretation of drug levels and toxicity may occur at "therapeutic" serum levels.

Phosphate salts:

Electrolyte

Treatment of hypophosphatemia:

PO: 1-2 mmol/kg/day div BID-QID

IV: 0.15-0.34 mmol/kg (maximum 15 mmol/dose)
over 4-5 hours (may repeat)
(see Pediatric-IV Phosphate Supplementation Order Set)

IV as sodium PHOSPHATE (3 mmol phosphate + 4 mmol sodium/mL) OR potassium PHOSPHATE (3 mmol phosphate + 4.4 mmol potassium/mL).

PO available as:

1) IV formulation of potassium phosphate (see above) given PO, OR
2) Phosphate 500 mg effervescent tablet (contains 16 mmol phosphate/3 mmol potassium per tablet) OR
3) sodium phosphate oral solution (4.2 mmol/mL phosphate)- **cheapest alternative for discharge**

Always order in mmol phosphate component

Dose recommendations assume normal renal function. Please refer to Pediatric IV monograph for further prescribing details and limitations

Pico-Salax® (picosulfate sodium/magnesium oxide/citric acid)
Stimulant and Osmotic Laxative

PO: 1-6 yrs administer ¼ sachet
6-12 yrs administer ½ sachet
Over 12 yrs: 1 sachet

Dose can be repeated after 4-6 hours for bowel prep and may be ordered BID short-term for refractory constipation
Used for refractory constipation, fecal impaction and for cleaning out bowels. Contents of 1 sachet are mixed with 160 mL water.

Piperacillin-Tazobactam
Broad spectrum antibiotic (first line for febrile neutropenia); has gram positive coverage (MSSA, streptococcal coverage), gram negative activity (including Pseudomonas) and active against most anaerobes
IV: 240-300 mg/kg/DAY (of Piperacillin component) div q6-8h – see dose banding chart below

Usual adult dose is 4.5g (4 grams piperacillin component) IV q8h

Weight	Piperacillin-tazobactam dosing	**Exceptions:** *Cystic fibrosis patients *Confirmed *Pseudomonas aeruginosa* infections May use up to 100mg/kg/DOSE (or piperacillin) IV q6h with maximum of 4g/DOSE in above scenario
Less than/equal to 20 kg	200-300mg/kg/DAY of piperacillin in 3 divided doses (as before)	
20.1 to 30kg	2g of piperacillin (2.25g piperacillin-tazobactam) IV q8h	
30.1 to 40 kg	3g of piperacillin (3.375g of piperacillin-tazobactam) IV q8h	
Greater than 40 kg	4g (4.5g of piperacillin-tazobactam) IV q8h	

Order antibiotic as x mg (or g) of piperacillin component IV q_h
Please note that piperacillin-tazobactam does not have reliable CNS penetration

Potassium Salts
Electrolyte. 1mmol of potassium CHLORIDE = 1 mEq of potassium CHLORIDE

Treatment of hypokalemia:
PO: 1-2 mmol/kg/DAY div q6h-24h (usual max 80mmol/DAY)
IV: 0.25-0.5 mmol/kg/DOSE (suggest max 20mmol/DOSE then reassess)
In PICU/ED/HEM-ONC may give up to 1mmol/kg/DOSE

For IV administration, potassium CHLORIDE available as:
Peripheral: 10mmol/100mL sterile water
Central: 20 mmol/100mL sterile water
Please round doses where possible.
Risk of arrhythmias and cardiac arrest with rapid IV administration**.**
Dose recommendations assume normal renal function. Please refer to Pediatric IV monograph for further prescribing details and limitations

For PO administration, potassium available as:
Potassium chloride
1) oral solution 1.33 mmol/mL
(Dilute oral solution in water or juice and give over 5-10 mins)
2) Micro-K 600mg = 8 mmol slow release capsules.
(swallowed whole or can be opened and contents sprinkled on semi-solid food)
Potassium citrate as
1) K-Lyte effervescent 25 mEq tablet
2) K-Citra 2mEq/mL oral solution
** no oral potassium supplements covered by ODB**

prednisONE or prednisoLONE
Corticosteroid.

Acute asthma:
PO: 1-2 mg/kg/DOSE q24h.
Anti-inflammatory or immunosuppressive:
PO: 0.5-2 mg/kg q24h (usual max is 60 mg/DAY)
1 mg prednisONE = 1 mg prednisoLONE.
PrednisONE is 5 mg/mL and compounded as liquid in hospital.
PrednisoLONE is 1 mg/mL and commercially available.

Discontinuation of therapy greater than 10 days of hydrocortisone 10mg/m^2/day equivalent requires gradual tapering. Consider supplemental steroids at times of stress if patient has received long-term or frequent bursts of steroid therapy.

Propranolol
Beta-blocker
Arrhythmia
PO: 0.5-4 mg/kg/DAY divided Q6-8H (usual max 320 mg/DAY)
Tetralogy of Fallot spells
PO: 1-6 mg/kg/DAY divided Q6-8H (usual max 320 mg/DAY)
Hemangiomas
PO: 0.5 mg/kg/day div q8h (increase to goal 2 mg/kg/day)
(measure blood glucose pre feeds x 3 with each increase)

Available as a 5mg/mL compounded suspension in hospital. IV ≠ PO dosing (IV only in critical care) -highly variable bioavailability with oral route (20 – 60%). Dissolve and dose possible with tablets.

Ranitidine **oral liquid on long-term backorder**
See famotidine as alternative for oral suspension
H_2 receptor antagonist.
Reduction of gastric acid secretion:
IV: 2-4 mg/kg/DAY div. q8-12h (usual max 50 mg q8h).
PO: 4-10 mg/kg/DAY div. q8-12h (usual max 300 mg/DAY).
IV dose is approximately 50% of oral dose. Modify dosage interval for patients with renal impairment. May add IV daily dose to TPN.
Available as a 15 mg/ml oral solution, 75 mg or 150 mg tablets.

Rupatadine
Antihistamine
PO: 2-11 years: 10-25kg: 2.5mg DAILY
Greater than 25kg: 5mg DAILY
Adolescents: 10mg DAILY
For allergic reactions, may give BID.
Available as 1mg/mL liquid, and 10mg tablet. Not covered by ODB.

Salbutamol (Ventolin)
Bronchodilator, β_2 agonist.

Acute asthma:

MDI: Less than 20 kg: 4 puffs q30 mins – q4h prn
Greater than 20 kg: 8 puffs q30mins-q4h prn

NEB: Less than 10 kg: 2.5 mg q30mins – q4h prn
10 kg or greater: 5 mg q30mins – q4h prn

Administered in 3 mL of NS.

Available as 5 mg/mL solution for nebulization.

Maintenance therapy:

MDI: 1-2 puffs q4h prn.

Titrate dose to effect and/or adverse effects (monitor for tachycardia, tremor and hypokalemia). For most patients metered dose inhalers with a spacer device are the preferred method of drug delivery.

Senna
Stimulant laxative.

PO: infants: 1 or 2.5 mL (1.7 or 4.25 mg) q24h.
children: 2.5 or 5 mL (4.25 or 8.5 mg) q24h.
adolescents: 5 or 10 mL (8.5 or 17 mg) q24h.

Some patients, particularly those receiving opiates may require higher doses and/or more frequent administration. Also supplied as 8.6 mg tablets.

Sodium citrate (Dicitrate)
Alkanizing agent

PO: 2-3 mEq/kg/day divided BID-TID

Each 1 mL = 1 mEq sodium + 1 mEq bicarbonate
**** see potassium citrate for alternative****

Sodium Chloride
Salt Supplement
PO: 3-4 mmol/kg/day div BID-QID
Available in hospital as sodium chloride 4mmol/mL (IV preparation given enterally)
Note: 1/8 teaspoon table salt = 12.5 mmol sodium chloride

Spironolactone
Potassium sparing diuretic.
PO: 1-3 mg/kg/DAY div. q12-24h.
Available as a 5 mg/mL suspension. *Please round doses to the nearest 0.5 mg or 1 mg.* Unable to be dissolve and dosed

Tobramycin
Preferred aminoglycoside at HHS (unless for neonate and other exceptions-see gentamicin)
IV: 5-7 mg/kg/dose **q24h** (extended frequency dosing is preferred in patients without renal impairment to maximize pharmacokinetics and dynamics of drug)
Cystic Fibrosis:
IV: 10-12 mg/kg/DAY q24h
INH: 80 mg BID to TID

Once daily dosing should be used for all patients - over 1 month of age, except in the setting of endocarditis and in patients with extensive burns. *Ototoxicity* and *nephrotoxicity* may occur, consider monitoring trough levels pre-2nd dose (target less than 1 mg/L) in patients at risk for nephrotoxicity (e.g. septic shock, concurrent nephrotoxins, fluctuating renal function or extended treatment courses). Prolonged therapy (i.e. greater than 2 weeks) generally not warranted and needs to be reassessed. May potentiate muscle weakness with neuromuscular blockers or conditions that affect the neuromuscular junction.

Topiramate
Anticonvulsant
For greater than 2 yrs and less than 16 yrs:
PO: 1-3 mg/kg/DAILY OR div BID (max 25 mg/DAY)
Increase dose every 1-2 week interval by 1-3 mg/kg/DAY
Usual maintenance: PO: 5-9 mg/kg/DAY divided q12h
17 years and older :
PO: 25 to 50 mg/DAY as a single dose, may increase dosage by 25 to 50 mg/DAY at 1-week intervals, give q12h.
Titrate dose to response to a usual maintenance dose of 200 to 400 mg/DAY divided q12h
Available as 6 mg/mL liquid (compounded in hospital), or 25 mg or 100 mg tablets

Trimethoprim
Urinary tract infection prophylaxis:
PO: 2 – 3mg /kg once daily
Tablet: 100 mg, Suspension: 10 mg/mL

Ursodiol
TPN Cholestasis:
PO: 10 mg/kg/DOSE q8h
Biliary Atresia:
PO: 5-10mg/kg/DOSE BID

ValACYclovir
Antiviral

Cold sores (Herpes labialis) – 1st or recurrent episode
3 months to 11 years:
6 to < 15 kg: 250mg po BID x 3 days
15 - < 30 kg: 500mg po BID x 3 days
30 – 36 kg: 750mg po BID x 3 days
>36 kg: 1000mg po BID x 3 days
12 years of age or older: 2000mg BID x 1 day

Varicella or zoster
2 years or older: 20mg/kg PO TID
6 to < 15 kg: 250mg po TID x 5 days
15 - < 30 kg: 500mg po TID x 5 days
30 – 36 kg: 750mg po TID x 5 days
≥ 36 kg: 1000 mg po TID x 5 days
(reference: HSC 2017 Drug Handbook and Formulary)

Prodrug of acyclovir (improved oral bioavailability, less frequent administration). Unavailability of suspension and lack of pediatric dosing are limiting factors for routine use in young children

Valganciclovir
Antiviral (CMV infection)
Congenital CMV: 16mg/kg PO BID
For other indications including prophylaxis or pre-emptive treatment of CMV disease in immunocompromised hosts (e.g. solid organ transplant or HSCT), please consult Infectious Diseases service.
Available as 450 mg tablets (LU) and 50mg/mL suspension (EAP)

Valproic Acid and Derivatives
Anticonvulsant.

Maintenance
PO: 15-20 mg/kg/DAY increased to a maximum of 30-60 mg/kg/DAY div q6-12h.

Dosing is equivalent for valproic acid, divalproex and sodium valproate. Valproic acid oral liquid may be administered rectally (PR) Valproic acid IV is special access only and reserved for specific indications. Please consult Pharmacist.

Vancomycin (IV or PO)

Only active against gram positive organisms (including MRSA). Use as an alternative for GP coverage in patients with severe penicillin allergy (i.e. anaphylaxis, angioedema)
Meningitis or MRSA infections:
IV: 60 mg/kg/DAY div q6-8h (MAX: 4 g/DAY)
Other infections:
IV: 40-60 mg/kg/DAY div q6-12h (usual MAX: 2 g/DAY)
Higher doses may be required in patients with suspected/confirmed MRSA infections, or individuals who are in clinically severe sepsis

Infuse over a minimum of 1 hour to avoid Red Man Syndrome; If reaction occurs, increase infusion time. In patients with known history of Red Man Syndrome, write on order to infuse over at least 2 hours.
Monitor trough levels (initially pre-4th dose) in patients with septic shock, proven MRSA infections, concurrent nephrotoxins, fluctuating renal function or extended treatment courses

Clostridium difficile infection (usually reserved for severe infection or failed metroNIDAZOLE):
PO: 10 mg/kg/DOSE q6h (usual maximum dose is 125mg PO q6h)

125mg capsules for patients able to take solid dosage form, but if liquid formulations (e.g. G-tube) required, the IV formulation will be used orally **LU code required for OHIP +**

Vigabatrin
Anticonvulsant (for infantile spasms)
PO: 25mg/kg/dose BID (titrate to 75mg/kg/dose BID)
Supplied as 500 mg tablet in hospital. In community, 500mg sachets available (EAP required)

Vitamin K (Phytonadione)
Reversal of prolonged clotting times.
IV/PO: 0.5-10 mg/DOSE
Give PO as IV injection orally, undiluted or in juice or water. Use lower doses if there is no significant bleeding. May repeat in 6-8h

Voriconazole
Requires ID endorsement and extensive monitoring of drug levels (trough)
Coverage against many *Candida* species and *Aspergillus*
(IV or PO)

Invasive aspergillosis:
1) Children 2 to less than 12 years OR
2) 12 – 14 years but less than 50 kg

Loading dose (IV): 9 mg/kg/dose q12h x 2 doses then
Maintenance dose (IV): 8 mg/kg q12h (MAX: 350 mg/dose)
PO (following IV therapy): 9 mg/kg q12h (MAX: 350mg/dose)

3) Children 12 to 14 years AND at least 50 kg OR 15 years or older:

Loading dose: (IV) 6 mg/kg/dose q12h x 2 doses then
Maintenance dose(IV): 4 mg/kg/dose q12h
PO (following IV therapy): 200-300mg BID
Only IV formulation needs to be used with caution in patients with renal impairment (use oral formulation in this scenario)

Available as 50 mg, 200 mg tablets (LU for aspergillosis) and 40mg/mL suspension (EAP)

Zinc

Supplement

PO: 0.5-1 mg elemental zinc/kg/DAY divided once daily to BID
(usual max 50mg elemental zinc/DAY)

Available as 10 mg/mL elemental zinc suspension, 10 mg or 50 mg elemental zinc tablets (as zinc gluconate) in hospital.

Approximate Opioid Analgesic Equivalence at HHS - April 2014

Suggested dose equivalence apply in stable analgesic states. Patients with acute postoperative pain may have variations to suggested conversions.

OPIOID	Parenteral Dose (mg)[a]	Oral Dose (mg)
fentaNYL	0.1	N/A
HYDROmorphone	2	6
Methadone	N/A[b]	2.5-10 [b]
Morphine	**10**	30
OxyCODONE	N/A	15

These approximate analgesic equivalences should be used only as a guide for estimating equivalent doses when switching from one opioid to another in chronic pain patients. Additional references & patient response should be consulted to verify appropriate dosing of individual agents.

[a] Parenteral route includes intravenous, intramuscular and subcutaneous route, but does not include intraspinal route.

[8] Methadone equivalency is highly variable – this ratio from Micromedex as suggested equivalency ratio in patients on chronic oral methadone.

Approximate Systemic Corticosteroid Equivalence

Drug	Equivalent Dose (mg)[a]	How to convert to Hydrocortisone	Relative Mineralocorticoid Potency
Short-acting (biologic half-life 8–12 h)			
Hydrocortisone	100		2
Intermediate-acting (biologic half-life 12–36 h)			
MethylPREDNISolone	20	Multiply by 5	0
PrednisoLONE	25	Multiply by 4	1
PrednisONE	25	Multiply by 4	1
Long-acting (biologic half-life 36–54 h)			
Dexamethasone	2	Multiply by 50	0

[a] Equivalent doses are approximations and may not apply to all diseases or routes of administration. Duration of hypothalamic-pituitary-adrenal (HPA) axis suppression and degree of mineralocorticoid activity must be considered separately.

PPI (Proton Pump Inhibitors) in Pediatrics – Reflux Disease – Best Evidence in Peds with Omeprazole, Lansoprazole and Pantoprazole.

Drug Generic Name	***Brand Name***	***Pediatric Dose[1, 6]*** *(BID dosing is thought to provide better control of breakthrough acid)*	***Max Dose[1]*** *(faster clearance in peds than adults – may need higher than standard adult dose)*	***Usual Adult Dose GERD[2]***	***Administration*** *(See note below)* ***Note: Pharmacy Prepared Suspension[5]*** *(Compounding dependent on pharmacy)*	***Available Formats[4] and Cost***	***LU Code [3]***
Omeprazole	Losec	1-1.5 mg/kg/day PO once daily or divided BID NEONATAL: 0.5-1.5 mg/kg/dose	3.5 mg/kg/day	10-20 mg PO OD	1.Capsule – can be opened & sprinkled on yogurt and given 2. Pharmacy prepared suspension can be used	10mg capsules– not ODB covered 20 mg cap ($0.41/cap)	293 – GERD or non erosive GERD when H_2Antags have failed 297-PUD or prevention of NSAID induced ulcers 401- treatment of GI disorders: Crohns, short Gut etc. 402-severe esophagitis, Zollinger-Ellison etc. Required for billing of suspension
Lansoprazole	Prevacid	<10 kg: 7.5 mg PO OD 10-30 kg: 15 mg PO OD >30 kg: 30 mg PO OD	1.6 mg/kg/day or 30 mg/day	15-30 mg PO OD	1.Capsules may be opened and sprinkled into applesauce 2.FasTabs can be placed on tongue for doses 15mg or greater 3. FasTabs can be split and mixed with water if no other options exist (cannot dissolve and dose) 4. Pharmacy Prepared suspension has short expiry so not made at HHS	15mg ($0.5/cap) 30mg ($0.5/cap) with Enteric coated microgranules 15, 30 mg FasTabs (not ODB covered)	For capsules only: (not FasTabs) 293 – GERD or non erosive GERD when H_2Antags have failed 295 – for HPylori Peptic Ulcer 297-PUD or prevention of NSAID induced ulcers 401- treatment of GI disorders: Crohns, short Gut etc. 402-severe esophagitis, Zollinger-Ellison etc.
Esomeprazole	Nexium	1mo-11 yrs: <5kg:2.5- 5mg PO OD >5kg: 10 mg PO OD 12-17yrs: 20 mg PO OD	40 mg/day	20-40 mg PO OD	1.Tabs can be dispersed for PO admin. Mix with 25-50mL mL of water 2. Sachet can be dissolved & administered via G tube	20 mg, 40 mg tablet ($0.36/40mg tab) 10 mg sachet for oral suspension (Not ODB covered)	NO – Not covered under ODB
Pantoprazole	Pantoloc	1-1.5 mg/kg/day	40 mg/dose	20-40 mg PO OD	Cannot be crushed	20mg- not a benefit 40 mg ($0.3/tablet)	See above (same as omeprazole)
Rabeprazole	Pariet	Greater than 10 years: 10 mg PO OD		20 mg PO OD	Cannot be crushed	10 mg ($0.12 tablet)), 20 mg ($0.24/tablet)	No LU code required

Note: Directions for opening capsules and dissolving tablets with dispersed microgranules into food or water requires that the granules must NOT be crushed or chewed for effect.

1. Hospital for Sick Children. Drug Handbook and Formulary. 2016.
2. RX Files Drug Comparison Charts. 8th Edition
3. ODB Drug Formulary
4. eCPS, 2016
5. Jew, RK et. Al. Extemporaneous Formulations for Pediatric, Geriatric, and Special Needs Patients. ASHP. 2nd Edition.
6. Micromedex . Accessed May 2017.

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ANTIBIOTIC GUIDE FOR COMMON INFECTIONS

Infection	Major Organisms	Antibiotic	Duration	Notes
Otitis Media	*S. pneumoniae, H. influenzae (non-typeable), M. catarrhalis (2-20%)* *Group A Streptococcus (5%)*	Preferred: High-dose Amoxicillin PO (75-90mg/kg/DAY divided BID) if type 1 allergy → Clarithromycin PO if non-type 1 → Cefprozil PO OR Ceftriaxone IM x 1 dose If initial therapy fails: Amoxicillin-Clavulanate (Clavulin) PO if type 1 allergy → call ID	10 days (age < 2) 5 days (age >2)	watchful waiting appropriate when: - > 6mo - healthy child (NO immunodeficiency or chronic disease or anatomical abnormality of head and neck, NO Down's syndrome, NO history of complicated otitis media) - illness not severe - reliable parents *CPS statement 2016*
Community-acquired pneumonia	3 mo – 4 yrs *Viral >> Bacterial (S. pneumoniae,* group A Streptococcus*) >> Atypicals (Mycoplasma, Chlamydia, Legionella)* 5 – 18 yrs *S. pneumoniae,* atypicals, GAS	Outpatient or admitted to ward: High dose Amoxicillin PO (75-90mg/kg/DAY divided TID (max 1g po TID)) or Ampicillin IV Atypical pneumonia (often seen in generally well older children): Clarithromycin PO Pleural effusion/empyema Ampicillin IV if not getting drained Ceftriaxone IV if chest tube being inserted (pending culture and PCR) Consider Vancomycin if history of MRSA infection in patient or family Admitted to PCCU/Necrotizing: Ceftriaxone IM/IV + Vancomycin IV	Mild Nonsevere pneumonia (no admission required): 5 days Pneumonia requiring admission to hospital: 7-10 days Empyema/effusion: consult ID (likely weeks)	Features of atypical pneumonia: subacute onset, non-lobar infiltrate, minimal leukocytosis, older school-age - macrolides should only be considered in true anaphylactic reactions to penicillin - If you are sure it is not a type-1 reaction, can try cephalosporins (2nd or 3rd gen.) - Consider risk factors for MRSA *CPS statement 2016*
Community-acquired Meningitis in children greater than 3 months (excluding neurosurgery or immunocompromised patients)	*Bacterial (S. pneumoniae, N. meningitidis, H. influenzae), Viral (HSV, Enterovirus)* *Special considerations in:* - < 3mo - immunocompromised - known CNS disease, post-neurosurgery, trauma	Ceftriaxone IV/IM (meningitic dose, 100mg/kg/day in 2 divided doses) PLUS Vancomycin 15mg/(kg*dose) IV q6h *above antibiotic choices may not apply to those with special considerations ADD acyclovir if: - CSF pleocytosis <1500 WBC/hpf, OR - significant change in LOC, OR - MR findings consistent with HSV, OR - HSV PCR positive	Depends on organism: *S. pneumoniae* 10-14 days *N. meningitidis* 5-7 days *H. influenzae* 7-10days	**Mandatory ID consult** consider DEXAMETHASONE if bacterial pathogen suspected 0.6 mg/kg/day divided q6h before or within 30 minutes of the first dose of antibiotics (only continue for 2 days if S. pneumonia or H. influenza isolated, any other pathogen discontinue) - Target vancomycin trough levels 10-15 *CPS statement 2014*
Urinary Tract Infection (≥ 2 months of age)	*E.coli, Klebsiella, Enterococcus, Proteus, Serratia, Pseudomonas, Staphyloccus saprophyticus* *Acronym: KEEPPSS*	Uncomplicated febrile UTI: Cephalexin (infants) Trimethoprim/sulfamethoxazole (older children) Complicated (requires admission, <2 months, hemodynamically unstable, elevated serurm creatinine, poor urinary flow, abdominal or bladder mass, vomiting, clinically deteroriating after 24 hours of appropriate antibiotics, immunocompromised): Ampicillin IV PLUS tobramycin IV	Febrile UTI: 7-10 days (usual duration)7	- Diagnosis: urine R+M and culture (will only send culture if mid-stream, catheter or suprapubic aspiration ie. NO BAG SAMPLES for culture) - UNLIKELY TO BE UTI IF URINALYSIS NORMAL in an immunocompetent patient (any age) - First febrile UTI in an infant warrants investigation with an abdominal ultrasound *AAP Clinical Practice Guideline 2011* *CPS Statement 2020*
Cellulitis	*Group A Streptococcus,* *S. aureus (MSSA/MRSA),*	Preferred: 1st gen ceph. (Cephalexin PO/Cefazolin IV)	7-10 days (usually 1-2 days after the rash resolves)	- Must do I&D as first line if abscess or furuncle - Consider MRSA risk factors

	Group C/G streptococcus If pus present – very likely *S. aureus* If pus not present – very likely streptococcal	<u>If suspect MRSA (eg. abscess seen) OR severe disease:</u> Trimethoprim/Sulfamethoxazole PO or Vancomycin IV if concerns of MRSA	Varies depending on presence of abscess and degree of drainage	- avoid oral cloxacillin if possible as it has poor bioavailability and has GI side effects
Orbital cellulitis	Group A *Streptococcus, Streptococcus pneumoniae, Staphylococcus aureus, H.influenzae, anaerobes*	<u>Ceftriaxone + metronidazole</u> <u>(may need CNS dosing depending on extent of infection)</u> <u>If suspect MRSA (e.g. previous colonization), or if severe disease, add vancomycin and involve ID</u> <u>Oral stepdown: amoxicillin clavulanic acid</u>	Mild orbital cellulitis – usually 2-3 weeks total duration, but will depend on whether there are abscesses and/or bone or CNS involvement.	**Mandatory ID consult**
Bone and Joint Infection	Group A *Streptococcus, Staphylococcal aureus, Kingella kingae (particularly in pre-school age), Streptococcus pneumoniae*	<u>Preferred:</u> <u>1st gen cephalosporin (cefazolin IV) at 50mg/kg/DOSE IV q8h</u> <u>If suspect MRSA:</u> <u>Vancomycin 20mg/kg/DOSE IV q8h and involve ID</u>	In general, for acute uncomplicated infection, Septic arthritis 2-3 weeks Acute uncomplicated osteomyelitis 4 weeks	**Mandatory ID consult**
***Clostridioides difficile* infection (CDI)** **See algorithm below**	*Clostridioides difficile* Mild to moderate Diarrhea BUT no systemic toxicity Severe disease Systemic toxicity +/- complications including hypotension, shock, toxic megacolon, severe colitis, ileus etc.	1st episode (mild-moderate) Metronidazole 30mg/kg/DAY PO (or IV) TID or QID 1st episode (severe +/- complications) or recurrent disease Vancomycin 10mg/kg/DOSE QID (maximum 125mg/DOSE) *can consider rectal vancomycin if ileus present, see algorithm	General duration is 10-14 days A course of vancomycin tapering may be considered in recurrent episodes	- always reassess need for concomitant antibiotics - Don't send stool for *C.diff* testing in children < 1 year of age - *C.diff* testing should only be done on diarrheal stool - Do not send stool for test of cure - Strongly consider ID consult for severe CDI or recurrent disease
Fever in a neonate (< 4 weeks) **(presenting from home)**	Group B Streptococcus, gram negatives (*E. coli*), Enterococcus, (Community acquired pathogens *S. aureus*, *S. pneumonia* less likely) HSV (usually before 4 weeks of age) Virus (e.g. Enterovirus)	If clinically stable and no concerns of meningitis: ampicillin + gentamicin If clinically unwell/septic: ampicillin + cefotaxime, consider acyclovir If meningitis suspected clinically (e.g. unwell, bulging fontanelle, seizures, posturing, significant lethargy) or CSF abnormalities, ensure that cefotaxime and acyclovir are given Empiric therapy: cefotaxime and reassess need for ongoing antibiotics in 24-36 hours	Duration will depend on final diagnosis	LP is usually warranted in a neonate who presented with a fever Indications for acyclovir not clear-cut. Should be given for any neonate with severe sepsis, especially if thrombocytopenia or transaminitis or coagulopathy is present, any neonate with CSF pleocytosis, or if vesicular rash. However, incidence of neonatal HSV disease low, most cases occur < 21 days. Any baby started on acyclovir requires at minimum: 1. LP for HSV PCR 2. Mouth, rectal, conjunctival, and vesicle swab for HSV PCR

CLNICAL PEARLS

Other Clinical Scenarios:	**Challenging Organisms:**			**Antibiotics of note:**	
Septic Shock: - ceftriaxone + vancomycin - can consider pip-tazo if require coverage for anaerobes (eg. GI infection) or pseudomonas *Febrile Neutropenia:* - Piperacillin-tazobactam - Consider empiric vancomycin if previous infection/colonization with MRSA, or clinical severe sepsis - Refine Abx if blood Cx +ve - Consider previous microbiology history (e.g. antibiotic-resistant organisms) - Please note that piperacillin-tazobactam does not have reliable CNS coverage	*Pseudomonas often covered by:* - ceftazidime - piperacillin +/- tazobactam - ciprofloxacin - meropenem - aminoglycosides (gentamicin/tobramycin /amikacin)	*MRSA covered by:* - Vancomycin - Septra - Clindamycin (increasing resistance) - Linezolid (needs ID endorsement) - Doxycycline (available as PO and generally not indicated unless > 8 years) *Risk Factors:* - Previous MRSA infection or household contact - Healthcare exposure/recent hospitalization - TRAVEL (including to USA)	*Organisms resistant to penicillins and cephalosporins:* - MRSA - ESBL - most CONS - C diff - SPICE (AmpC producers): *Serratia*, *Providencia*, Indole +ve *Proteus* (*Proteus vulgaris*), *Citrobacter*, *Enterobacter* , *Hafnia, Morganella* - Atypicals Cephalosporins do not have activity against Enterococcus or Listeria	*Vancomycin (only covers gram +ve), indications:* - MRSA - Severe *C diff* infection (PO only) - CONS - *Enterococcus*	*Carbapenem indications:* - ESBL - SPICE **REQUIRES ID CONSULT**

Hamilton Health Sciences

Paediatric INITIAL *C. difficile* Associated Diarrhea Evaluation & Management

Unexplained and new-onset =3 unformed stools in 24h
AND
No prior C. difficile infection (CDI) history
(If prior CDI history, see pathway for Recurrent CDI)

History, physical examination
Laboratory Tests:
CBC, Electrolytes, creatinine, albumin,
Stool sample for C. difficile toxin x 1
Place in Contact Precautions until discontinued by Infection Prevention & Control

Test stool for *C. difficile* toxin gene by LAMP

Negative
Investigate other causes for diarrhea

Positive

***C. difficile* toxin gene test result**

No empiric therapy needed

Hemodynamically stable,
No signs of shock
AND
No suspicion ileus or toxic megacolon

Empiric therapy needed

Hypotension
OR
Signs of shock
OR
Suspected ileus or toxic megacolon

Metronidazole 10mg/kg po q8h x10d

- ☑ **Discontinue anti-motility agents** (e.g. loperamide) / **laxative** (e.g. senna, lactulose, milk of magnesia) / **stool softener** (e.g. docusate sodium)
- ☑ **Discontinue/narrow offending antibiotic***, if possible
- ☑ **Reassess use of proton pump inhibitors (e.g. lansoprazole, omeprazole, pantoprazole)**

Negative
Investigate other causes for diarrhea

Positive

Fulminant CDI

- ☑ **Obtain abdominal x-ray**
- ☑ **Consult General Surgery and Infectious Diseases**
- ☑ **Initiate empiric therapy**
  Metronidazole 10mg/kg IV q8h (max 500mg IV q8h)
  AND
  Vancomycin 10mg/kg PO/NG qid (max 500mg po QID)

  If ileus, consider adding vancomycin rectal retention enema q6h (10mg/kg dissolved in normal saline to a concentration of 5mg/mL, as a 30-60 minute retention enema; max 500mg in 100mL NS)

****Diarrhea or peritoneal sign may be absent with ileus**

If worsening or no improvement within 24 hours:
- ☑ Perform CT of abdomen

*** Antibiotics and Risk for CDI**

High
Cephalosporins
Beta-Lactams – broad spectrum
Fluoroquinolones
Clindamycin

Medium
Beta-lactams – narrow spectrum
Carbapenems
Trimethoprim-Sulfamethoxazole
Macrolides

Low
Vancomycin IV
Linezolid
Nitrofurantoin
Metronidazole
Tetracyclines
Daptomycin
Tigecycline

Please Note:
- ☑ Wash hands with soap & warm water, if hand washing sink is available, or use alcohol based hand sanitizer after removing gloves DO NOT use patient sink
- ☑ Terminal cleaning of patient room and bathroom as per Infection Prevention & Control Policy and Procedures
- ☑ **DO NOT submit repeat stool for *C. difficile* toxin testing; there is no test of cure as test will remain positive**
- ☑ Inform Long Term/Home Health Care of Infection Control and environmental disinfection strategy
- ☑ Order accurate stool charting
- ☑ Contact telephone request service from the exceptional access program for oral vancomycin approval prior to discharge (1-866-811-9893)

*CDI testing in children less than 1 years of age rarely indicated due to high rates of colonization and inability to mount inflammatory response to toxin; 1-2 years of age indicated only once all other causes of diarrhea ruled out

Mandatory Infectious Diseases Consultations

As a move towards achieving accreditation goals, and quality indicators the following list of conditions has been developed to help to improve clinical outcomes for rare but severe infections.

ID consultation:

Please call ID for consultation within 24 hours for all patients with the following conditions.

Condition-based

1) Any proven meningitis or encephalitis
2) Any proven orbital cellulitis
3) Any suspected/proven bone or joint infection
4) Any suspected/proven necrotizing skin infection
5) Any suspected/proven endocarditis
6) Any severe pneumonia complicated by parapneumonic effusion requiring drainage
7) Fluid refractory septic shock requiring admission to PICU with >24hours of persisting end organ dysfunction

Organism-based:

1) Severe *C. difficile* infection (including toxic mega colon, admission to ICU, or significant lab abnormalities)
2) *Staphylococcus aureus* bacteremia
3) Invasive Candida infection (Candidemia, Candida meningitis, Hepatosplenic candidiasis)
4) Any suspected infection with multi-drug resistant pathogens or requiring a carbapenem, such as a patient with a known current or past history of infection or colonization with: ESBL producers, multi-drug resistant Pseudomonas, septic patient worsening despite >24 hours of broad spectrum antimicrobials
5) Any suspected/proven infection requiring broad spectrum antimicrobials (Caspofungin, Amphotericin, Voriconazole)
6) Complex pathogens requiring specific microbiologic information
7) Any suspected/proven malaria
8) Any suspected/proven TB (tuberculosis infection)

Routine Microbiology Testing

Please refer to Hamilton Regional Laboratory Test Information Guide for more information
https://ltig.hrlmp.ca/

- Stool multiplex PCR (Salmonella, Shigella, Campylobacter, Yersinia and Shiga toxin producing E.coli (STEC) including E.coli H7:O157)
- Respiratory virus PCR (Influenza A & B, RSV, rhinoenterovirus, parainfluenza, human metapneumovirus, adenovirus and COVID-19)
    - *Mycoplasma pneumoniae* / *Chlamydia pneumoniae* is an add-on test
- CSF virus PCR (HSV, VZV, enterovirus and parechovirus [< 5 years of age])

Microbiology Tests which require ID or Microbiologist approval:

- Bacterial CSF PCR (Pediatric: S. pneumoniae, N. meningitidis, H. flu, Listeria; Neonate: also includes GBS, E. coli K1)
- Pleural fluid/Empyema PCR: GAS, MSSA/MRSA, S. pneumoniae
- Bone biopsy/joint fluid: GAS, MSSA/MRSA, S. pneumoniae, Kingella kingae
- CMV or EBV blood PCR
- 16s bacterial PCR on sterile sites
- 18s fungal PCR

DIAGNOSIS OF URINARY TRACT INFECTIONS IN PEDIATRICS

An appropriately collected urine sample is important for the accurate diagnosis of a urinary tract infection in children. An inadequate sample may lead to overtreatment of what is a contaminated sample, potentially overlooking the real cause of infection in a febrile infant, or failure to diagnose and treat a true urinary tract infection. Following a review of national and international guidelines, the following recommendations are to be followed for submitting a urine sample from children for bacteriological culture:

1. DO NOT collect urine in a urine bag, the so-called “bagged urine”. These samples are associated with significant contamination of >50%. This sample source is no longer available to order and will be rejected for culture by the laboratory. Where bacterial contamination is not of concern (e.g. urine for CMV, metabolic screens), a bag urine may be appropriate. Urine collected into a “clean” cotton swab in a “clean” diaper and squeezed out is NEVER an appropriate sample to send for culture.
2. In children who are toilet trained, a “clean catch” urine can be collected. Where possible, start collecting the urine after the first few drops which will wash away any contaminants. Identify the specimen type as “Urine, Clean Catch” (URCC).
3. In young infants < 6 months of age, there can be value in attempting to collect a clean catch urine sample by suprapubic cutaneous stimulation, the so-called “Bladder Stimulation/Tap”, or a variation of this method, in a well hydrated infant. If a clean catch urine can be collected within 5-10 minutes of trying, this sample can be submitted, ensuring that it is identified as “clean catch” (URCC). If this is unsuccessful, an “in/out catheter” sample should be collected.
4. In a child who is not toilet-trained or where collecting a timely clean catch urine is difficult, the best sample to collect is using an “in and out catheter” as this minimizes any contamination. The specimen type MUST be correctly identified as an “in and out catheter” so that the appropriate

work-up can be done in the laboratory. Use the NEW source code (URCIO) to correctly identify these samples.

5. There will be occasions where there may be other sources of urine for culture, e.g. indwelling catheter, nephrostomy tube. Please ensure the correct specimen type is identified on the order.

Urinalysis is sensitive and specific for the diagnosis of urinary tract infections in children, EVEN IN YOUNG INFANTS. For most infants and children, it is recommended that urine culture is only performed when the urinalysis is positive (leukocyte esterase or nitrites). Culture, however, should be performed on children who are neutropenic, regardless of the urinalysis, and pregnant patients. The correct Meditech code for urine culture is Category MIC Procedure Mnemonic CUR. In those settings where microscopy is clinically appropriate, Urine R and M (PURM) can still be ordered.

Canadian Pediatric Society. Urinary tract infection in infants and children: Diagnosis and management. Paediatr Child Health 2014;19:315-19

American Academy of Pediatrics. Urinary tract infection: Clinical Practice guidelines for diagnosis and management of the initial UTI in febrile infants and children 2 to 24 months. Pediatrics 2011;128:595-610

Labrosse M, Levy A, Autmizguine J, et al. Evaluationof a New Strategy for Clean-Catch Urine in Infants. Pediatrics.2016;138(3):e20160573

Tzimenatos L, Mahajan P, Dayan PS et al. Accuracy of the urinalysis for urinary tract infections in febrile infants 60 days and younger. Pediatrics 2018 141(2):e20173068

McDaniel CE, Ralston S, Lucas B, Schroeder AR. Association of diagnostic criteris with urinary tract infection prevalence in Bronchiolitis. JAMA Pediatrics 2018.5091

Pediatric Blood Culture Guidelines

1. **AEROBIC** cultures are always drawn.
2. Does the patient require an **ANAEROBIC** culture as well?
   - ☐ **YES** if greater than 45kg
   - ☐ **YES** if less than 45 kg **AND** if any of these conditions are suspected

1. Intra-abdominal or pelvic infection
2. NEC or Intestinal perforation in a neonate
3. Necrotizing soft tissue infection (e.g. Necrotizing fasciitis)
4. Infected Bite Wound
5. Deep neck space infections (e.g. Lemierre's Syndrome)
6. Immunocompromised (e.g. Febrile neutropenic)
7. Prolonged fever of unknown origin with negative aerobic culture

Specimen Labels: Position lengthwise ensuring QR code and specimen window are not covered

For Peripheral cultures only: If patient has a Central Vascular Access Device, see instructions and chart on reverse.

Peripheral blood culture requirements:

- Find patient weight on chart below to see total volume of blood required
- Look at the appropriate section, **aerobic only** or **aerobic + anaerobic** to see how the total volume is divided. (Number of bottles, bottle colour and volume)
- Blood is collected from one peripheral poke, unless > 45kg
- If unable to obtain required blood volume, refer to min and max blood volume reference and adjust as needed
- For patients >45kg, if unable to get a 2nd site after the most proficient RN attempt, notify MRP for further direction

Min and Max Blood Volumes per Bottle Type		
Aerobic Bottles		**Anaerobic Bottle**
 Yellow 1.5 – 5.0mL	 Green 5.1-10mL	 Orange 1 - 10 mL

Weight	Total Blood Volume	Meditech code	Aerobic Volume per bottle and required bottle(s)	Meditech code	Aerobic + Anaerobic Volume per bottle and required bottle(s)
< 5 kg	2-4 mL divided →	CBLINF	2 – 4mL yellow	CBLINF + AN	1.5 – 2mL yellow 1.5 – 2mL orange
5 – 13 kg	5-7 mL divided →	CBLPED	5 – 7mL (yellow if 5, otherwise green)	CBLPED + AN	2.5 - 3.5mL yellow 2.5 - 3.5mL orange
13 – 36 kg	14-20 mL divided →	CBLPED	7 – 10mL green 7 – 10mL green	CBLPED + AN	7 – 10mL green 7 – 10mL orange
36 – 45 kg	21-30 mL divided →	CBLPED	10mL green 5 – 10mL (yellow if 5, otherwise green) 6 – 10mL green	CBLPED + AN	10 mL green 5 – 10mL (yellow if 5, otherwise green) 6 – 10mL orange
> 45 kg	40 mL divided →	**Aerobic and Anaerobic always drawn. Requires sample from 2 separate sites.**		CBL	Site 1: 10mL green 10mL orange Site 2: 10mL green 10mL orange

For Central and Peripheral cultures: If Patient has a Central Vascular Access Device (CVAD)

Central line (CVAD) blood culture requirements:

- Cultures from CVAD **and** peripheral draw required. A peripheral culture is essential to guide management.
- If the most proficient provider has tried and is unable to obtain a peripheral culture, a second CVAD culture can be done with a new set-up
- If CVAD has multiple lumens, **all lumens** must be cultured (sometimes the bug will only be found in 1 of the lumens)
- If anaerobic culture indicated, and patient is < 45 kg, **only need 1** anaerobic sample from any site

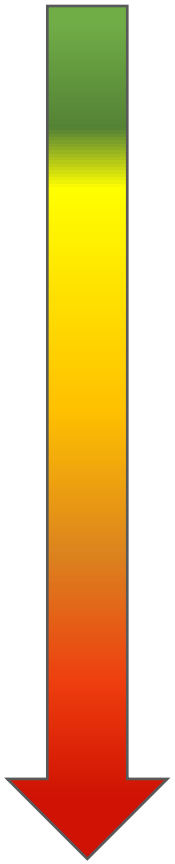
Use chart below to determine number of sample sites, blood volumes and bottles required

- Identify **number of lumens** on CVAD, **type of culture** (aerobic **or** aerobic + anaerobic) and **weight** of patient on chart
- Draw **volume of blood** listed from **each site** indicated and place in **coloured bottle(s)** noted

Legend: P= Peripheral L1= CVAD Lumen #1 L2= CVAD Lumen #2 L3= CVAD lumen #3

Weight	Total blood volume	Single lumen CVAD		Double lumen CVAD		Triple lumen CVAD	
		Aerobic	Aerobic + Anaerobic	Aerobic	Aerobic + Anaerobic	Aerobic	Aerobic + Anaerobic
< 5 kg	2-4 mL divided →	**L1**: 1.5-2mL yellow **P** : 1.5-2mL yellow	**L1**: 1.5mL yellow 1.5mL orange **P** : 1.5mL yellow	**L1**: 1.5 yellow **L2**: 1.5 yellow **P** : 1.5 yellow	**L1**: 1.5mL yellow 1mL orange **L2**: 1.5mL yellow **P** : 1.5mL yellow	Refer to Neo policy	Refer to Neo policy
5 – 13 kg	5-7 mL divided →	**L1**: 2.5-3.5mL yellow **P** : 2.5-3.5mL yellow	**L1**: 1.5-3mL yellow 2mL orange **P** : 1.5-2mL yellow	**L1**: 1.5-3mL yellow **L2**: 2mL yellow **P** : 1.5-2mL yellow	**L1**: 1.5-2mL yellow 1-2mL orange **L2**: 1.5mL yellow **P** : 1.5mL yellow	**L1**: 1.5-2mL yellow **L2**: 1.5-2mL yellow **L3**: 1.5mL yellow **P** : 1.5mL yellow	**L1**: 1.5mL yellow 1mL orange **L2**: 1.5mL yellow **L3**: 1.5mL yellow **P** : 1.5mL yellow
13.1 – 36 kg	14-20 mL divided →	**L1**: 7-10mL green **P** : 7-10mL green	**L1**: 5-10mL (yellow if 5, otherwise green) 5mL orange **P** : 4-5mL yellow	**L1**: 5-10mL (yellow if 5, otherwise green) **L2**: 5mL in yellow **P** : 4-5mL in yellow	**L1**: 4-5mL yellow 4-5mL orange **L2**: 4-5mL yellow **P** : 2-5mL yellow	**L1**: 4-5mL yellow **L2**: 4 -5mL yellow **L3**: 4 -5mL yellow **P** : 2-5mL yellow	**L1**: 5 yellow 5 orange **L2**: 1.5-4mL yellow **L3**: 1.5-4mL yellow **P** : 1.5-2mL yellow
36.1 – 45 kg	21-30 mL divided →	**L1**: 10mL green 6-10mL green **P** : 5-10mL (yellow if 5, otherwise green)	**L1**: 10mL green 6-10mL orange **P** : 5-10mL (yellow if 5, otherwise green)	**L1**: 10mL green **L2**: 6-10mL green **P** : 5-10mL (yellow if 5, otherwise green)	**L1**: 6-10mL green 5-10mL orange **L2**: 5mL yellow **P** : 5mL yellow	**L1**: 6-10mL green **L2**: 5-10mL (yellow if 5, otherwise green) **L3**: 5mL yellow **P** : 5mL yellow	**L1**: 5-10mL (yellow if 5, otherwise green) 5mL orange **L2**: 5mL yellow **L3**: 4-5mL yellow **P** : 2-5mL yellow
> 45 kg	40 mL divided →	**Aerobic and Anaerobic always drawn.**	**L1**: 10mL green 10mL orange **P** : 10mL green 10mL orange	**Aerobic and Anaerobic always drawn.**	**L1**: 10mL green 10mL orange **L2**: 10mL green **P** : 5mL yellow 5mL orange	**Aerobic and Anaerobic always drawn.**	**L1**: 10mL green 10mL orange **L2**: 5mL yellow **L3**: 5mL yellow **P** : 5mL yellow 5mL orange

HPEWS Hamilton Pediatric Early Warning System — Escalation Protocol



Continue plan of care
• Initiate nursing directed interventions* • Within **90** minutes post intervention(s), repeat HPEWS vital signs. • If patient remains YELLOW, notify charge RN, medical team ***and*** RT if applicable
In addition to nursing directed interventions:* • NOTIFY charge RN, medical team (team resident**/fellow/NP) ***and*** RT if applicable • Within **60** minutes post interventions, repeat HPEWS vital signs. • If patient remains ORANGE, re-notify team as above
In addition to nursing directed interventions:* • NOTIFY charge RN, medical team (team resident**/fellow/NP) ***and*** activate PACE • Within **30** minutes post interventions, repeat HPEWS vital signs • If patient remains RED, re-notify team as above

***nursing directed interventions** include increased frequency of vital signs, repositioning, comfort measures, prn medications etc.

****junior residents** must review with senior resident

At any time regardless of HPEWS colour, <u>anyone</u> can notify/activate MRP team, PACE team, RT or Pediatric Code Blue

Pediatric Assessment of Critical Events (PACE)

PACE Calling Criteria

Call PACE in the following situations:

If the health care provider or family member is worried about the patient's clinical state or if any of the following criteria are present

Airway

Threatened or obstructive symptoms: stridor, excessive secretions

Breathing

Severe respiratory distress, apnea, tachypnea or cyanosis

Age	Respiratory rate/min	Hypoxemia
Term – 3 months	> 60	SaO2 < 90% in >40% FiO2
4-12 months	> 50	
1-4 years	> 40	SaO2 < 60% in > 40% FiO2 (cyanotic heart disease)
5-12 years	> 30	
12 years +	> 30	

Circulation

Age	Bradycardia (beats/min)	Tachycardia (beats/min)	BP (systolic mmHg)
Term – 3 months	< 100	> 180	< 50
4-12 months	< 100	> 180	< 60
1-4 years	< 90	> 160	< 70
5-12 years	< 80	> 140	< 80
12 years +	< 60	> 130	< 90

Neurologic State

Acute change in neurologic status or convulsion

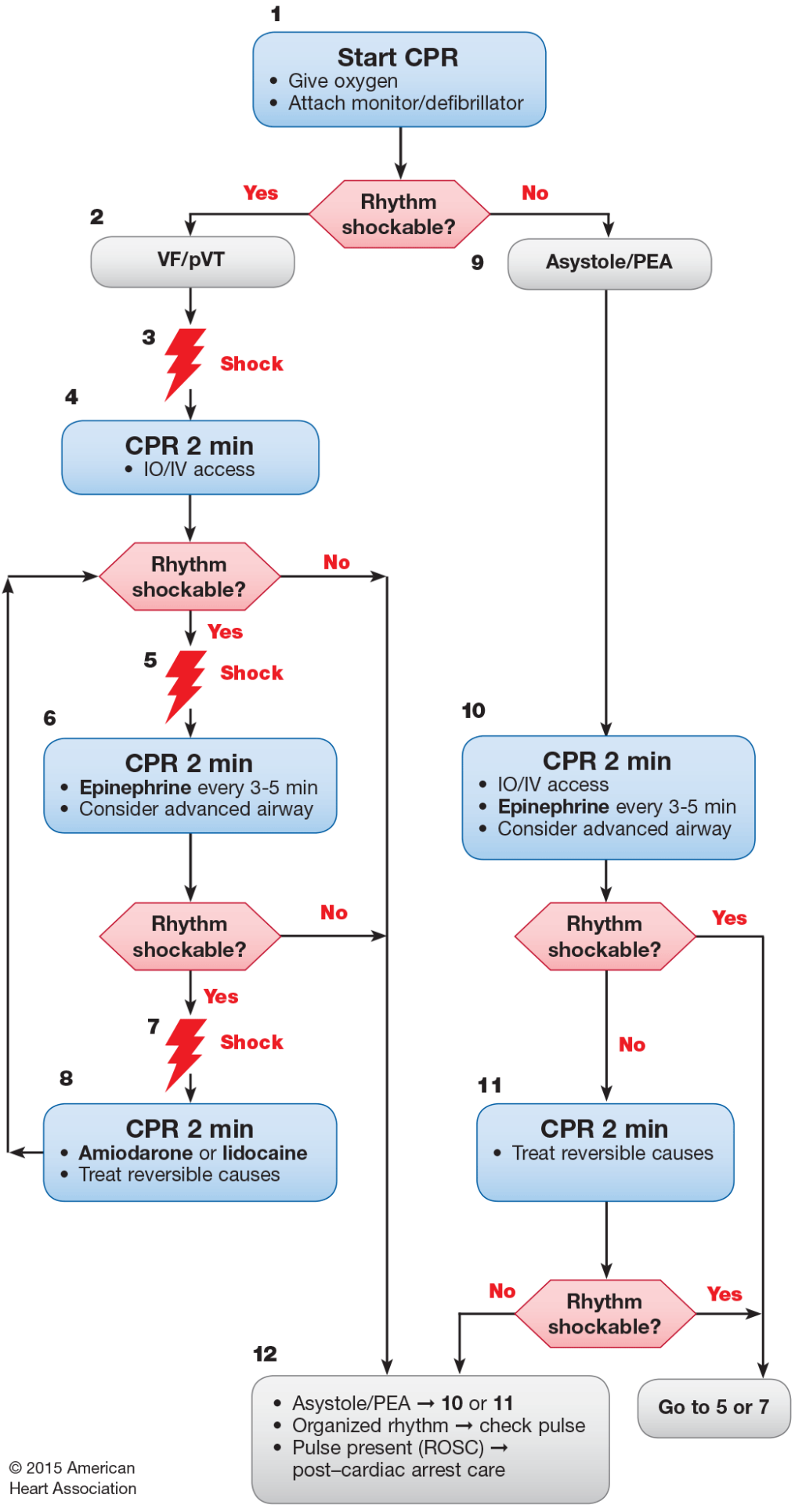
- Some of the values for respiratory rate, heart rate and blood pressure are outside the normal ranges for age: they represent concerning levels that may indicate serious illness and require expert review
- It is also important to look for worsening trends in vital signs and report these.

Call ext. 75030 and ask for PACE. We're here to help!

During the training phase, the PACE team will be available from Monday to Friday, 8 a.m. to 4 p.m.
Coming soon! On January 29th, 2007 we will begin providing 24-hour daily coverage.

Activate 'Code Blue' for all respiratory and/or cardiac arrests or other medical emergencies as per HHS policy.

Pediatric Cardiac Arrest Algorithm—2015 Update



CPR Quality

- Push hard (≥⅓ of anteroposterior diameter of chest) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Rotate compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 15:2 compression-ventilation ratio.

Shock Energy for Defibrillation

First shock 2 J/kg, second shock 4 J/kg, subsequent shocks ≥4 J/kg, maximum 10 J/kg or adult dose

Drug Therapy

- **Epinephrine IO/IV dose:** 0.01 mg/kg (0.1 mL/kg of 1:10 000 concentration). Repeat every 3-5 minutes.
  If no IO/IV access, may give endotracheal dose: 0.1 mg/kg (0.1 mL/kg of 1:1000 concentration).
- **Amiodarone IO/IV dose:** 5 mg/kg bolus during cardiac arrest. May repeat up to 2 times for refractory VF/pulseless VT.
- **Lidocaine IO/IV dose:** Initial: 1 mg/kg loading dose. Maintenance: 20-50 mcg/kg per minute infusion (repeat bolus dose if infusion initiated >15 minutes after initial bolus therapy).

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

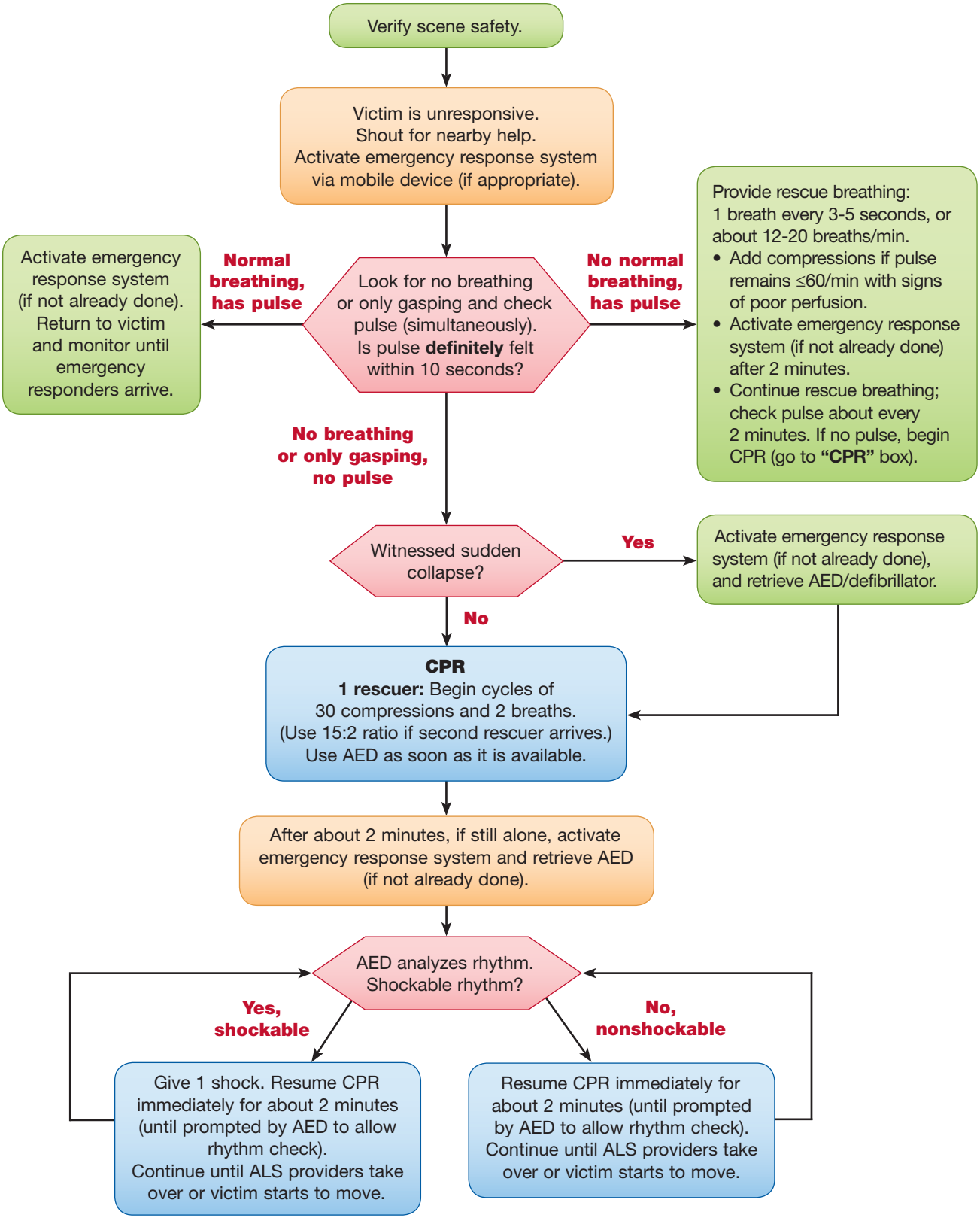
Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Spontaneous arterial pressure waves with intra-arterial monitoring

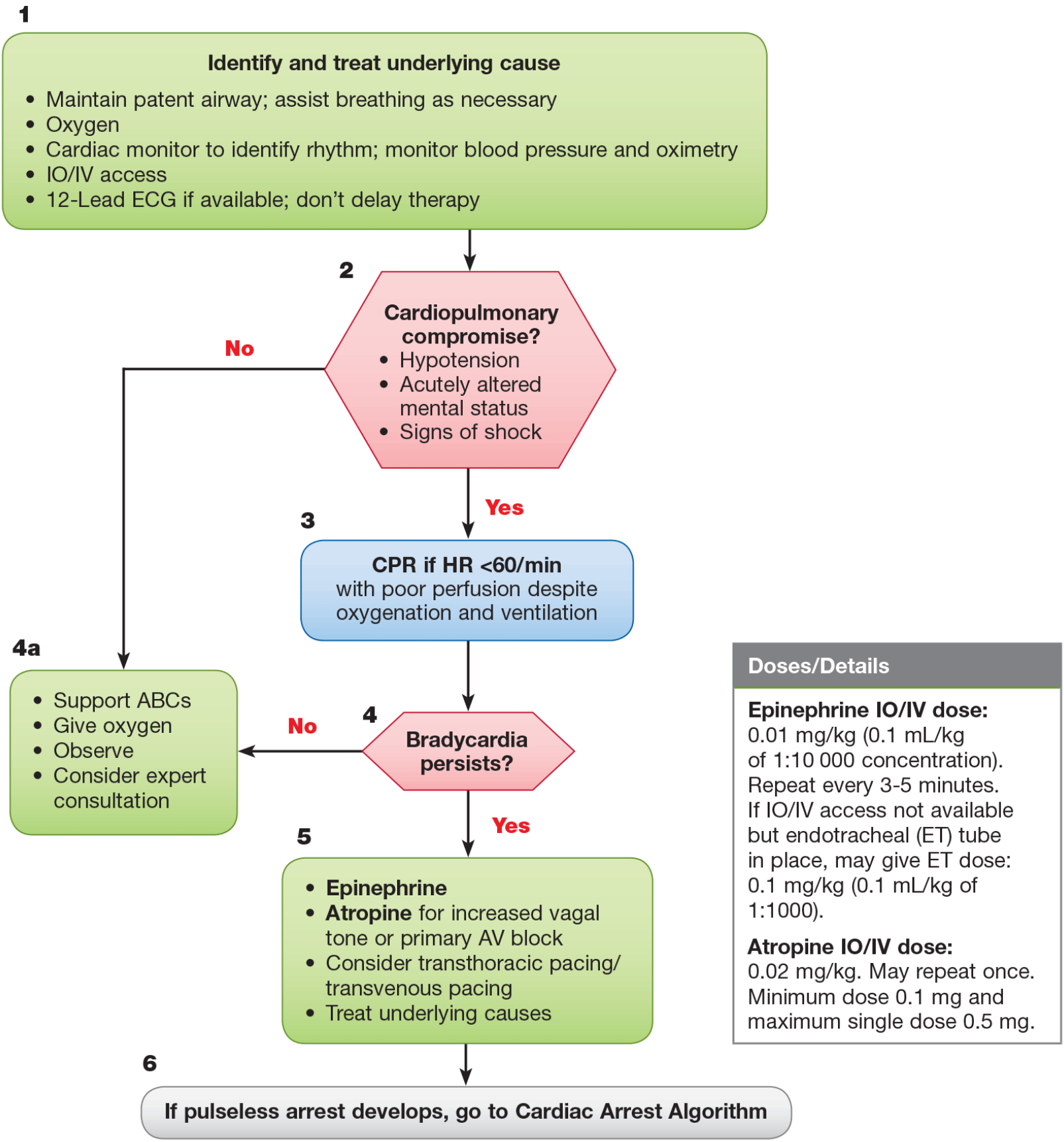
Reversible Causes

- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypoglycemia
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary

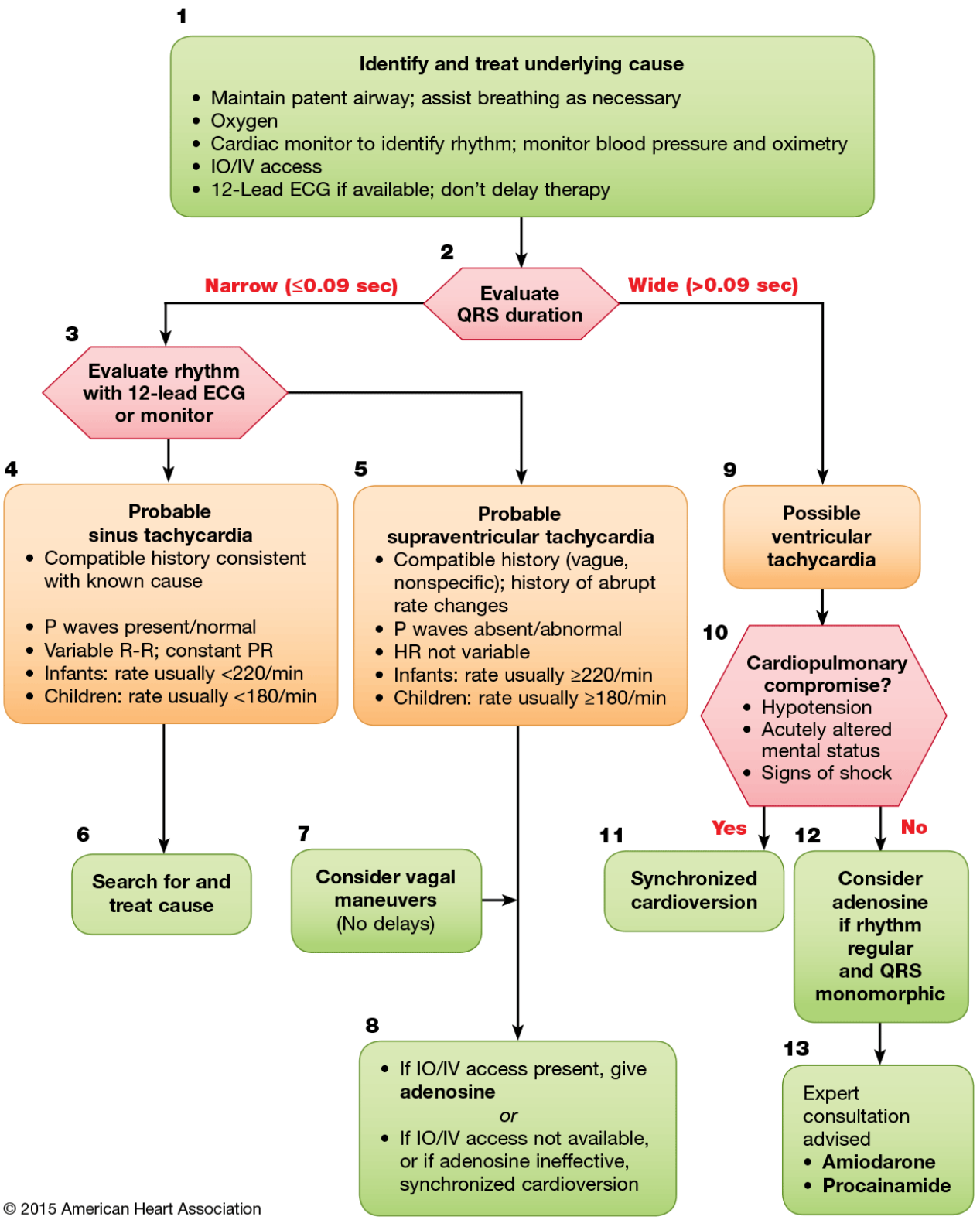
BLS Healthcare Provider
Pediatric Cardiac Arrest Algorithm for the Single Rescuer—2015 Update



Pediatric Bradycardia With a Pulse and Poor Perfusion Algorithm



Pediatric Tachycardia With a Pulse and Poor Perfusion Algorithm



Doses/Details
Synchronized Cardioversion
Begin with 0.5-1 J/kg; if not effective, increase to 2 J/kg. Sedate if needed, but don't delay cardioversion.
Drug Therapy
Adenosine IO/IV dose: First dose: 0.1 mg/kg rapid bolus (maximum: 6 mg). Second dose: 0.2 mg/kg rapid bolus (maximum second dose: 12 mg).
Amiodarone IO/IV dose: 5 mg/kg over 20-60 minutes *or* **Procainamide IO/IV dose:** 15 mg/kg over 30-60 minutes
Do not routinely administer amiodarone and procainamide together.

NOTES:

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