Unique Usability Challenges in Designing EHRs Used for the Care of Children

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One size fits all?

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www.imagewisely.org

Unique Usability Challenges Goals

1) Understand why pediatric patients have special requirements
2) Understand critical special functions used in pediatric charts
3) Understand how the absence, difficult to use, or malfunctioning of those functions can cause errors
4) Understand human factor solutions

NIST Document

- A Human Factors Guide to Enhance EHR Usability of Critical User Interactions when Supporting Pediatric Patient Care

Pediatric Patients- Time continuum

- MFM-fetus
  - Fetal diagnosis, fetal therapy, fetal surgery
- Neonatology-1-6 weeks
  - Unique immune, respiratory, cardiovascular,.....
- Pediatrics (newborns, infants, toddlers, children, adolescents)
  - 1 second old to 24 years, on a continuum
- Adolescent medicine 12-24 years
  - Brain scans show unique features.
- Adult congenital
  - Brand new natural histories to learn

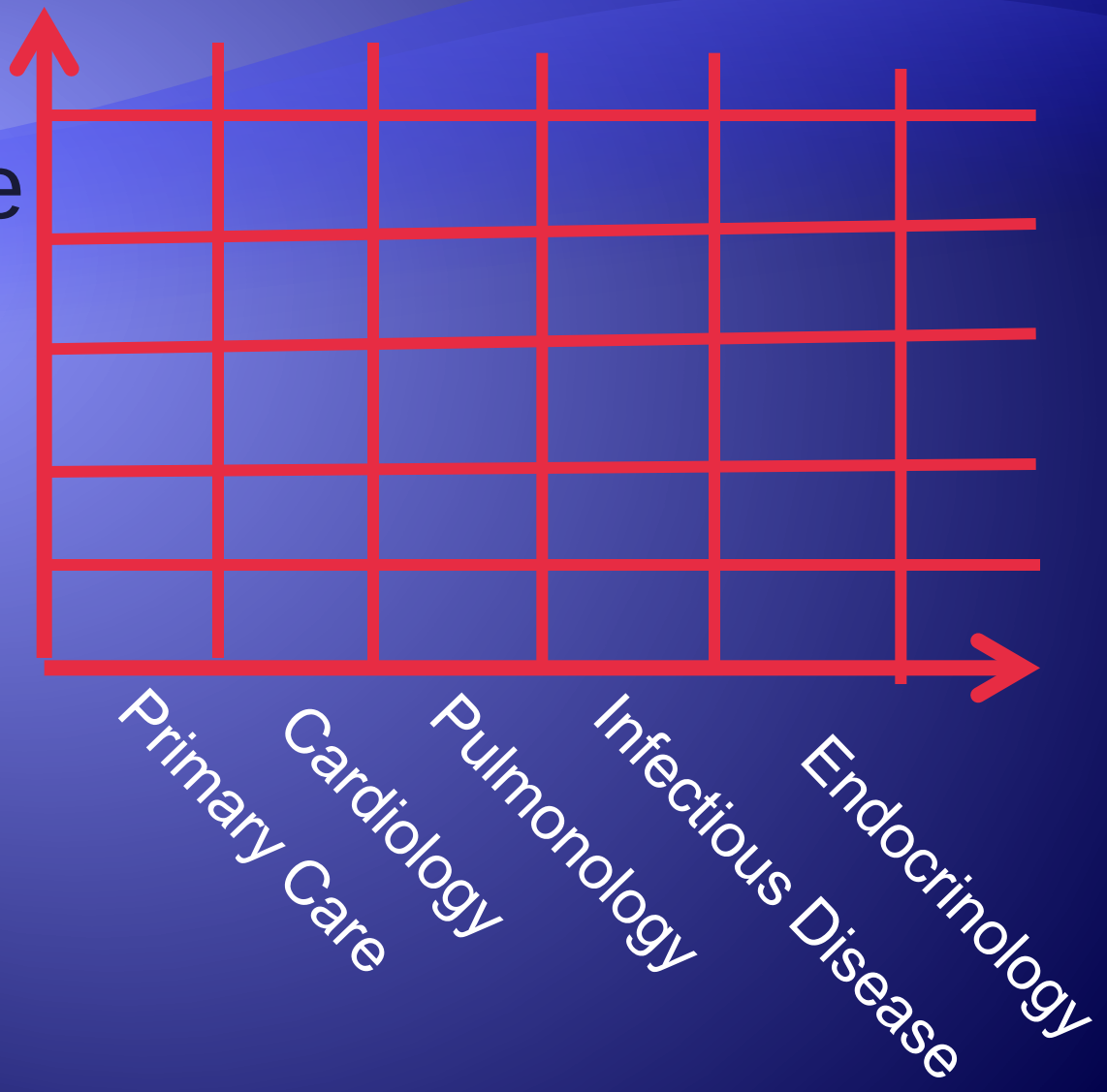
2D Matrix
Dimensions of Care

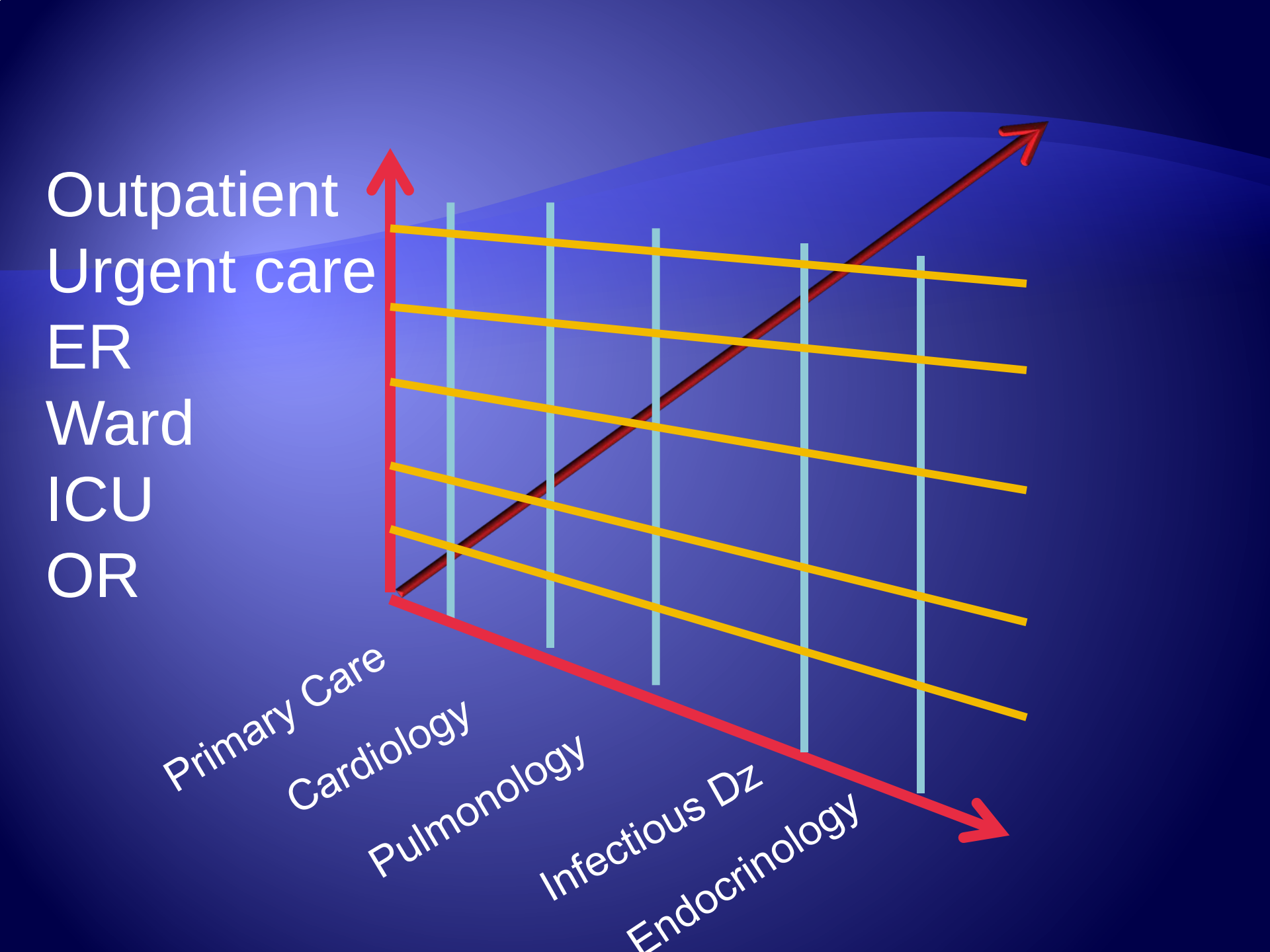
Outpat
Urgent
ER
Ward
ICU
OR

rinology

ease

Outpatient
Urgent care
ER
Ward
ICU
OR




Outpatient
Urgent care
ER
Ward
ICU
OR
Primary Care
Cardiology
Pulmonology
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Endocrinology

Outpatien
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ER
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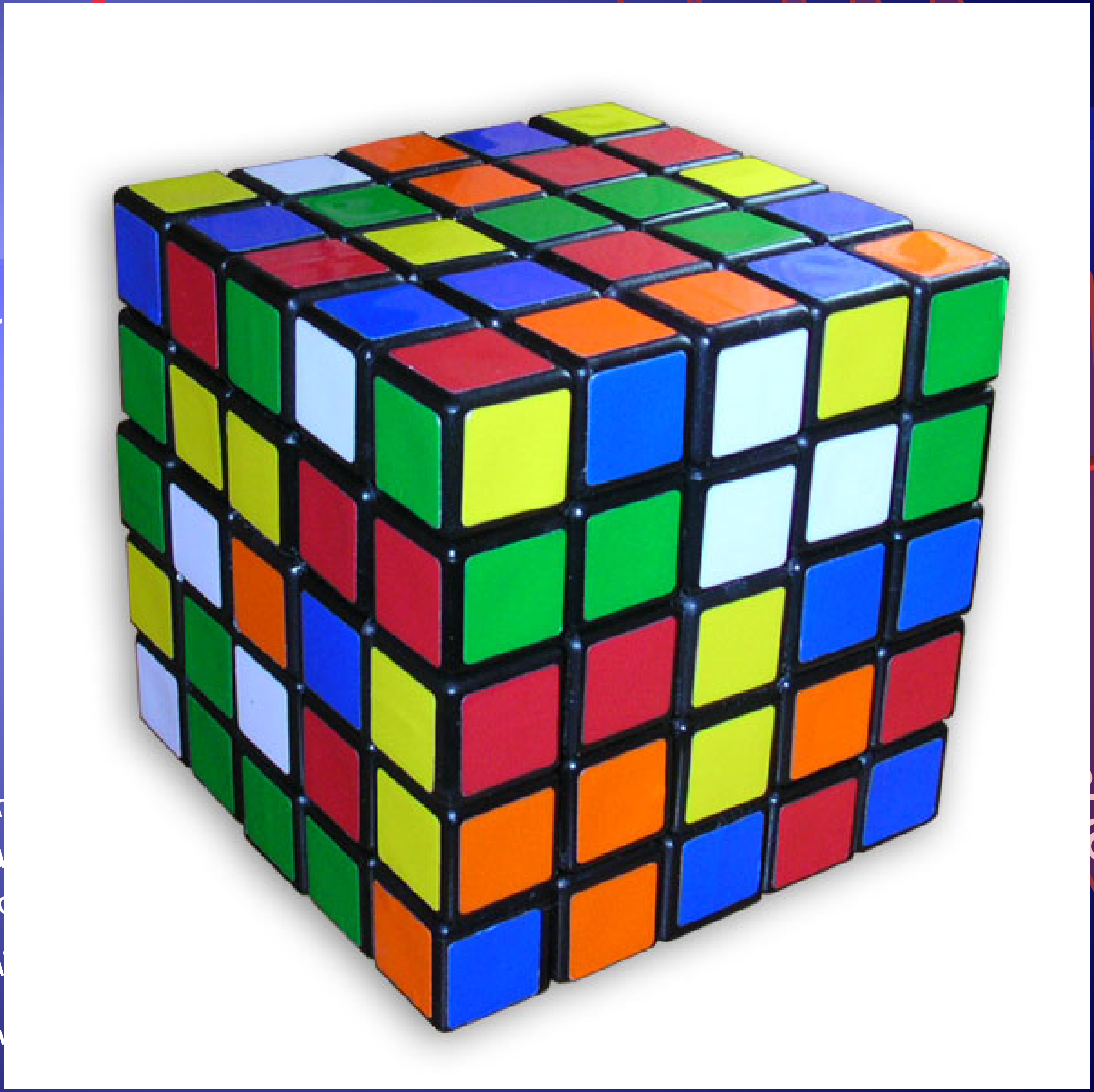
OR



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Variables that affect patient care

- Weigth
- Height
- BSA (body surface area)
- BMI (body mass index)
- Age
- Gestational age
- Etc….

Pediatric EMR

- Childrend's EMR charts need to have those special functions
- EMRS tend to be designed for the largest audience of patients (Adult Medicine)
- Key functionality in pediatric electronic charts can be missing, limited, un-customizable, malfunctioning,……"hard to use"

What do we need?

- Growth Charts
- Mg/kg dosing
- Vaccines
- Age related normal values
- Privacy
- Newborn issues
- Radiology issues
- Patient ID

What do we need?

- **Growth Charts**
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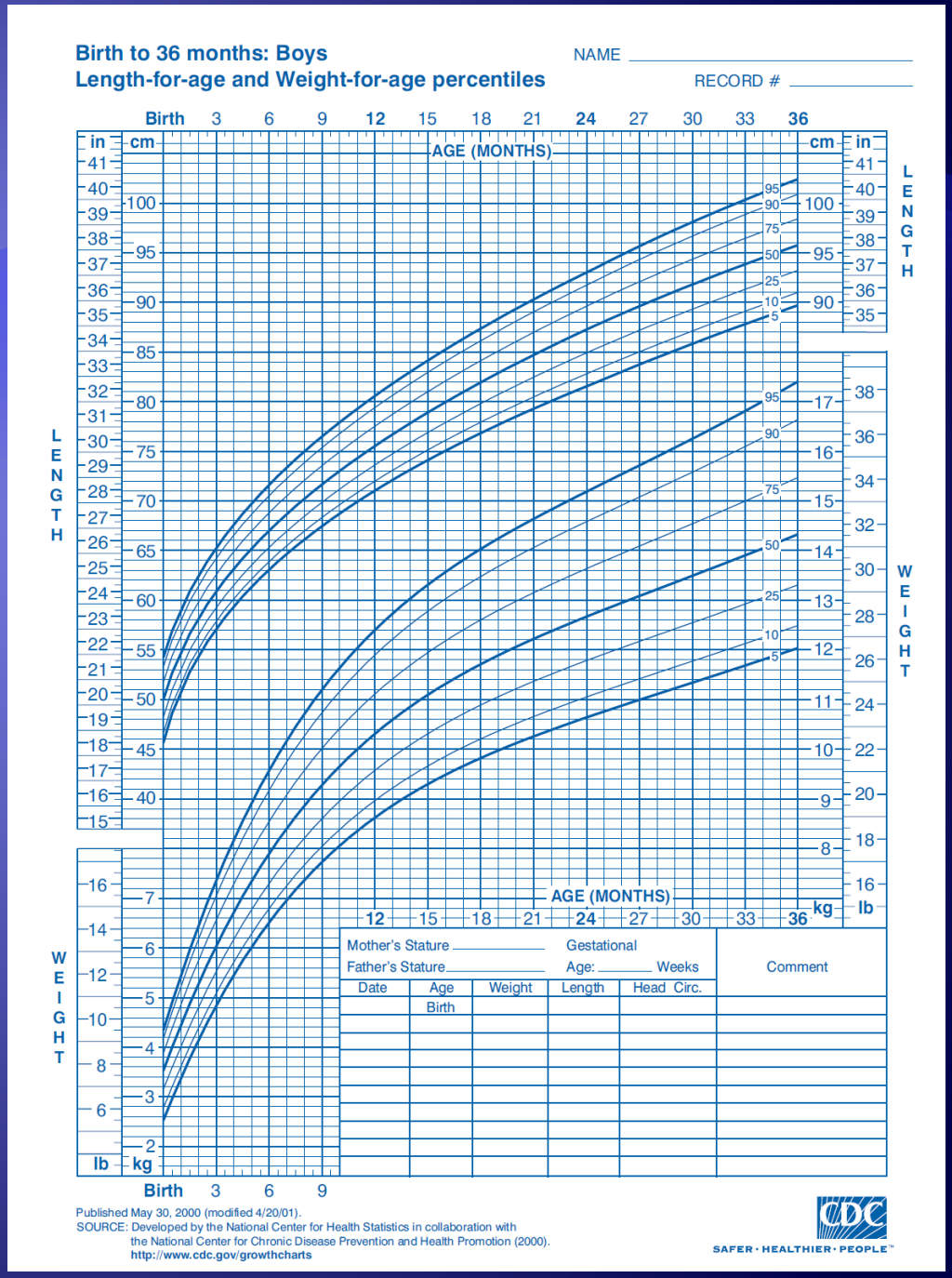
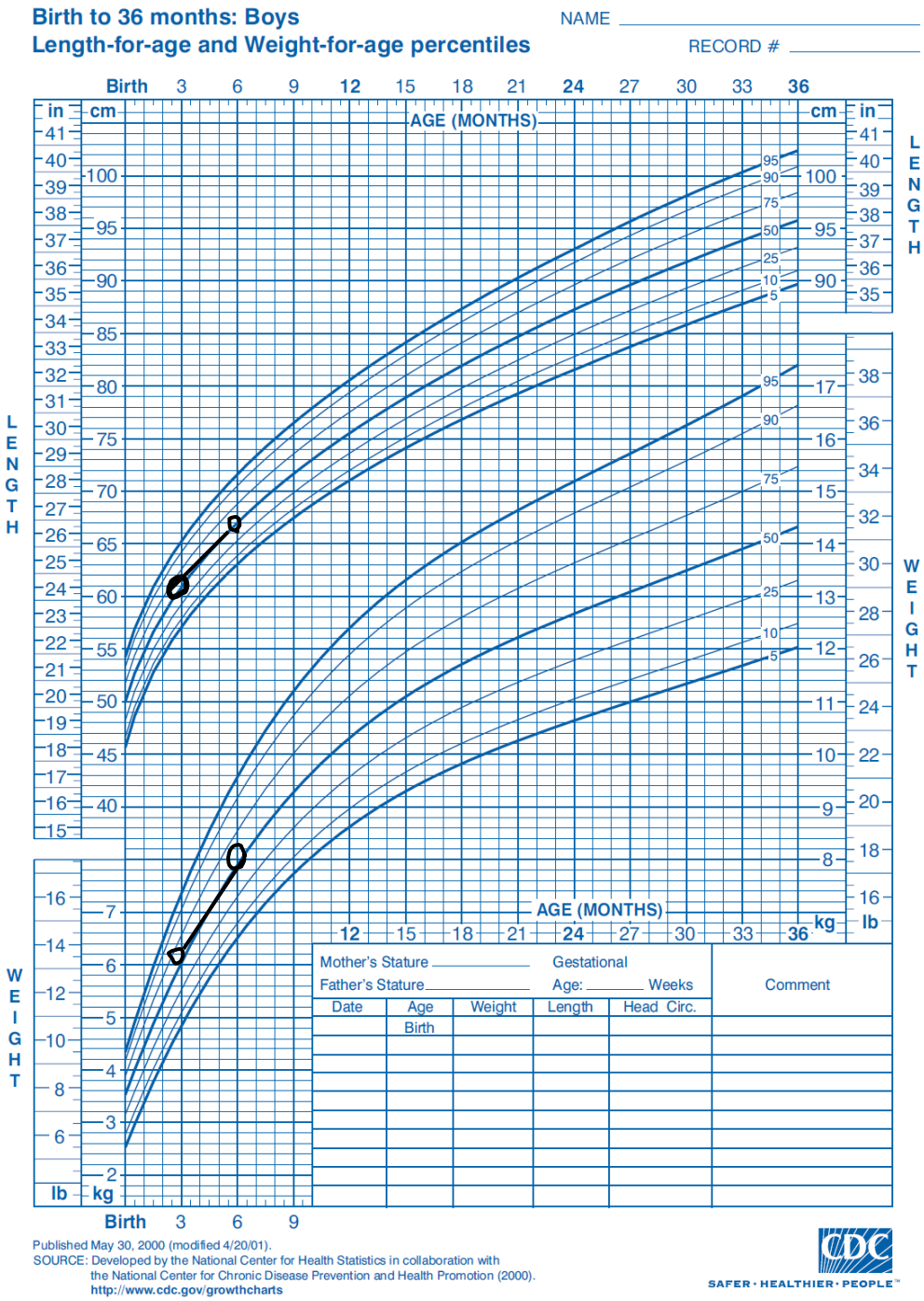
Growth Chart

- Critical component of any pediatric chart
- Allows doctor to check for proper growth at a glance.
- Standard of care part of each childs chart

CDC (Center for Disease Control) Growth Chart



What does Normal CDC Growth Chart Look Like



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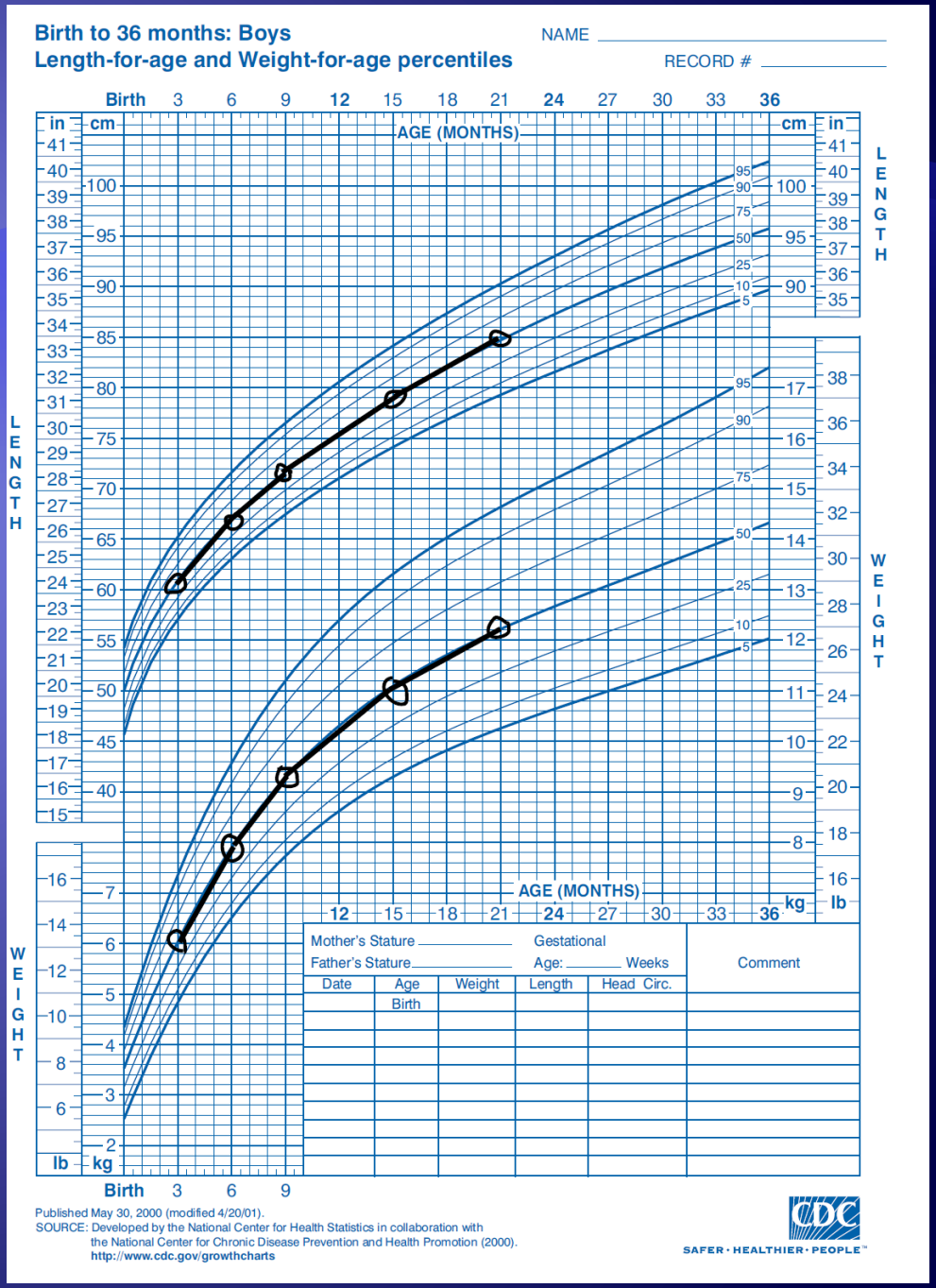
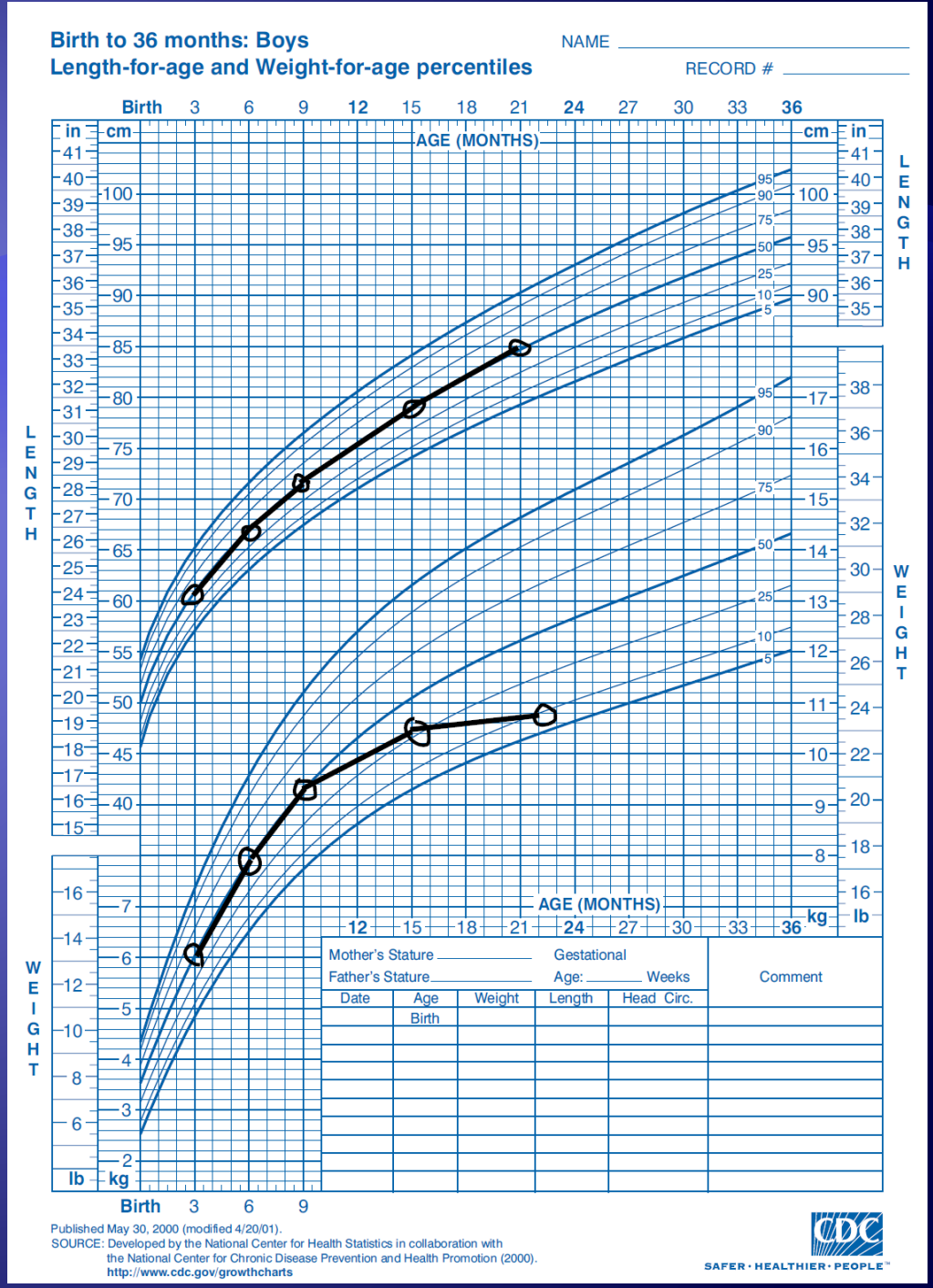
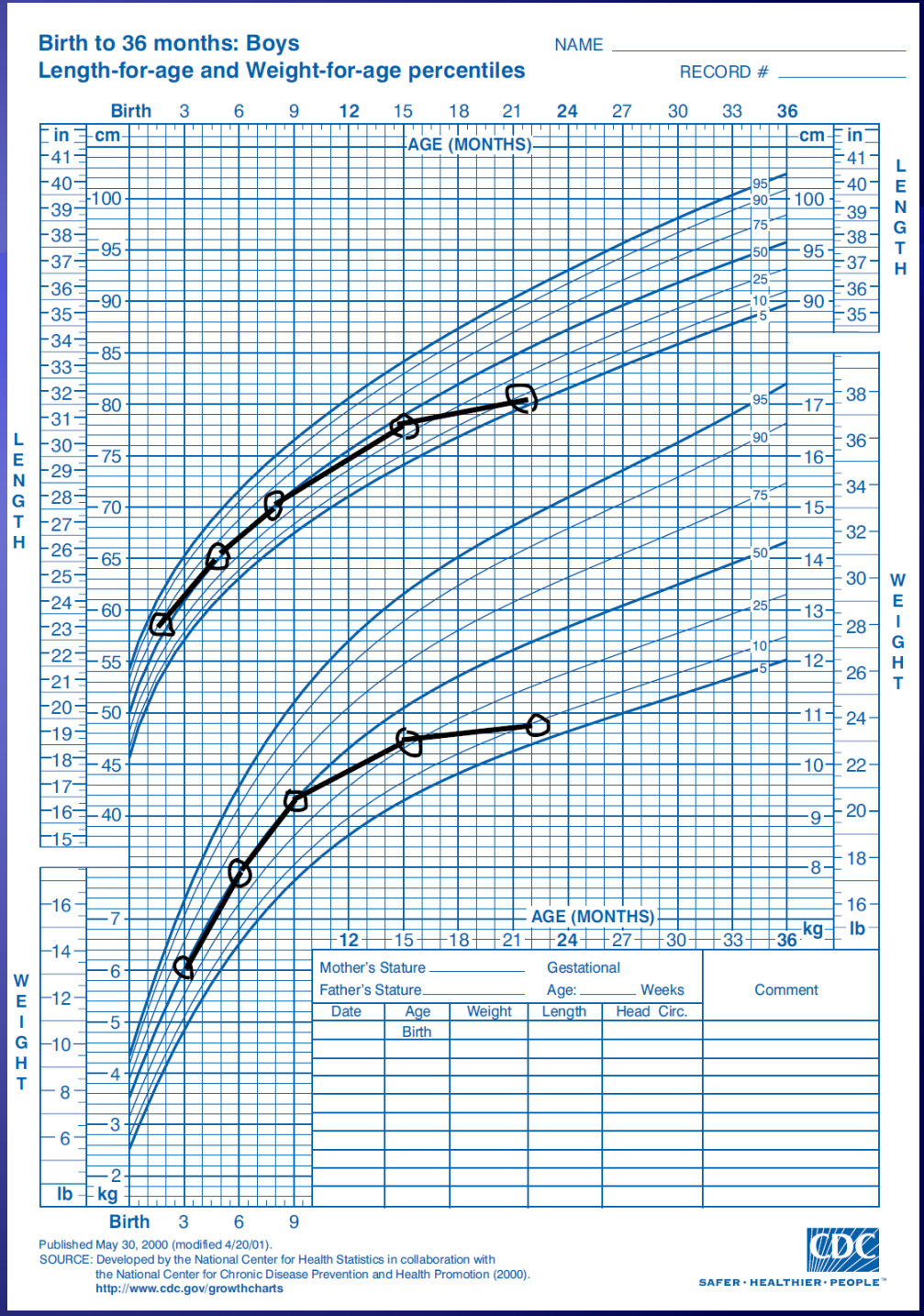


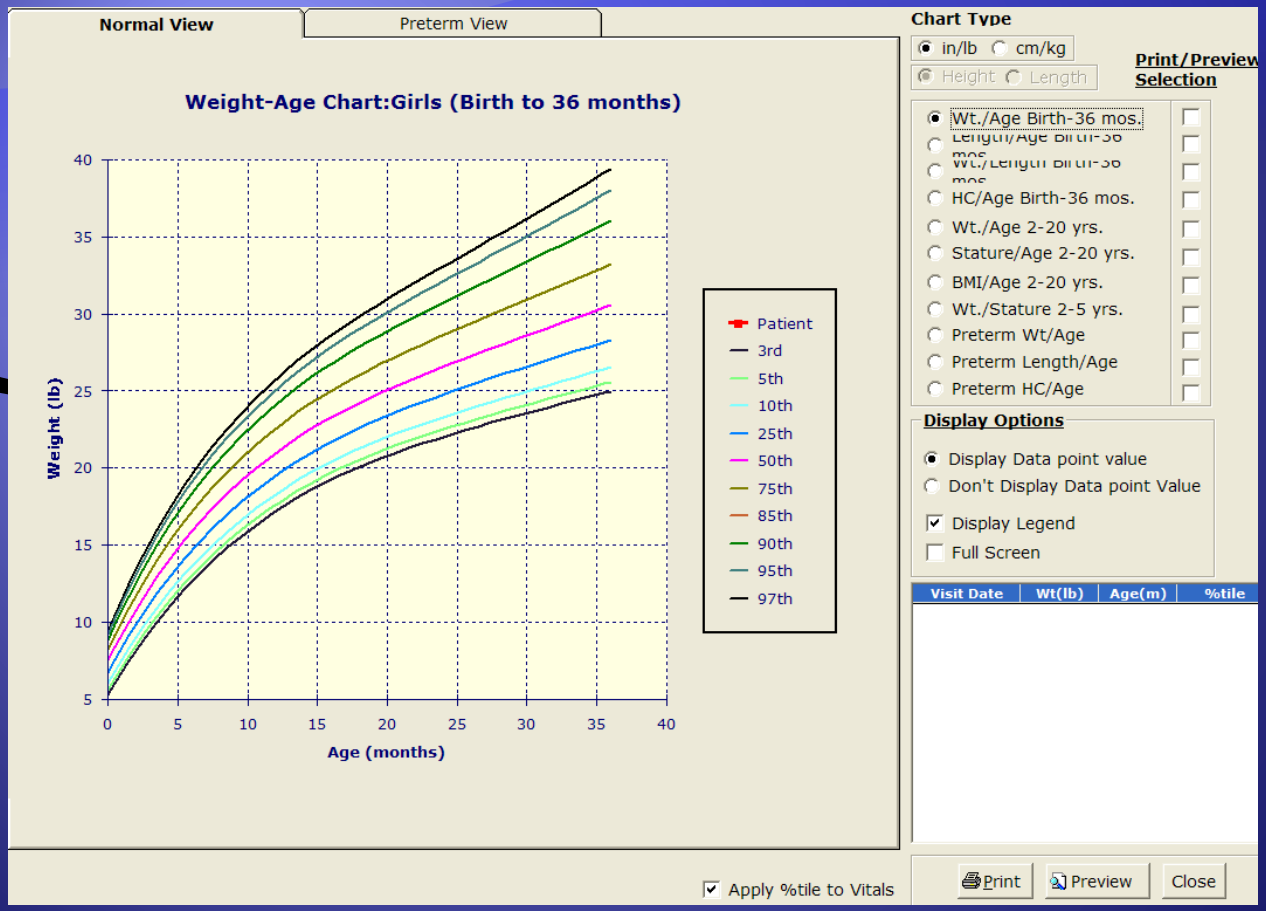
Growth Chart with (CHF) Congestive Heart Failure

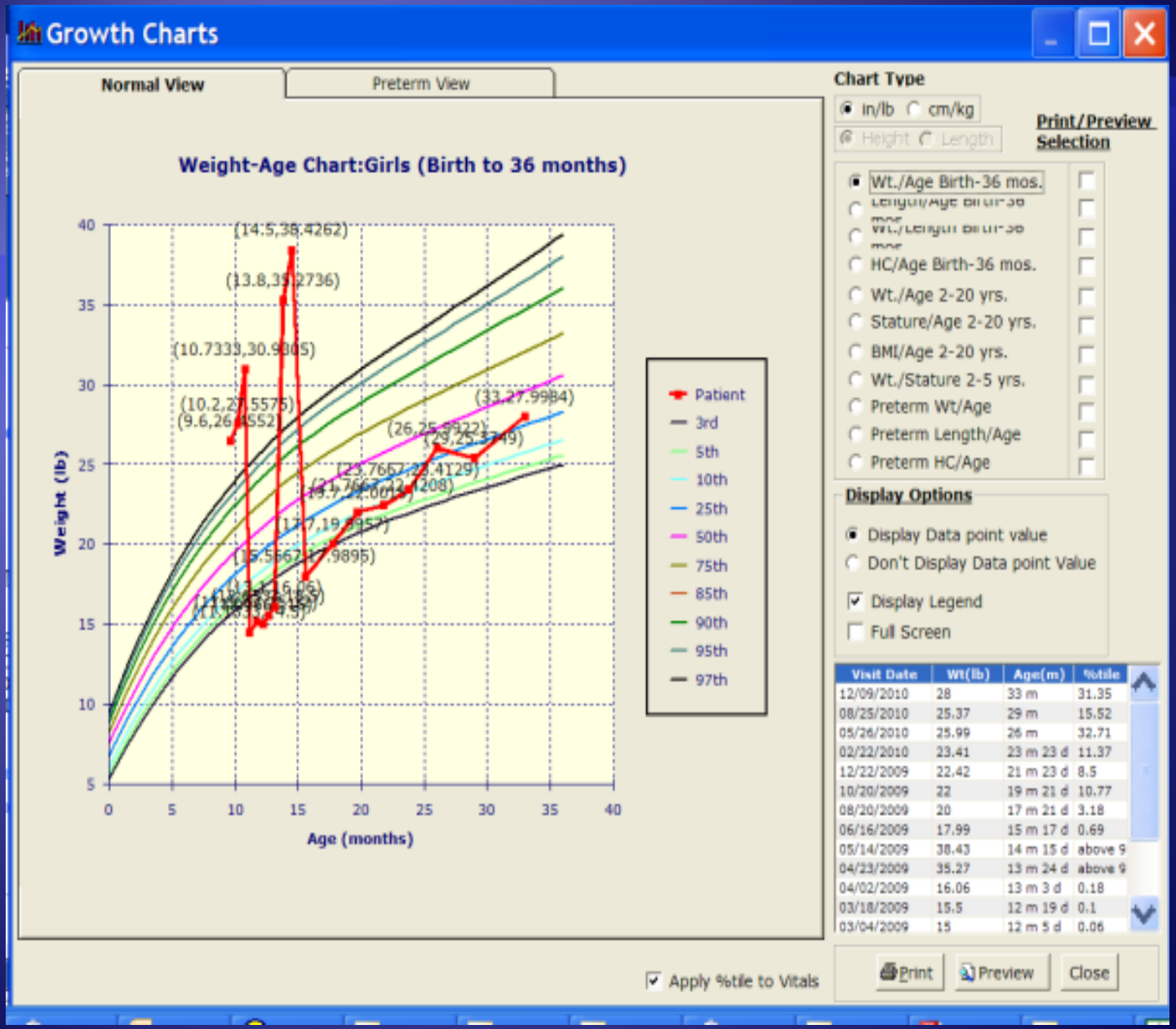


Growth Chart constitutional growth issue (growth issues caused by genetic mutation or syndromes)



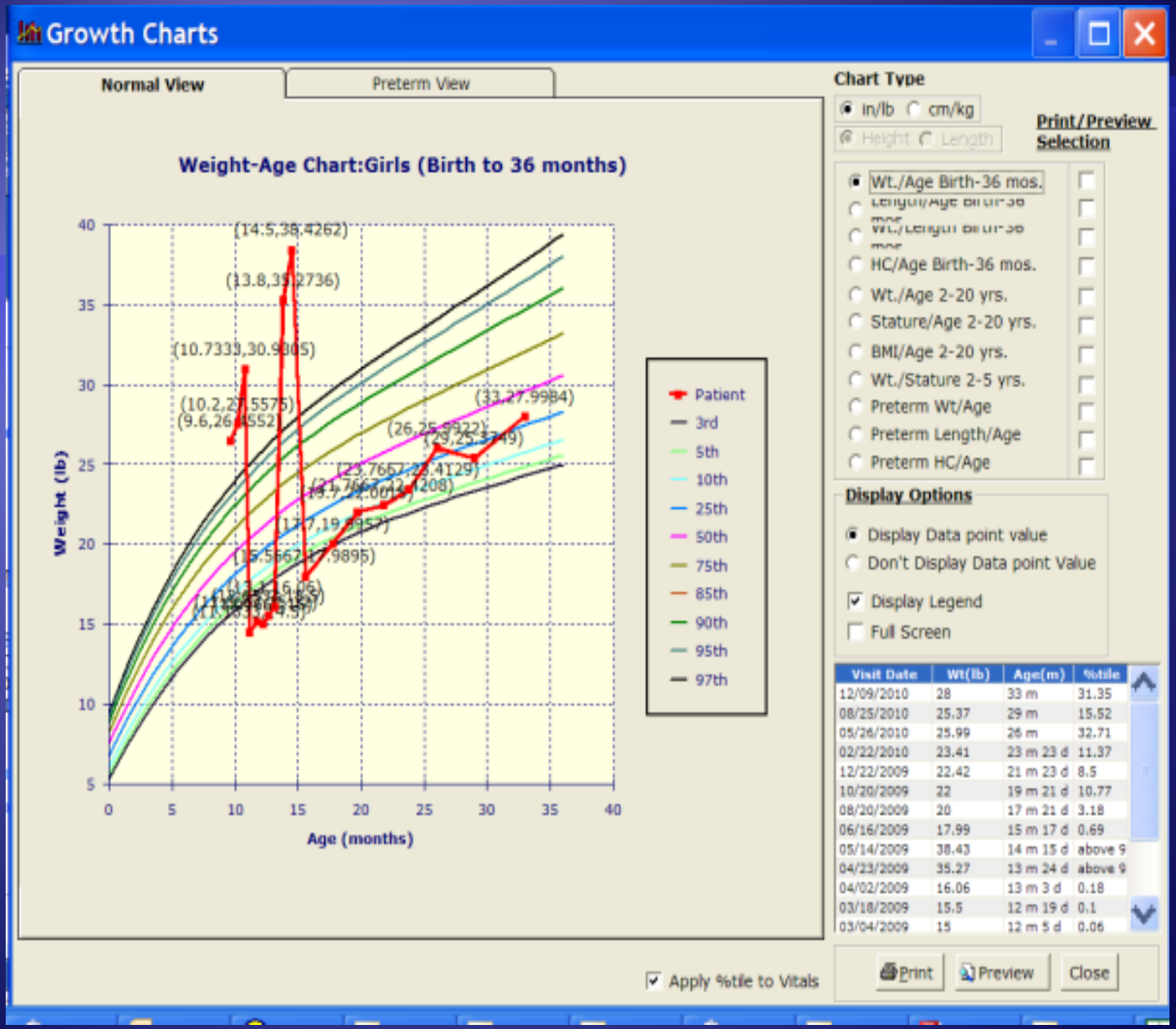
EMR growth chart




Growth Charts
Normal View
Preterm View
Weight-Age Chart:Girls (Birth to 36 months)
Weight (lb)
Age (months)
Patient
3rd
5th
10th
25th
50th
75th
85th
90th
95th
97th
Chart Type
In/lb
cm/kg
Height
Length
Print/Preview Selection
Wt./Age Birth-36 mos.
HC/Age Birth-36 mos.
Wt./Age 2-20 yrs.
Stature/Age 2-20 yrs.
BMI/Age 2-20 yrs.
Wt./Stature 2-5 yrs.
Preterm Wt/Age
Preterm Length/Age
Preterm HC/Age
Display Options
Display Data point value
Don't Display Data point Value
Display Legend
Full Screen
Visit Date | Wt(lb) | Age(m) | %tile
12/09/2010 | 28 | 33 m | 31.35
08/25/2010 | 25.37 | 29 m | 15.52
05/26/2010 | 25.99 | 26 m | 32.71
02/22/2010 | 23.41 | 23 m 23 d | 11.37
12/22/2009 | 22.42 | 21 m 23 d | 8.5
10/20/2009 | 22 | 19 m 21 d | 10.77
08/20/2009 | 20 | 17 m 21 d | 3.18
06/16/2009 | 17.99 | 15 m 17 d | 0.69
05/14/2009 | 38.43 | 14 m 15 d | above 9
04/23/2009 | 35.27 | 13 m 24 d | above 9
04/02/2009 | 16.06 | 13 m 3 d | 0.18
03/18/2009 | 15.5 | 12 m 19 d | 0.1
03/04/2009 | 15 | 12 m 5 d | 0.06
Apply %tile to Vitals
Print
Preview
Close

When is a pound a pound?

- 10 lbs=10 lbs
- 10lbs =10 kg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03/04/2009 | 15 | 12 m 5 d | 0.06
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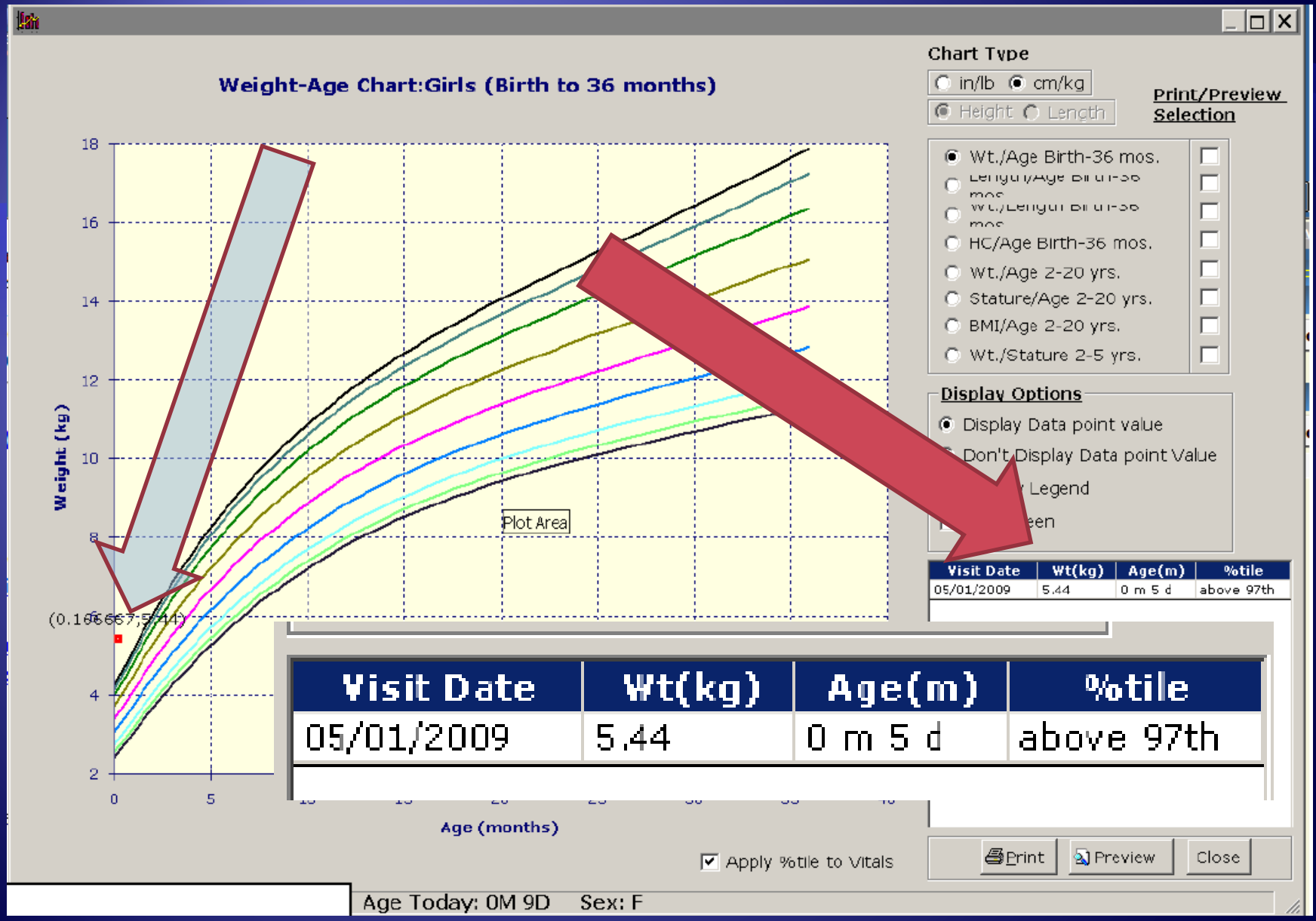
Print
Preview
Close

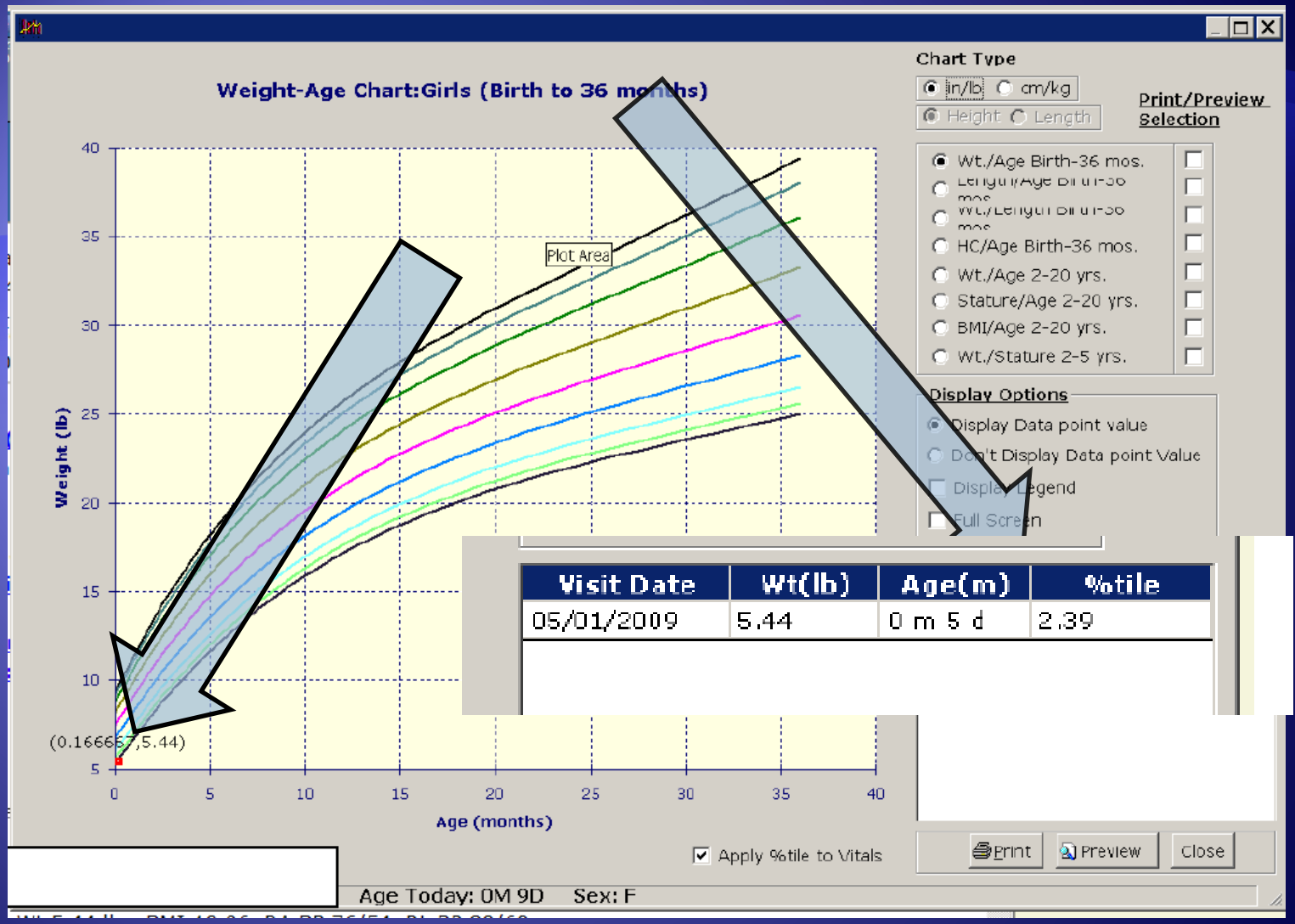
This is critical,



Hypothetical scenario

- Patient weights 5.4 kg
- Lets say we start the patient on digoxin
- Dose is 10 mcg/kg/day
- 50 mcg per day

- Patient dies , and the cause is……OVERDOSE! Error not caught by the doctor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Wt./Stature 2-5 yrs.
Display Options
Display Data point value
Don't Display Data point Value
Display Legend
Full Screen
Plot Area
Weight (lb)
Age (months)
(0.16663,5.44)
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Wt(lb)
Age(m)
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05/01/2009
5.44
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2.39
Apply %tile to Vitals
Print
Preview
Close
Age Today: 0M 9D
Sex: F

Usability Guidelines Growth CH

- IVA. Do not permit changes to measurement systems (e.g., lbs vs kg) unless initiated by the user.
- IVB. Support accurate conversion from pounds to kilograms
- IVC. Visibility of chart data and axes
- IVD. Display units accurately in standard notation
- IVE. Support selection of particular weight data value to display
- IVF. Display age-based percentiles for weight and height data
- IVG. Single-click navigation to access growth chart display
- IVH. Single-click interaction to view complete growth chart (e.g., no scrolling)
- IVI. Display height and weight on same chart
- IVJ. Support custom views with custom time ranges (ie 3 months to 6 months)
- IVK. Support corrections to plotted data

What do we need?

- Growth Charts
- **Mg/kg dosing**
- Vaccines
- Age related normal values
- Privacy
- Newborn issues
- Radiology issues
- Patient ID

Mg/kg dosing

- Amoxicillin-Clavulanate (Augmentin)
- Typical adult medicines have a standard dose
  750 Mg Twice a day
- In pediatrics dose can be based on wt.
  - 20-100 mg/kg/day divided twice a day

Dose can depend on

- Wt
- Age
- Gestational Age (how many weeks pregnant)
- Plus all of the adult variables
  - Renal function
  - Diagnosis
  - Etc….

Many more formulations

- Typical adult doctor can use 1 or 2 forms
  - Amoxicillin-Clavulanate (Augmentin) 875 or 1000
- Typical pediatrician can choose from
  - 13 formulations
    - Liguids 200,400,600,125,250
    - Tabs-250,500,875,1000
    - Chewables -200,400,125,250
  - Plus two in Europe 375,676 Europe

Vancomycin

- PNA <7 days:
  - <1200 g: 15 mg/kg/dose every 24 hours
  - 1200-2000 g: 10-15 mg/kg/dose every 12-18 hours
  - >2000 g: 10-15 mg/kg/dose every 8-12 hours
- PNA ≥7 days:
  - <1200 g: 15 mg/kg/dose every 24 hours
  - 1200-2000 g: 10-15 mg/kg/dose every 8-12 hours
  - >2000 g: 10-15 mg/kg/dose every 6-8 hours

Vancomycin

- 0.5 kg 15 mg/kg/dose every 24 hours
  - **7.5 mg** every 24 hours

- 100 kg 15 mg/kg/dose every 6 hours
  - **1500 mg** every 6 hours

  - 200 times the dose for teenager.

Liquid Formulations

- Amlodipine
- Amiodarone

  - Look-alikes that get confused
  - Both are used in adult medicine
  - Tablets however do not look alike

More prone to error

- Amlodipine

- Amiodarone

Which is Which

- Amiodarone and Amlodipine are used in adults

- Amiodarone is used in kids, pretty safe
- Amlodipine is lethal in infants

Amlodipine Amiodarone

Comme	Name	Strength	Formul	Take	Route	Frequenc	Duration	Disp
Start	Amlodi	10 mg	Tablet	1 tablet	Orally	Once a da	30 day(s)	30
Start	Amioda	100 MG	Tablet	1 tablet	Orally	Once a da	30 day(s)	30

- Amiodarone Amlodipine Amiodarone Amlodipine Amiodarone Amlodipine
- Amiodarone Amlodipine Amiodarone Amlodipine Amiodarone Amlodipine
- Amiodarone Amlodipine Amiodarone Amlodipine Amiodarone Amlodipine
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- Amiodarone Amlodipine Amiodarone Amlodipine Amiodarone Amlodipine

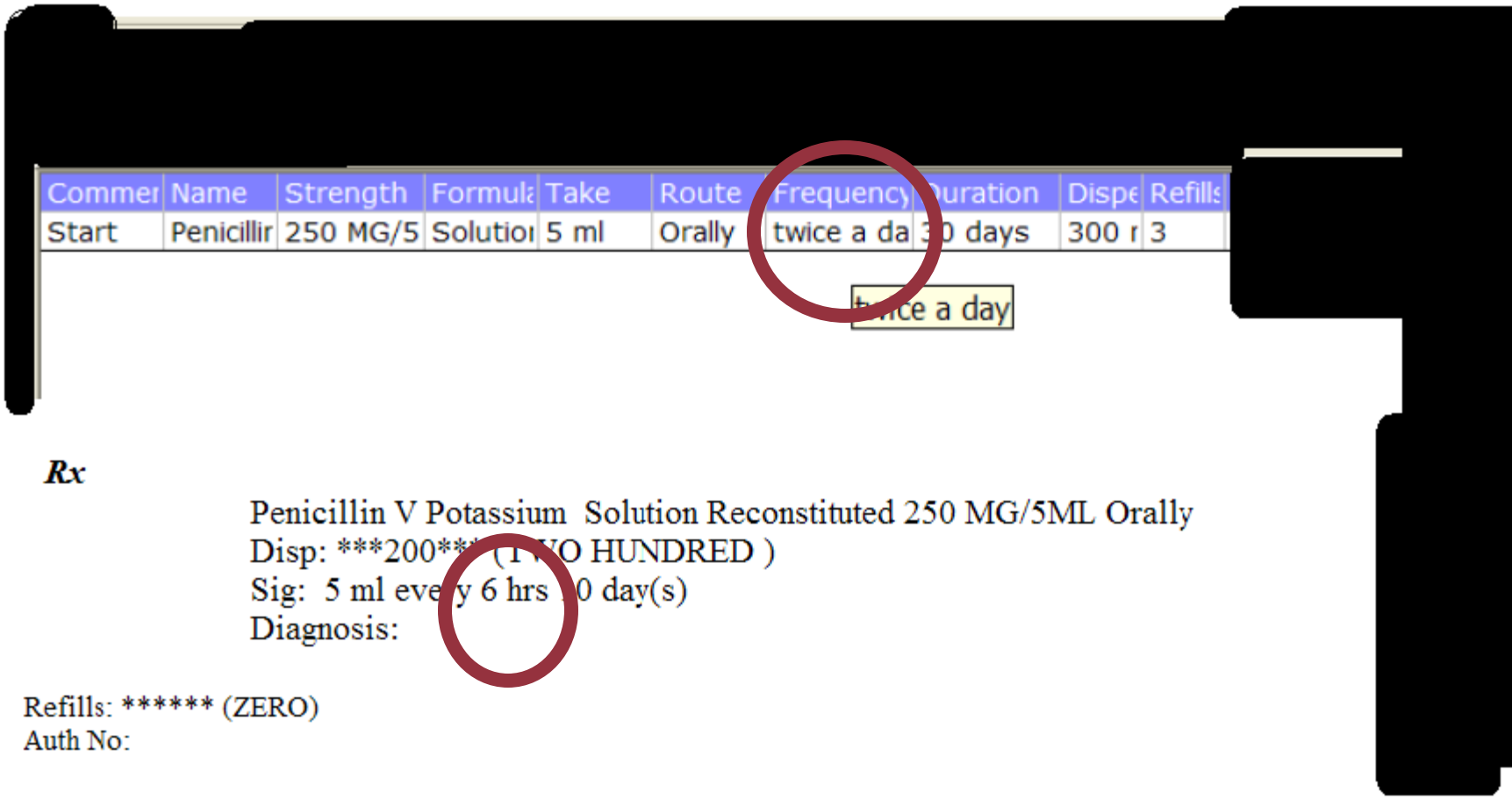
Which is which?- You cannot catch the mistake

- Amiodarone Amlodipine Amiodarone Amlodipine

MG/KG-Pediatric Dose can be larger than adult dose

- **Primary prevention of rheumatic fever (treatment of streptococcal tonsillopharyngitis)**
- Children 3-18 years: 50 mg/kg once daily (maximum dose: **1000 mg**) for 10 days
- Adult: Extended release tablets: **775 mg** once daily for 10 days

Not what the doctor ordered



Commer	Name	Strength	Formula	Take	Route	Frequency	Duration	Dispe	Refills
Start	Penicillir	250 MG/5	Solutior	5 ml	Orally	twice a da	0 days	300 r	3

twice a day

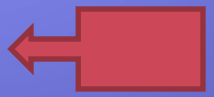
Rx

Penicillin V Potassium Solution Reconstituted 250 MG/5ML Orally
Disp: ***200*** (TWO HUNDRED)
Sig: 5 ml eve y 6 hrs 0 day(s)
Diagnosis:

Refills: ****** (ZERO)
Auth No:

Usability Guidelines -Dosing

- IIA. Protect against mode errors for mg/kg dosing and ml dosing
- IIB. Flag that an intended dose is unusual
- IIC. Support high-precision dosing for low-weight patients
- IID. Do not permit automated defaults to adult doses
- IIE. Support custom formulations for liquid medications
- IIF. Support documentation of incomplete medication information
- IIG. Reduce displayed options for medication orders
- IIH. Display the recommended dose range for the selected mg/kg dose
- III. Display "input masks" for data entry to clarify type of data
- IIJ. Avoid truncation of medication names and dosages in menus
- IIIE. Display normal ranges for medication doses and lab values based upon weight, height, Body Surface Area, Body Mass Index, and age information

- Growth Charts
- Mg/kg dosing
- **Vaccines** 
- Age related normal values
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vaccines

- **Types of Administration Errors**
- •Wrong vaccine or wrong diluent
- •Wrong dosage
- •Expired vaccine
- •Wrong route / site / needle size
- •Wrong time
- •Wrong patient

Vaccines

- **Most common error –wrong vaccine**
- Such errors usually involved vaccines whose generic or trade names looked or sounded alike (Tdap and DTaP; Adacel and Daptacel) or those with similar packaging.

Vaccine Acronyms & Abbreviations

DTaP	DTaP	Diphtheria, Tetanus & Acellular Pertussis	DAPTACEL®, Infanrix®, Tripedia®
DTaP-HepB-IPV	DTaPHBIP	Diphtheria, Tetanus & Acellular Pertussis, Hepatitis B, Polio	Pediarix®
DTaP-IPV	DTaP-IPV	Diphtheria, Tetanus & Acellular Pertussis, Inactivated Polio	Kinrix™
HepA	HAV	Hepatitis A Virus	Havrix®, VAQTA®
HepB	HBV, HBV2dose	Hepatitis B Virus	ENGERIX B®, RECOMBIVAX®
HepA-HepB	HAV-HBV	Hepatitis A and Hepatitis B	Twinrix®, Twinrix Junior®
Hib-HepB	HIB-HBV	Hepatitis B and *Haemophilus influenzae* type b	COMVAX®
Hib	HIB	*Haemophilus influenzae* type b	ACTHIB®, Hiberix®
Hib	HIBPEDVX	*Haemophilus influenzae* type b	PedvaxHIB®
DTaP-IPV/Hib	DTaPIPHi	Diphtheria, Tetanus & Acellular Pertussis, *Haemophilus influenzae* type b, Polio	Pentacel®
HPV2	HPV	Human papillomavirus (bivalent)	Cervarix®
HPV4	HPV	Human papillomavirus (quadravelent)	Gardasil®
IPV	IPV	Inactivated Polio	IPOL®
LAIV	FLU-LAIV	Live, Attenuated Influenza (nasal spray)	FluMist®
MMR	MMR	Measles, Mumps & Rubella	MMR-II®
MMRV	MMR-VZV	Measles, Mumps, Rubella & Varicella	ProQuad®
		Acellular Pertussis	
TIV	FLU	Trivalent (inactivated) Influenza	Afluria®, Fluarix®, FluLaval®, Fluvirin®, Fluzone®, Agriflu®, Fluzone High-Dose®, Fluzone Intradermal®
TT	TT	Tetanus Toxoid	
VAR	VZV	Varicella	VARIVAX®
ZOS	Zoster	Varicella Zoster Virus (Shingles)	Zostavax®

Note: You can find the most recent version of CDC's list at www.cdc.gov/vaccines/about/terms/vacc-abbrev.htm

FIGURE 3. Catch-up immunization schedule for persons aged 4 months through 18 years who start late or who are more than 1 month behind —United States • 2012

The figure below provides catch-up schedules and minimum intervals between doses for children whose vaccinations have been delayed. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Use the section appropriate for the child's age. **Always use this table in conjunction with the accompanying childhood and adolescent immunization schedules (Figures 1 and 2) and their respective footnotes.**

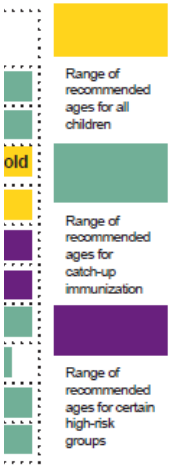
Vaccine	Minimum Age for Dose 1	Minimum Interval Between Doses			
		Dose 1 to dose 2	Dose 2 to dose 3	Dose 3 to dose 4	Dose 4 to dose 5
Persons aged 4 months through 6 years					
Hepatitis B	Birth	4 weeks	8 weeks and at least 16 weeks after first dose; minimum age for the final dose is 24 weeks		
Rotavirus[1]	6 weeks	4 weeks	4 weeks[1]		
Diphtheria, tetanus, pertussis[2]	6 weeks	4 weeks	4 weeks	6 months	6 months[2]
Haemophilus influenzae type b[3]	6 weeks	4 weeks if first dose administered at younger than age 12 months 8 weeks (as final dose) if first dose administered at age 12–14 months No further doses needed if first dose administered at age 15 months or older	4 weeks[3] if current age is younger than 12 months 8 weeks (as final dose)[3] if current age is 12 months or older and first dose administered at younger than age 12 months and second dose administered at younger than 15 months No further doses needed if previous dose administered at age 15 months or older	8 weeks (as final dose) This dose only necessary for children aged 12 months through 59 months who received 3 doses before age 12 months	
Pneumococcal[4]	6 weeks	4 weeks if first dose administered at younger than age 12 months 8 weeks (as final dose for healthy children) if first dose administered at age 12 months or older or current age 24 through 59 months No further doses needed for healthy children if first dose administered at age 24 months or older	4 weeks if current age is younger than 12 months 8 weeks (as final dose for healthy children) if current age is 12 months or older No further doses needed for healthy children if previous dose administered at age 24 months or older	8 weeks (as final dose) This dose only necessary for children aged 12 months through 59 months who received 3 doses before age 12 months or for children at high risk who received 3 doses at any age	
Inactivated poliovirus[5]	6 weeks	4 weeks	4 weeks	6 months[5] minimum age 4 years for final dose	
Meningococcal[6]	9 months	8 weeks[6]			
Measles, mumps, rubella[7]	12 months	4 weeks			
Varicella[8]	12 months	3 months			
Hepatitis A	12 months	6 months			
Persons aged 7 through 18 years					
Tetanus, diphtheria/ tetanus, diphtheria, pertussis[9]	7 years[9]	4 weeks	4 weeks if first dose administered at younger than age 12 months 6 months if first dose administered at 12 months or older	6 months if first dose administered at younger than age 12 months	
Human papillomavirus[10]	9 years	Routine dosing intervals are recommended[10]			
Hepatitis A	12 months	6 months			
Hepatitis B	Birth	4 weeks	8 weeks (and at least 16 weeks after first dose)		
Inactivated poliovirus[5]	6 weeks	4 weeks	4 weeks[5]	6 months[5]	
Meningococcal[6]	9 months	8 weeks[6]			
Measles, mumps, rubella[7]	12 months	4 weeks			
Varicella[8]	12 months	3 months if person is younger than age 13 years 4 weeks if person is aged 13 years or older			

1. **Rotavirus (RV) vaccines (RV-1 [Rotarix] and RV-5 [RotaTeq]).**
   - A single dose of PCV may be administered to certain children aged 6 through 18 years with underlying medical conditions. See age-specific schedules for details.
   - Administer PPSV to children aged 2 years or older with certain underlying medical conditions. See *MMWR* 2010;59(No. RR-11), available at http://www.cdc.gov/mmwr/pdf/rr/rr5911.pdf.

5. **Inactivated poliovirus vaccine (IPV).**
   through 18 years can count as part of the catch-up series. This dose can count as the adolescent Tdap dose, or the child can later receive a Tdap booster dose at age 11–12 years.

10. **Human papillomavirus (HPV) vaccines (HPV4 [Gardasil] and HPV2 [Cervarix]).**
    - Administer the vaccine series to females (either HPV2 or HPV4) and males (HPV4) at age 13 through 18 years if patient is not previously vaccinated.
    - Use recommended routine dosing intervals for vaccine series catch-up; see Figure 2 ("Recommended immunization schedule for persons aged 7 through 18 years").

Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online (http://www.vaers.hhs.gov) or by telephone (800-822-7967). Suspected cases of vaccine-preventable diseases should be reported to the state or local health department. Additional information, including precautions and contraindications for vaccination, is available from CDC online (http://www.cdc.gov/vaccines) or by telephone (800-CDC-INFO [800-232-4636]).



Guidance for hortage

The following are sample schedules for completing a series using Pediarix (DTaP-IPV-HepB) and Hib vaccines for children previously vaccinated with Pentacel (DTaP/IPV-Hib).

- When using combination vaccines, ensure that minimum intervals between doses and the minimum age have been met for each of the component vaccines.

1 prior dose of Pentacel

Birth	1 month	2 months	4 months	6 months	12-15 months	15-18 months	4-6 years
HepB	HepB		Pediarix	Pediarix*			
		Pentacel				DTaP**	DTaP
							IPV
			Hib	Hib	Hib		

2 prior doses of Pentacel

Birth	1 month	2 months	4 months	6 months	12-15 months	15-18 months	4-6 years
HepB	HepB			Pediarix			
		Pentacel	Pentacel			DTaP**	DTaP
							IPV
				Hib	Hib		

3 prior doses of Pentacel

Birth	1 month	2 months	4 months	6 months	12-15 months	15-18 months	4-6 years
HepB	HepB			HepB			
		Pentacel	Pentacel	Pentacel		DTaP**	DTaP
							IPV
					Hib		

*Administration of a 4th dose of HepB vaccine is permissible when a combination vaccine containing HepB is given after the birth dose.
** The 4th dose of DTaP can be given as early as 12 months of age, provided at least 6 months have elapsed since the 3rd dose. Off label Advisory Committee on Immunization Practices recommendation.

Vaccine	Use for
DTaP	Any dose in the 5-dose series for children 6 weeks through 6 years of age
DTaP/IPV/HepB (Pediarix)	Doses 1, 2, and 3 of DTaP and IPV; any dose of HepB for children 6 weeks through 6 years of age
HepB	Any dose in the HepB series for children at birth and older
Hib (ActHIB, PedvaxHIB)	Any dose in the Hib series for children 6 weeks through 4 years of age
Hib (Hiberix)	The last (booster) dose in the Hib series for children 12 months* through 4 years of age
IPV	Any dose in the polio series for persons 6 weeks of age and older
DTaP/IPV (Kinrix)	Dose 5 of DTaP and dose 4 of IPV for children 4 through 6 years of age Do **not** use for doses 1 through 3 of DTaP and IPV or dose 4 of DTaP

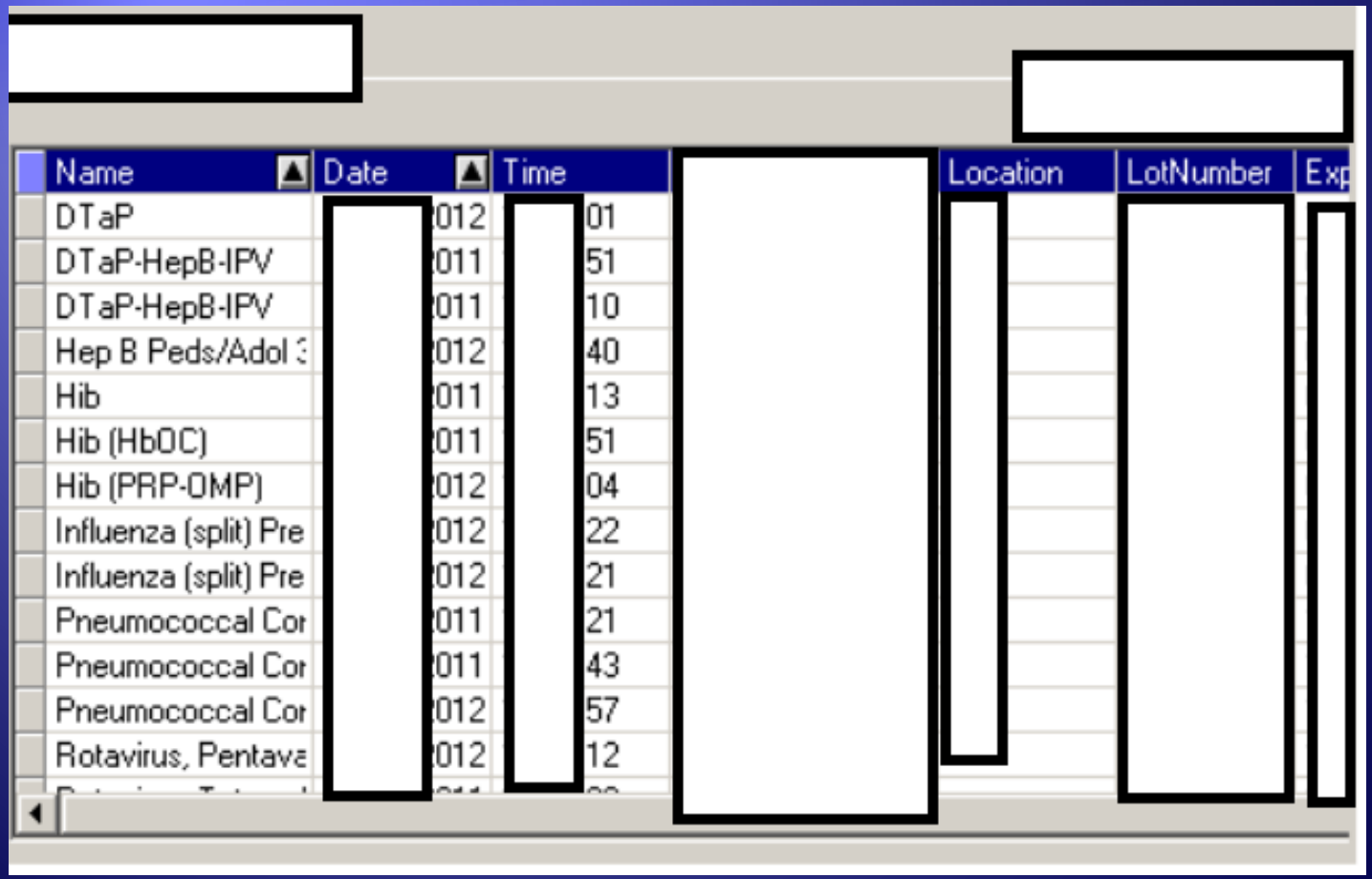
*Off label Advisory Committee on Immunization Practices recommendation

Vaccine errors

	Name	Date	Time	Given By
	DTaP-HepB		13:51:16	
	Polio (IPV)		13:51:28	

	Name	Date	Time
	DTaP-HepB-IPV		13:51:16
	Polio (IPV)		13:51:28

Long list of combo vaccines with various sorting options.



Usability Guidelines- Vaccines

- VA. Allow ordering vaccination via reminder
- VB. Allow data entry for vaccinations given at other institutions
- VC. Support display and tracking of components of combination vaccines
- VD. Display the days prior vaccinations were given and support alerts for recommended minimum/ideal/maximum intervals between vaccinations
- VE. Allow sorting of vaccination data by multiple fields

What do we need?

- Growth Charts
- Mg/kg dosing
- Vaccines
- **Age related normal values**
- Privacy
- Newborn issues
- Radiology issues
- Patient ID

Pediatric Normal Values

- Wt
- Ht
- BSA
- BMI
- Age
- Gestational age

Norr

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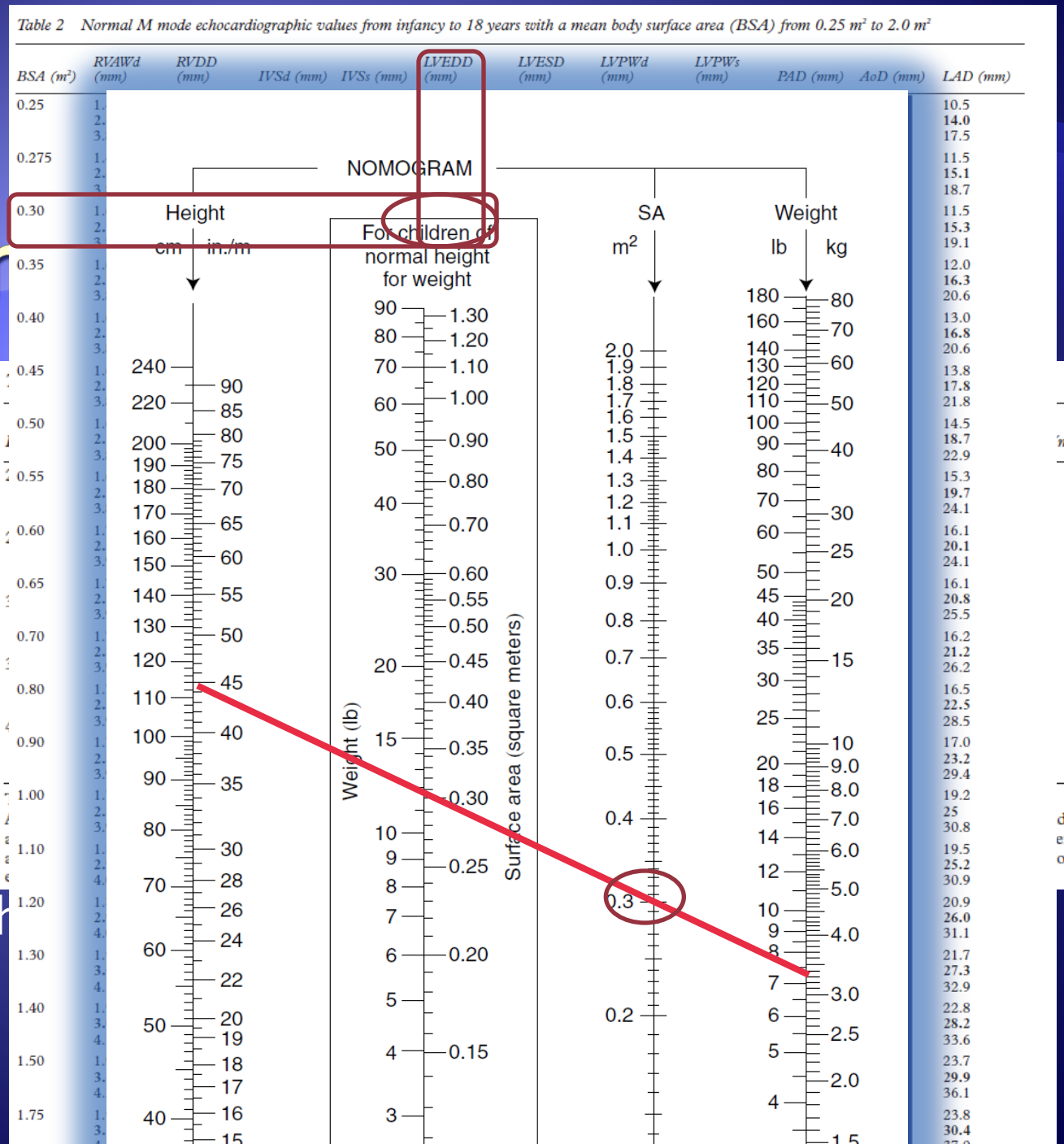
- One
  mak
- Adu
- Ped
  - If th

Table 2 Normal M mode echocardiographic values from infancy to 18 years with a mean body surface area (BSA) from 0.25 m² to 2.0 m²

BSA (m²)	RVAWd (mm)	RVDD (mm)	IVSd (mm)	IVSs (mm)	LVEDD (mm)	LVESD (mm)	LVPWd (mm)	LVPWs (mm)	PAD (mm)	AoD (mm)	LAD (mm)
0.25	1.	2.	3.								10.5 14.0 17.5
0.275	1.	2.	3.								11.5 15.1 18.7
0.30	1.	2.	3.								11.5 15.3 19.1
0.35	1.	2.	3.								12.0 16.3 20.6
0.40	1.	2.	3.								13.0 16.8 20.6
0.45	1.	2.	3.								13.8 17.8 21.8
0.50	1.	2.	3.								14.5 18.7 22.9
0.55	1.	2.	3.								15.3 19.7 24.1
0.60	1.	2.	3.								16.1 20.1 24.1
0.65	1.	2.	3.								16.1 20.8 25.5
0.70	1.	2.	3.								16.2 21.2 26.2
0.80	1.	2.	3.								16.5 22.5 28.5
0.90	1.	2.	3.								17.0 23.2 29.4
1.00	1.	2.	3.								19.2 25 30.8
1.10	1.	2.	4.								19.5 25.2 30.9
1.20	1.	2.	4.								20.9 26.0 31.1
1.30	1.	3.	4.								21.7 27.3 32.9
1.40	1.	3.	4.								22.8 28.2 33.6
1.50	1.	3.	4.								23.7 29.9 36.1
1.75	1.	3.	4.								23.8 30.4

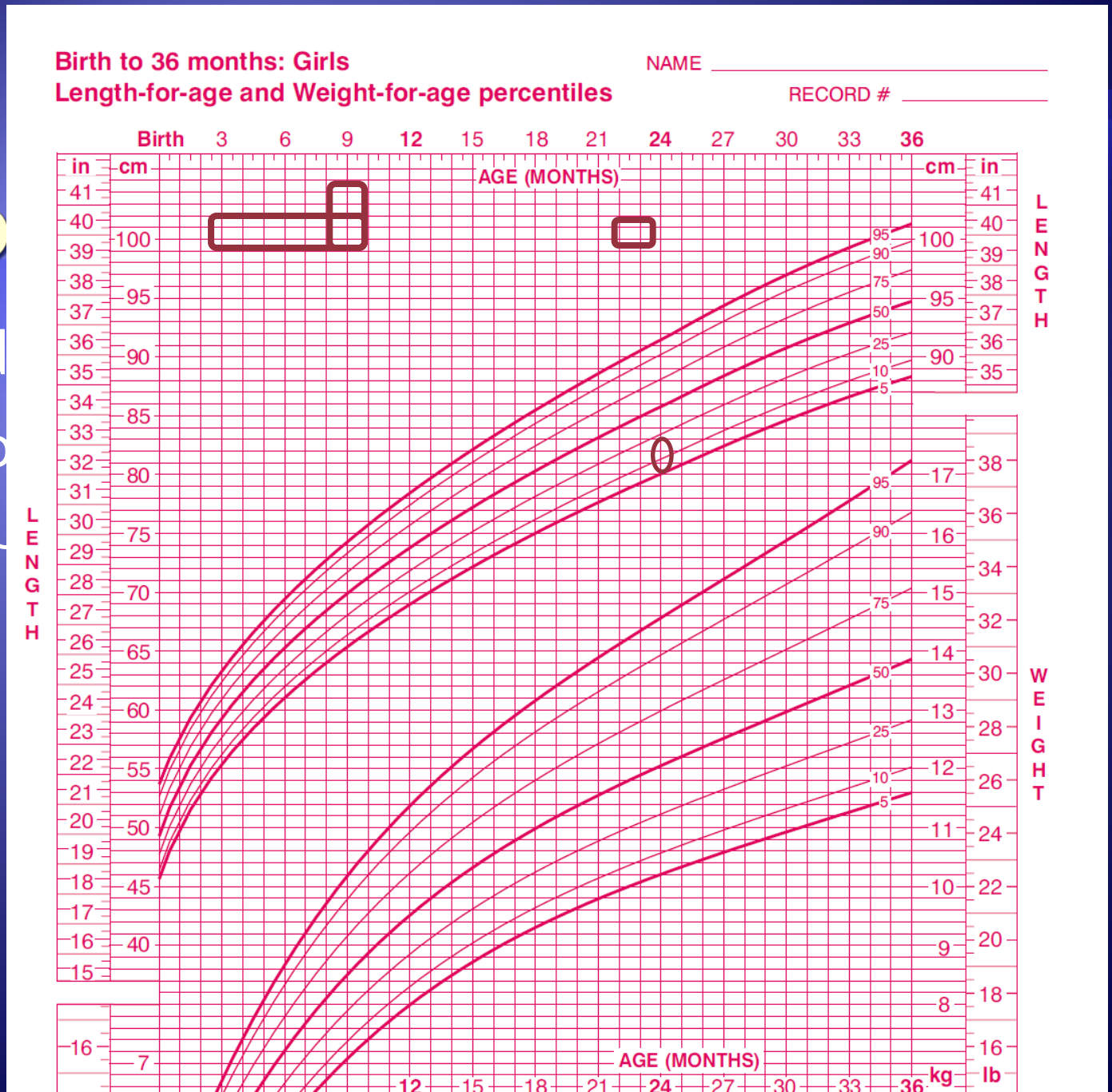


mm)	LAD (mm)
	8.3 11.5 14.7
	8.5 12.1 15.6
	9.4 12.6 15.8
	10.2 13.2 16.2
	10.5 13.7 16.9

d systole; LAD, left
erior wall thickness
or wall thickness at

Blo

- Ad
- No
  - U


Birth to 36 months: Girls
Length-for-age and Weight-for-age percentiles
NAME
RECORD #
Birth 3 6 9 12 15 18 21 24 27 30 33 36
AGE (MONTHS)
in cm
LENGTH
95 90 75 50 25 10 5
WEIGHT
kg lb
AGE (MONTHS)

Usability Guidelines- Normal

- VIA. Support communications to change inaccurate normal ranges
- VIB. Enable seeing where normal ranges originated from (adult normal, pediatric normal, weight-based normal, age-based normal, body surface area normal)
- VIC. Enable integrated view of lab results from different sources
- IIIE. Display normal ranges for medication doses and lab values based upon weight, height, Body Surface Area, Body Mass Index, and age information

What do we need?

- Growth Charts
- Mg/kg dosing
- Vaccines
- Age related normal values
- **Privacy**
- Newborn issues
- Radiology issues
- Other…..

Privacy

- Certain parts of your chart are handled differently
- Teenagers have special rights to protect their privacy.

What is the difference between……

- Private Note
- Confidential Note
- Secure Note
- Internal Note
- Sticky Note
- What happens when you export the chart.

Guidelines- Privacy

- VIIIA. Support documenting consent agreements for non-traditional parents (children in foster or custodial care, adults who are not parents, adoptive parents, and guardians)
- VIIIB. Support "break the glass" privacy law violations for urgent care situations
- VIIIC. Make easily visible the rules that describe what information can be viewed , printed, and transferred with different levels/types of security on notes and all text in the chart

What do we need?

- Growth Charts
- Mg/kg dosing
- Vaccines
- Age related normal values
- Privacy
- **Newborn issues**
- Radiology issues
- Patient ID

States Report Hundreds of Medical Errors

States Report Hundreds of Medical Errors in Perinatal Hepatitis B Prevention

Avoid tragic mistakes—vaccinate newborns against HBV in the hospital

- "In 2000, we had 25 cases where the babies of positive moms did not receive HBIG at birth. Three of these babies are now infected. In one of the cases, the mother's status was erroneously marked as unknown, another was marked as negative, and in one the status was correctly marked, but the HBIG was still not given."

infants of HBsAg-positive mothers (including premature infants) should receive hepatitis B vaccine and HBIG within 12 hours of birth.

Case report examples:

- "The mother had been diagnosed with chronic hepatitis B in 1994. In her prenatal record she was documented to be HBsAg and HBeAg positive, and this information appeared in several places on the record that was sent to the hospital. Despite this, her baby did not receive HBIG or the first dose of hepatitis B vaccine in the hospital. In fact, the hepatitis B vaccine order was crossed out in the infant's chart. Follow-up

mothers of unknown HBsAg status were not properly prophylaxed.

Recommendation of CDC, AAP, AAFP, and ACOG: If the mother's HBsAg status is unknown, infants must receive hepatitis B vaccine within 12 hours of birth. For premature infants weighing less than 2kg, HBIG is also given. [Authors' note: It's not recommended to wait for the HBsAg lab result to determine your course of action. Order hepatitis B vaccine from the pharmacy and give it immediately—within 12 hours of birth.]

Case report examples:

- "The mother's positive lab result was not re-

that a copy of the mother's original HBsAg lab report be sent to the birthing hospital as part of the prenatal record. Labor and delivery units and nursery units should carefully review this original lab report to determine the appropriate course of action. Do not rely on transcribed results!

Case report examples:

- "We had a mom who was reported to the hospital as HBsAg negative by the prenatal care provider. Unfortunately, this woman was actually HBsAg positive. The baby did not receive HBIG or the birth dose of hepatitis B vaccine, and by three

1 minute old baby

- Before born can have
  - Surgery
  - Cath
  - Blood transfusion
- Needs work arounds to get post natal blood transfusion because does not have MRN

Usability Guidelines- Newborns

- VIIA. Enable efficient creation of newborn records
- VIIB. Support updating information that is initially inaccurate or unknown (e.g., last names, sex, weight)
- VIIC. Support the use of gestational age and corrected age for patient care (in addition to chronologic age)
- VIID Support efficient processes for administration of breast milk, including labeling and matching mother to baby to milk
- VIIE. Support connecting prenatal data (e.g., fetal imaging procedure) with post-birth data
- VIIF. Support efficient documentation of blood type
- VIIG. Support the use of alternative weights for dosing
- VIIH. Support conversion from Days of Life (DOL) to Days Old (DO) during care transitions
- VIII. Display weights in grams and ages in days, weeks, or months under thresholds

What do we need?

- Growth Charts
- Mg/kg dosing
- Vaccines
- Age related normal values
- Privacy
- Newborn issues
- **Radiology issues**
- Patient ID

Radiology

- Kids often are sedated/intubated for radiology procedures
- Ionizing radiation can be more important issue due to rapid cell growth
- Entire lifetime to have affect.
- Dose of contrast agents based on mg/kg
- More variation in what is typically ordered
- Need to keep track of radiation exposure

Usability- Radiology

- IXA. Support physician-radiologist communications to clarify which scan variation to order for high-stakes sedation and intubation procedures.
- IXB. Support alerts for contraindicated procedures
- IXC. Monitor cumulative radiation exposure over time

What do we need?

- Growth Charts
- Mg/kg dosing
- Vaccines
- Age related normal values
- Privacy
- Newborn issues
- Radiology issues
- **Patient ID**

Patient ID

- All Babies born the same Day
- BG SMITH----> Sara Jones
- BG SMITH----> Rebecca Smith-→Rebecca Porter
- BB Chen-------→ John Chan
- BB Chen-------→ John Chen
- BG Martinez-→ Sarah Rabinowitz
- BG Martinez→ Sheila Rivera
- BG DOE→BG Harrison →Amanda Kuo

Usability-Patient ID

- IA. Use unique patient identification numbers that are not based upon social security numbers
- IB. Include photographs of newborns with primary caregivers for patient identification
- IC. Include age, gestation, gender, and weight on constant-identification banner headers on all screens
- ID. Distinguish between newly generated and copied information

In Summary

- Pediatric patients have special requirements
- Pediatric patients have critical special functions required in EHR
- Absense, difficult to use or malfunctioning of those functions can cause errors
- There are human factor solutions to these important issues

Thank you

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- ONC
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The End