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# THE PROMISE OF EMRS

# Who am I

- ◆ Clinical Pediatric Cardiologist
- ◆ Computer geek
  - ◆ Ad Hoc IT department for my Practice, hospital departments, Mom , Dad, first , second and third degree relatives, .....
- ◆ Early adopter of HIT
- ◆ Have worked on deployment of all aspects of HIT

# Examples of Usability

- ◆ There are many examples of poor usability which have potential to CAUSE medical errors in HIT systems
- ◆ I am bringing one example to show that there are ways to improve usability
- ◆ The Pediatric Growth Chart

# Not about a **SPECIFIC** EMR

- ◆ I have used or tested dozens of EMRs
- ◆ The issues I will discuss today are NOT just anecdotes but are emblematic of key issues
- ◆ I have discussed this with hundreds of end users, the VAST MAJORITY feel that poor EMR usability can increase the potential of errors during patient care

# Growth Chart

- ◆ Critical component of any pediatric chart
- ◆ So important , that when paper charts are being used, practices can be cited for
  - ◆ Not having growth chart displayed on first page
  - ◆ Not having accurate updated data on growth chart

# Promise of EMR

- ◆ Growth Chart for EMR should be all that paper charts offer, plus:
  - ◆ More accurate-- as plotted by computer
  - ◆ Able to do calculations such as BSA (body surface area), BMI (body mass index)
  - ◆ Able to alert when HT/WT (height/ weight) ratio not typical
  - ◆ Able to alert when % change in meaningful way
  - ◆ Programmable for future issues

# EMR

- ◆ I will display real images from an EMR
- ◆ Similar issues may affect all EMR products from any vendors
- ◆ These issues can potentially lead to critical errors that may have profound impact on patients

It is not at all uncommon for a child to weigh from nine to twelve pounds at the time of birth, and individual instances are on record where the scales have shown a new-born child to weigh as high as twenty pounds. The average length of an infant at the time of birth is about eighteen inches, but there is considerable variation

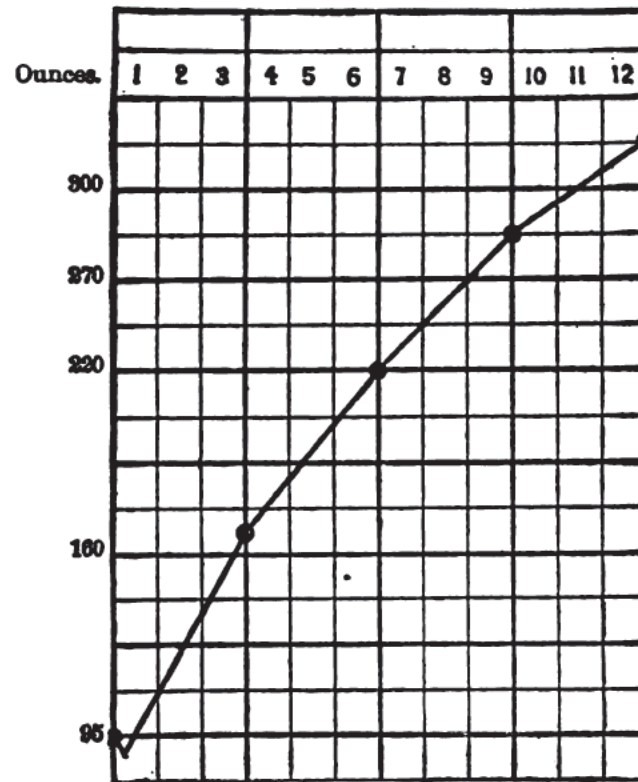


FIG. NO. I.

TWELVE MONTHS' WEIGHT-CHART.

tions of the body. After the first week the child shows some increase in weight, and during the first six months of its life grows very rapidly. It is not at all uncommon for it to double in weight during the first six months, after which its growth is considerably slower.

here as in the matter of weight. The vigor of an infant is better determined by its strength and muscular resisting ability than by its size. During the first week of life there is some falling off in weight, this amounting from several ounces to a pound or more in individual instances, and being due to the waste of tissues incident to the first performance of efforts at breathing and the carrying on of the necessary functions

# History of growth chart

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M

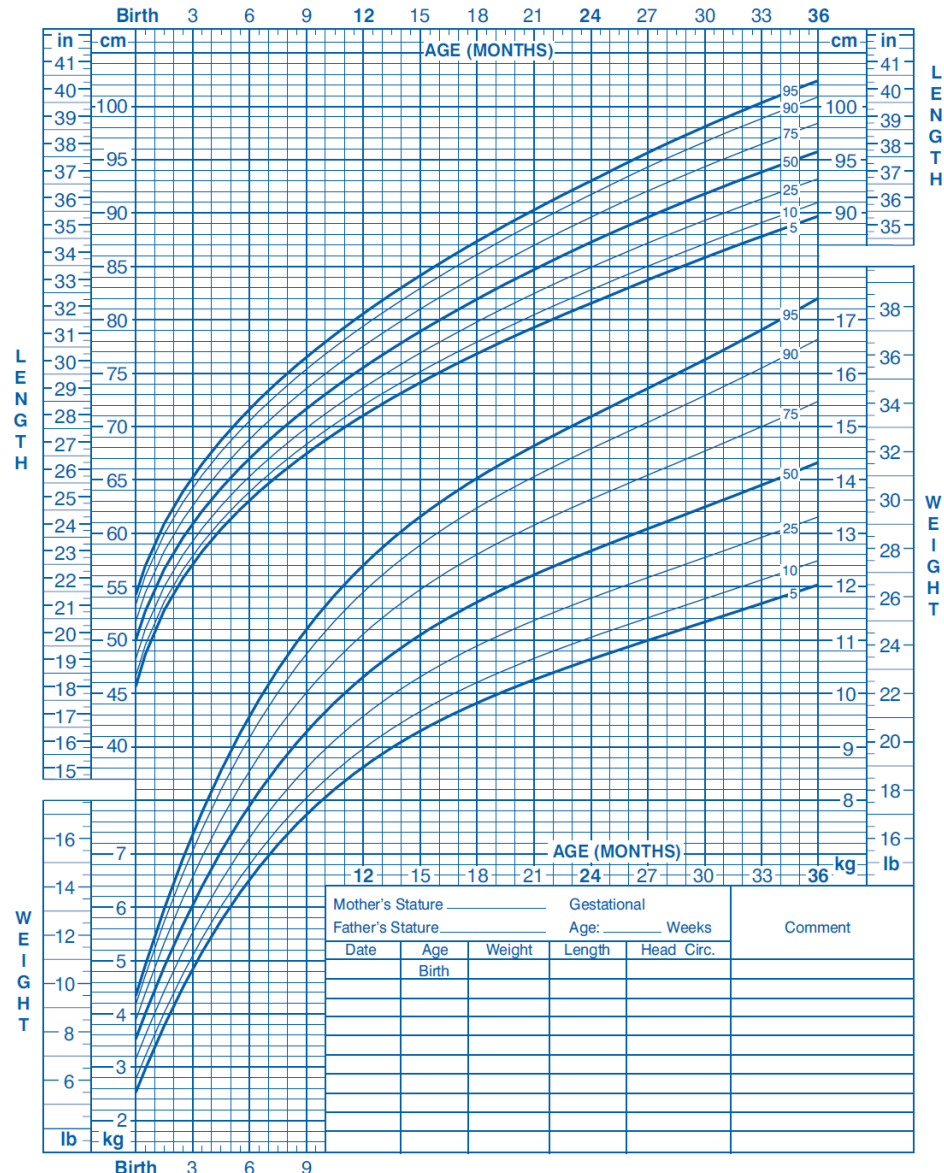


# CDC (Center for Disease Control) Growth Chart

Birth to 36 months: Boys  
Length-for-age and Weight-for-age percentiles

NAME \_\_\_\_\_

RECORD # \_\_\_\_\_



Published May 30, 2000 (modified 4/20/01).  
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).  
<http://www.cdc.gov/growthcharts>



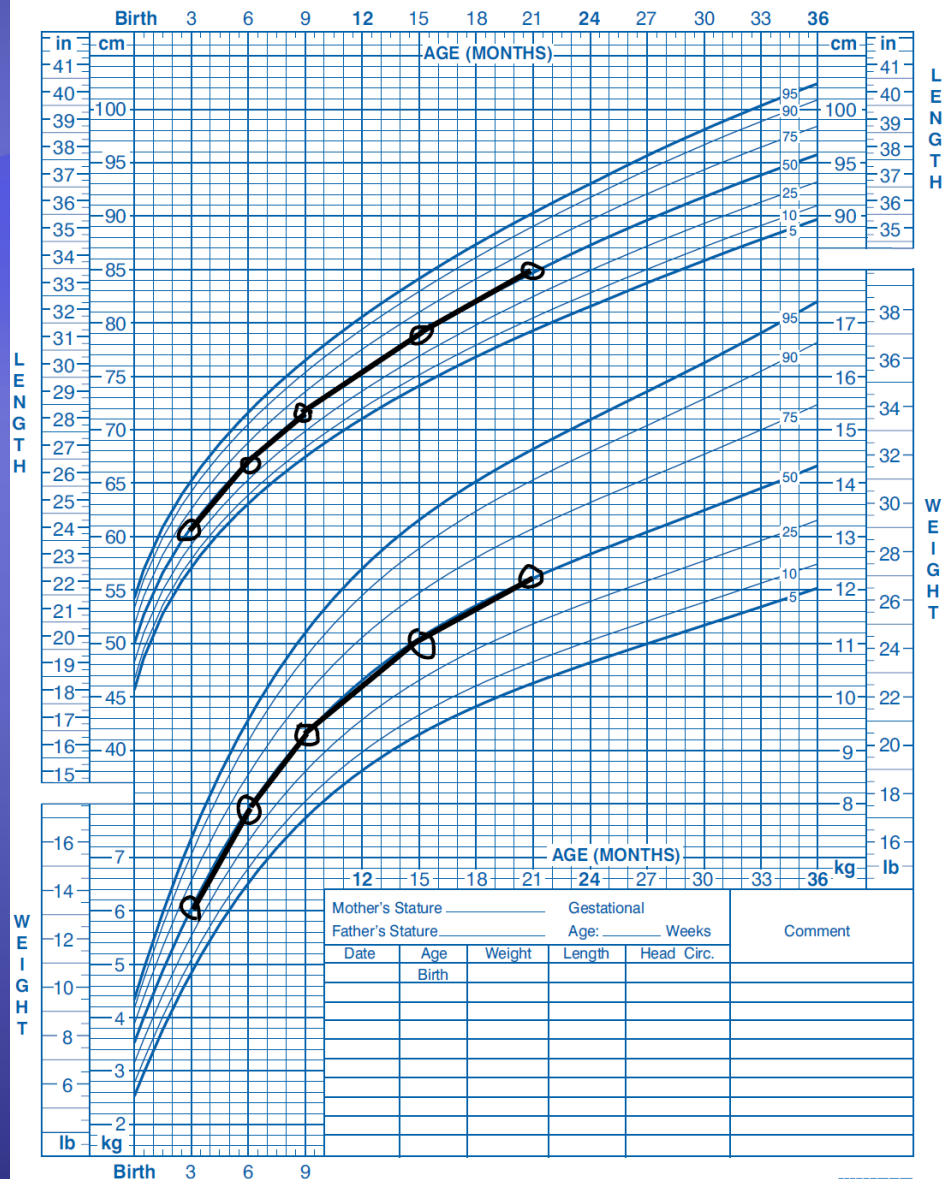
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# What does a Normal Growth Chart Look Like?

## Birth to 36 months: Boys Length-for-age and Weight-for-age percentiles

NAME \_\_\_\_\_

RECORD # \_\_\_\_\_



Published May 30, 2000 (modified 4/20/01).  
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).  
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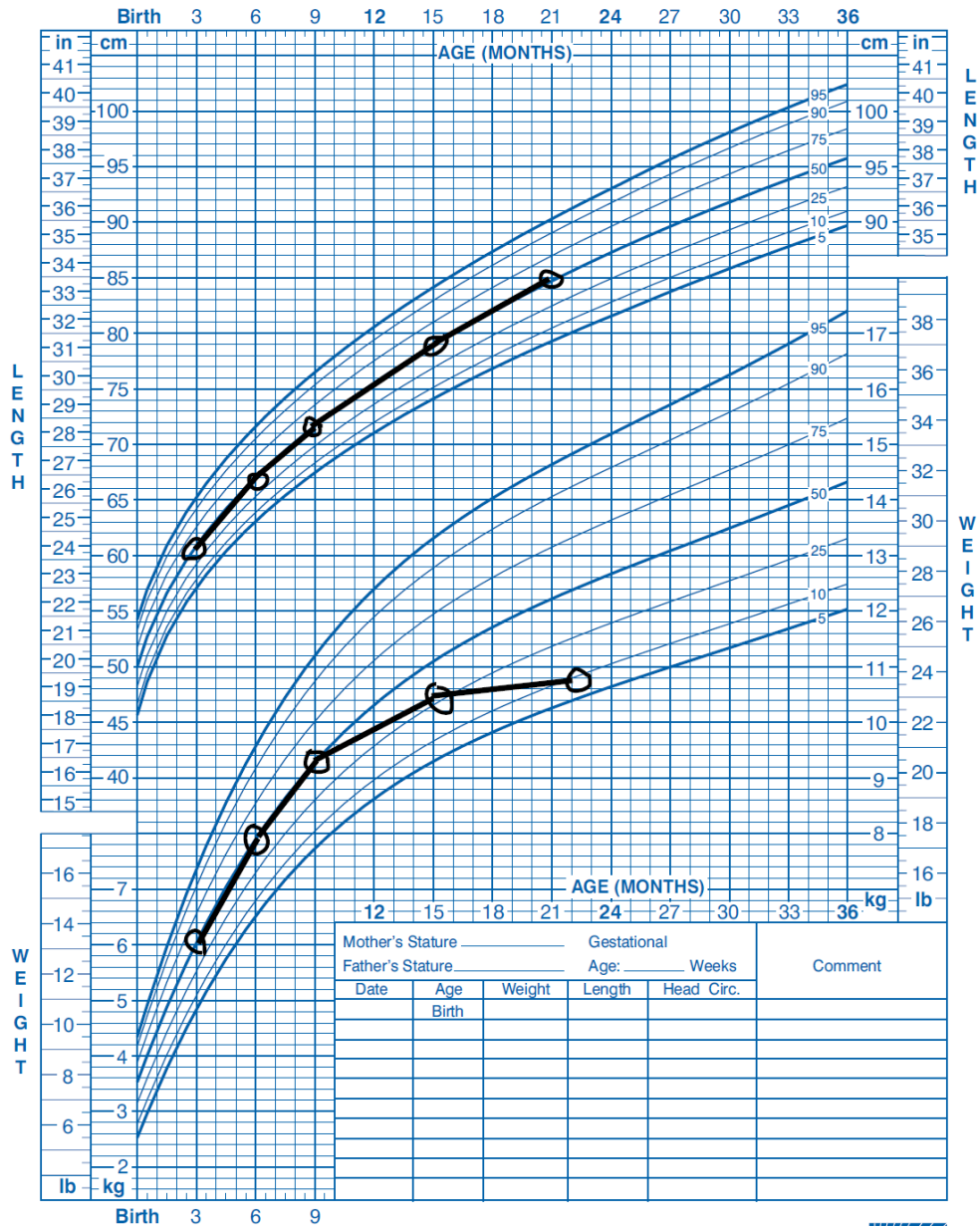
# Growth Chart with (CHF) Congestive Heart Failure

Birth to 36 months: Boys

NAME \_\_\_\_\_

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

RECORD # \_\_\_\_\_



Published May 30, 2000 (modified 4/20/01).

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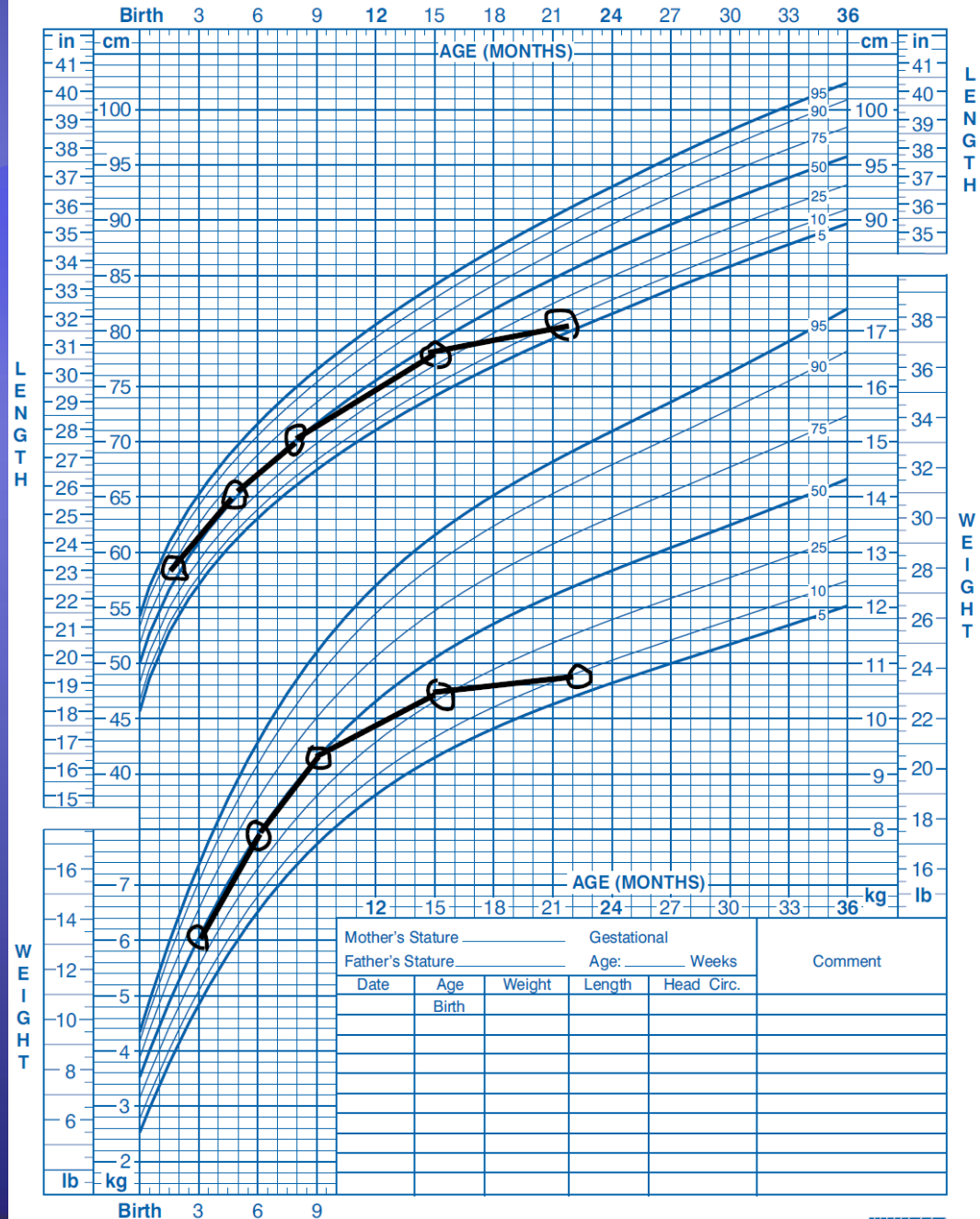
# Growth Chart

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

Birth to 36 months: Boys  
 Length-for-age and Weight-for-age percentiles

NAME \_\_\_\_\_

RECORD # \_\_\_\_\_



# Paper Growth Chart

- ◆ Notice height and weight both on same page
- ◆ Takes “one move” (open chart) to see the growth chart
- ◆ Problems with “paper growth chart” are clear and similar to all paper medical records

# Dream of EMR Growth Chart

- ◆ Like Paper growth chart but better
- ◆ Easier to scale and customize
- ◆ Can also include other calculations important to doctors, such as Body Surface Area (BSA) and Body Mass Index (BMI)
- ◆ Can alert to deviations in growth percentiles



# EMR growth chart

Poor legibility for crucial data

Height  Length Selection

This critical function (EMR) should be displayed prominently on the screen automatically in order to support a doctor in the decision making. In this EMR it takes 8 clicks instead of 1 to get g displayed

This adds complexity

Crucial data is not displayed

Apply %tile to Vitals

Print

Preview

Close

Normal View

Preterm View

Weight-Age Chart:Girls (Birth to 36 months)

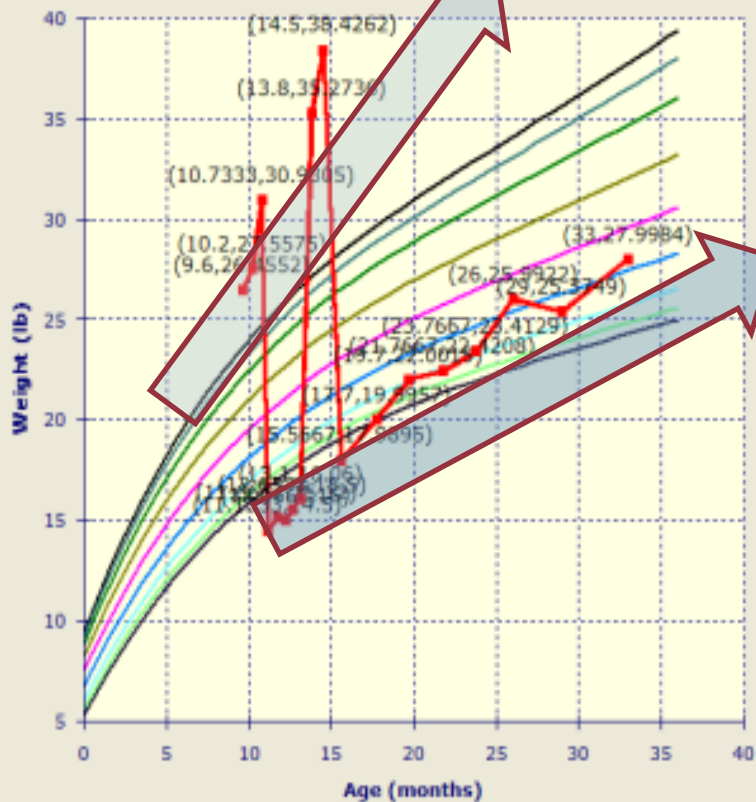


Chart Type

In/lb  cm/kg

Height  Length

Print/Preview Selection

- Wt./Age Birth-36 mos.
- Length/Age Birth-36 mos.
- Wt./Length 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

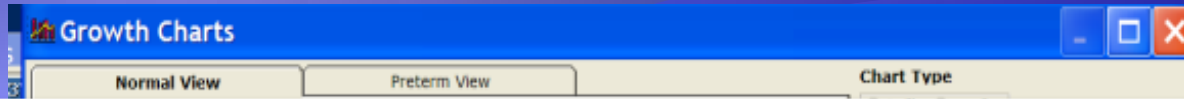
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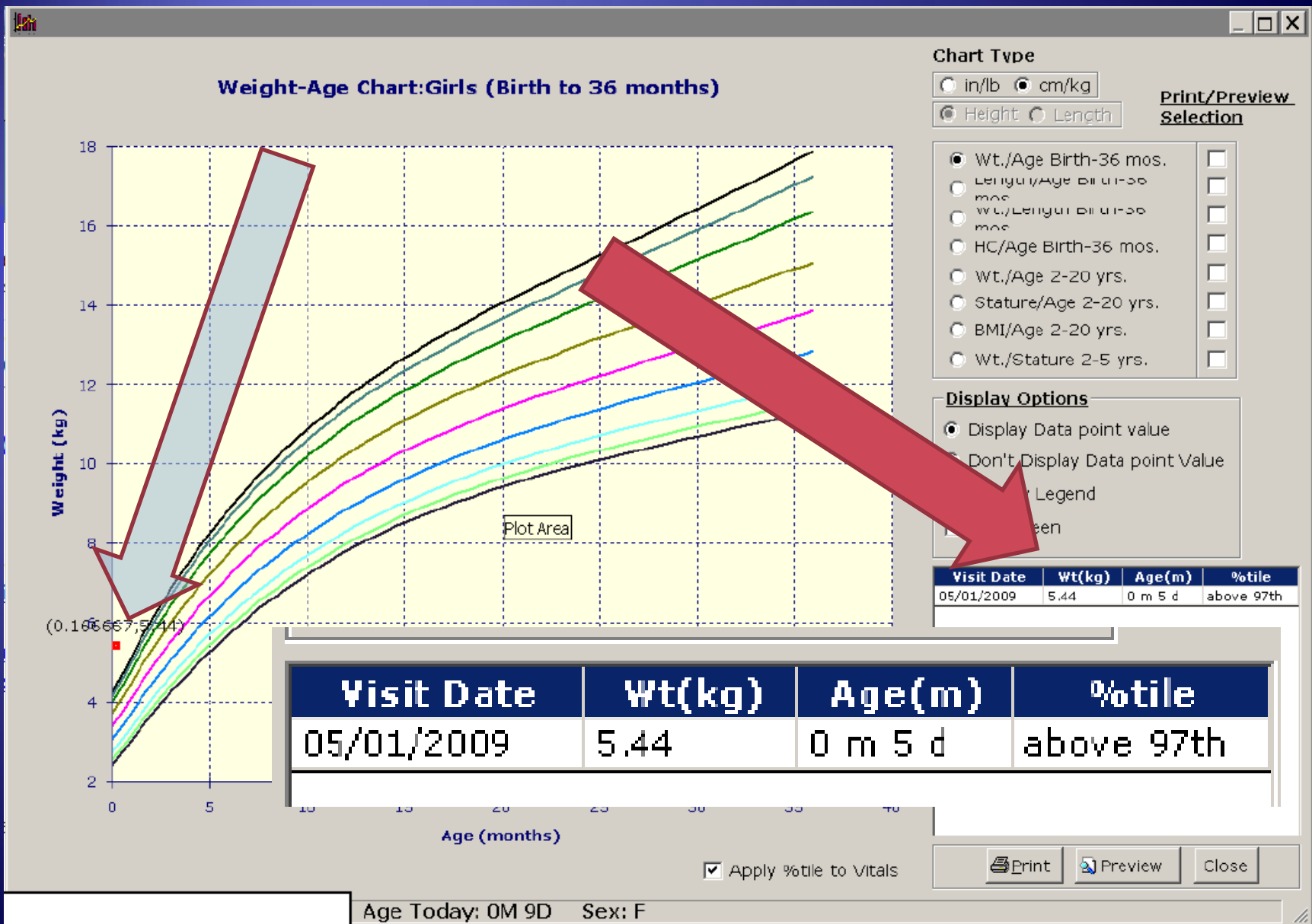




“I am  
glad  
my car  
does not  
drive like this”

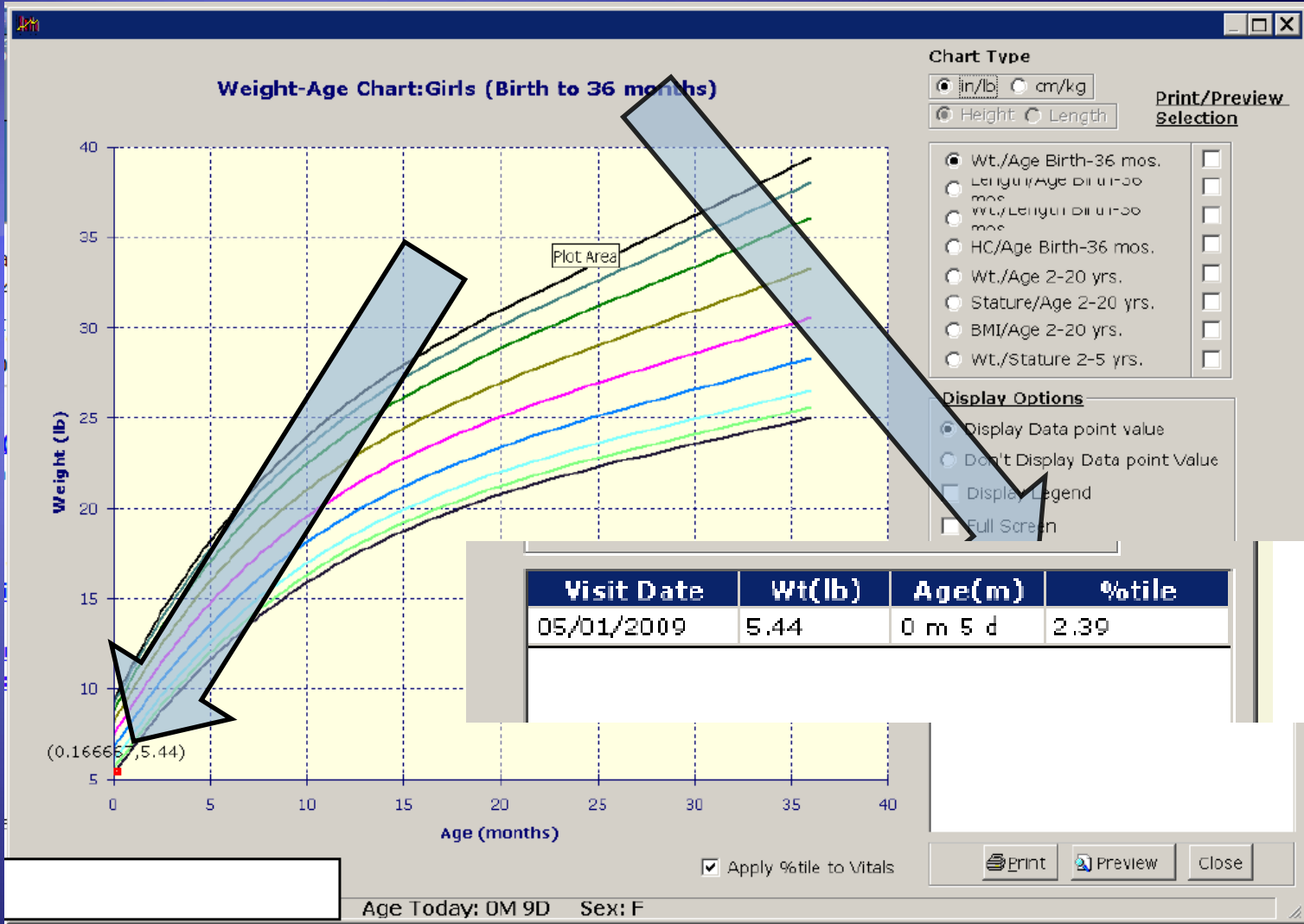


This is critical,



# Hypothetical scenario

- ◆ Patient weights 5.4 kg
- ◆ Lets say we start the patient on digoxin
- ◆ Dose is 10 mcg/kg/day
- ◆ 50 mc per day
  
- ◆ Patient dies , and the cause is.....OVERDOSE!  
Error not caught by the doctor...we are all on alert for a WORKAROUND for the doctor



# REASON

- ◆ Pa of
- ◆ 5- ca
- ◆ Di d
- ◆ Pa
- medi

Th

EMR alerts me not to trust it.

Increasing my cognitive bandwidth with manual calculations in addition to the computer calculations

# In Summary

- 1) EMRs have a great potential to improve quality of health care, however
- 2) Poor usability of current EMRs have the potential to cause medical errors
- 3) Our goal is to ensure that that NIST usability protocol is sensitive to these potential errors
- 4) We should be able to test and identify critical usability issues that can cause these medical errors
- 5) Test the system before it is fielded, and identify the critical usability issues that potentially can cause medical errors like those described in this presentation