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

Mother’s Stature

Father’s Stature

Gestational Age

Weeks

Comment

Date

Age

Weight

Length

Head Circ.

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
What does a Normal Growth Chart Look Like?
Growth Chart with (CHF) Congestive Heart Failure
Growth Chart constitutional growth issue (growth issues caused by genetic mutation or syndromes)
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

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 growth displayed.

Crucial data is not displayed

Poor legibility for crucial data

This adds complexity
“I am glad my car does not drive like this”
This is critical,
Patient weights 5.4 kg

Let's 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
Patient weighs 5.5 lbs

\[
\frac{5.5}{2.2} = 2.5 \text{ kg}
\]

Digoxin 10 mcg/kg = 25 micrograms

Patient received double the dose of a cardiac medicine...

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REASON

- Patient's weight is critical
- 5.5 lbs
- Digoxin dosage
- Double dose

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