Re-Design of EHR Screens and Data Elements to Optimize Use by Providers

ABSTRACT

Data quality issues are a major obstacle to the effective implementation and use of new EHR clinical data sources in the Vermont Children's Hospital (VCH), which is a National Association for Children's Hospitals and Related Institutions-accredited children's hospital within Fletcher Allen Health Care. An interdisciplinary EHR User Group partnered with the Jeffords Quality Institute to identify and address data quality and consistency issues for newborns and infants within the EHR as well as within their own clinical processes. The means and mechanism to overcome these data quality problems included:

- Identification of inconsistencies in data field use through manual and electronic matching audits (human factors analysis);
- Created a data field documentation tool to track and compare data element use throughout the various screens, flow sheets and outputs used by nurses and physicians (design element tracking);
- Identified the need for comparison reports to track inconsistent data recording patterns (data content quality); and
- Development of a structure for ongoing data extracts for patient results to use for education of residents and attending physicians to improve clinical quality (data quality process improvement).

BIOGRAPHY

Paul T. Rosenau
Vermont Children's Hospital Director for Quality
Vermont Children's Hospital at Fletcher Allen Health Care

Paul Rosenau is the Vermont Children's Hospital Director for Quality and a practicing pediatric hospitalist in the University of Vermont Medical Group. He received his Doctorate of Medicine from Harvard Medical School in 2004, his Master of Science degree in Pollution Prevention and Cleaner Production from University of Massachusetts Lowell in 2003 and his Bachelor of Arts degree from Middlebury College in 1995. He completed his pediatric training with the University of Vermont Pediatric Residency Program in 2007.

Michael E. Nix
Clinical/Operations Measurement Group Manager
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Michael Nix is Manager of the Clinical and Operations Measurement Group of the James M. Jeffords Institute for Quality and Operational Effectiveness at Fletcher Allen Health Care, Burlington Vermont. With an academic background in Industrial Management (University of Alabama) and Systems Management (University of Southern California) he has worked for thirty one years in healthcare including quantitative analysis, quality management, clinical operations analysis, consulting, material management as well as general hospital data collection and distribution. He has also taught a variety of business, management and finance courses at the college level for over 24 years and is currently a Graduate Faculty member as well as a part-time Adjunct instructor at Champlain College in Burlington Vermont teaching Financial and Economic Modeling in both their undergraduate and MBA programs.

Hannah Avarraschild
Measurement Support Associate
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Hannah Avarraschild is a Measurement Support Associate within the Clinical and Operations Measurement Group of the Jeffords Institute for Quality at Fletcher Allen Health Care who provided technical support for the project. She came to the Measurement Group in 2004 after retirement from IBM and prior to that a career in the US Army. She is a 2007 winner of the Jeffords Institute Quality Cup Award as the outstanding member of the Institute staff. She also active in a number of community and national charities as well as being a long time volunteer at Fletcher Allen Health Care.

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MIT 5th Annual Information Quality Industry Symposium

July 14, 2011

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Fletcher Allen Health Care
Burlington, Vermont

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Our Vision

Fletcher Allen Health Care

Is committed to being a national model for the delivery of high-quality academic health care for a rural region

About Fletcher Allen

- 620 Licensed Bed Academic Tertiary Care Medical Center located in Burlington, Vermont
- Affiliated with University of Vermont College of Medicine
- Operates the **Vermont Children's Hospital** as a "Hospital within a Hospital"
- EPIC based EHR system "Inpatient go live" – June 2009 – our system is named ***"PRISM"***
- ***"PRISM"*** implementation completed in Clinic settings in November, 2010

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Statement of EHR Challenges

- EHR's systems are inherently complex
- A classic clash of cultures & tribal approaches (clinical vs. computer personalities)
- EHR screens tend to be very intense and visually overwhelming
- Inconsistencies in data identification can lead to very diverse issues
- EHR's are configured by humans!

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EHR Design & Build Considerations

"To err is human, but to really foul things up requires a computer."

~*Farmer's Almanac*, 1978

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Our Situation

- Pediatric clinicians were having trouble with certain aspects of PRISM
- Intuitive understanding that data wasn't consistently accurate due to design inconsistencies
- Hospital still in roll out mode – couldn't devote EHR implementation resources to fixes yet
- Decided to figure out the solutions themselves

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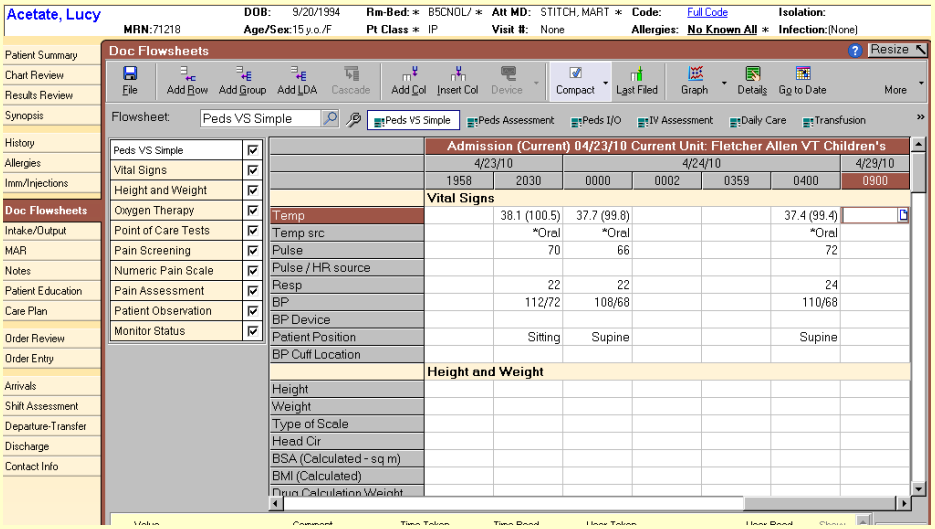
What Does a Typical EHR Screen Look Like? - A Sample Flow Sheet



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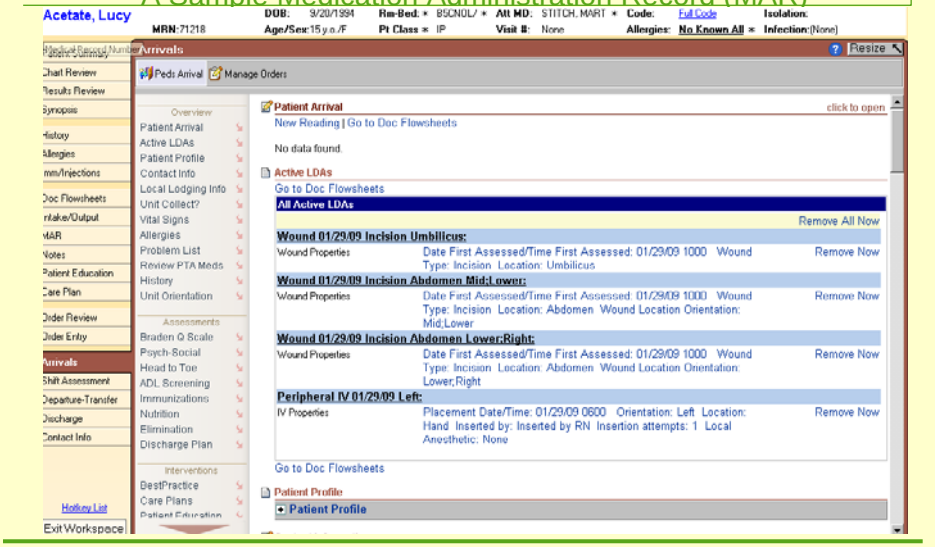
Another Typical Screen
A Sample Medication Administration Record (MAR)



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VCH Director for Quality

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First Activities

Newborn & Infant PRISM User Group (NIPUG)

Chicago, IL

10/09 — **11/09**

VCH Director for Quality

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So What Was The Issue?

- Elements in different places and they were not always the same data!
- A simple example
  - The head circumference of a newborn is very important information but doctors and nurses were not seeing the same information
  - When MDs saw blanks they thought data wasn't recorded or available
  - Nurses saw data that MD's didn't & vice versa!!

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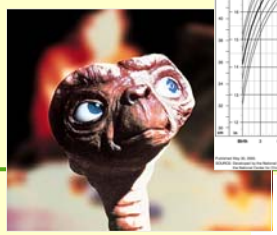
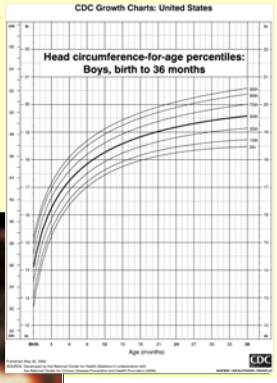
Row Harmonization

What is this infant's head circumference?
An operational/informatics challenge

- Standard measurement for all infants
- Frequently does not appear in the growth chart
- Does not appear in commonly used PRISM reports





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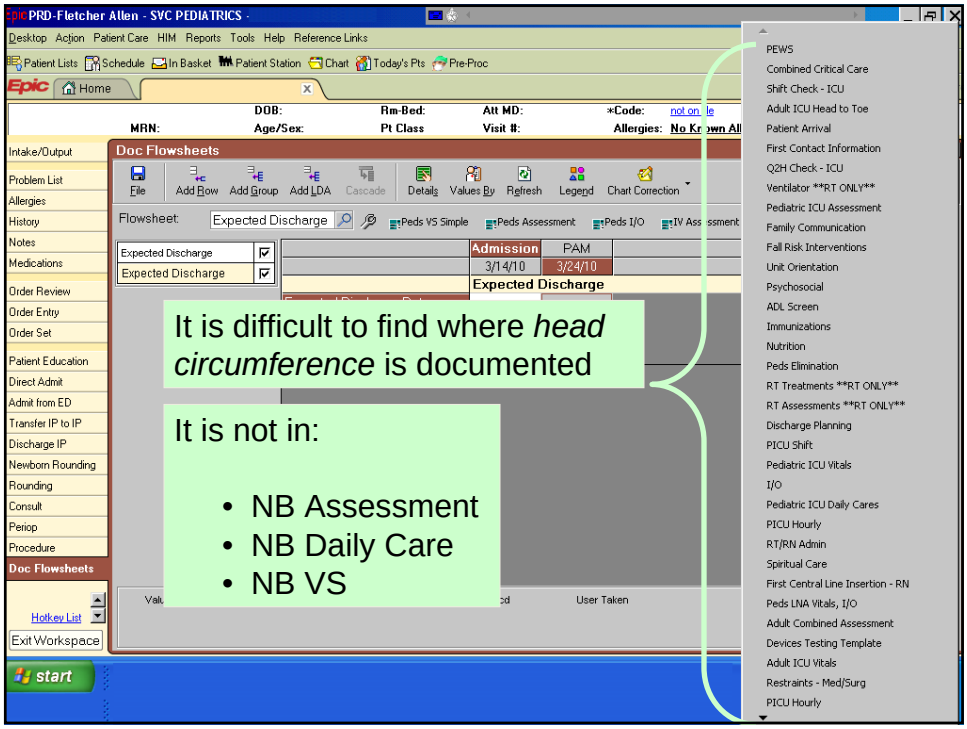

Understanding the Problem Was Crucial To Solving It

- Complexity of the screens was a factor – many screens had 50+ elements (fields, labels, tabs, drop downs, etc.)
- Sheer number of different screens in pediatric medicine environment made visualization difficult
- Diversity of care providers environments – Nurse screens looked different than MD screens, etc.

You Can't Fix What You Can't Describe

- The EHR system didn't have utilities to cross reference fields (limited Meta data)
- Pressing Needs:
  - To identify where same data elements were used in multiple locations
  - To identify when identically labeled elements were not same data
  - To understand hierarchy of data structures in screens used by caregivers
  - Understanding the differences in how various care providers were accessing data differently

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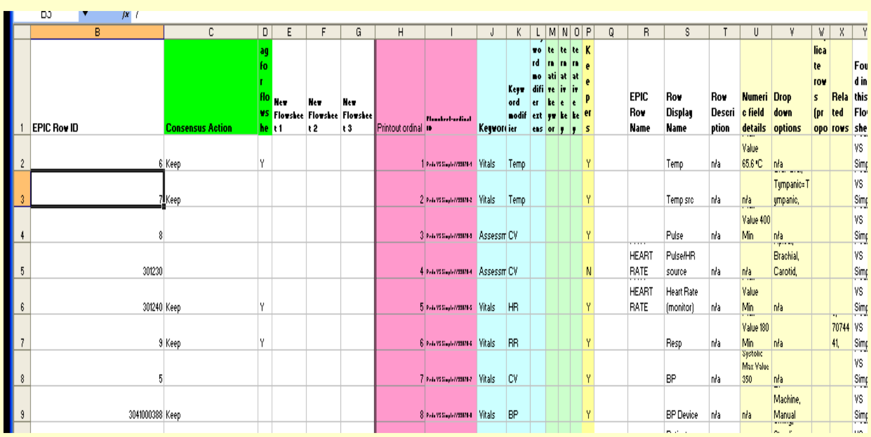
The Start – A Manual Inventory In Excel



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Sample Clinical Data Element Analysis – Manual Excel Format

Flow Sheet Num	Flow Sheet Name	Grp ID	Group Name	Row ID	Row Name	Comments
3041004058	Lactation Assessment	12155	Breast/Nipples	12156	Breast/Nipples (WDL)	Duplicate numbers due to row start removes
3041004058	Lactation Assessment	12155	Breast/Nipples	12157	Left Breast	
3041004058	Lactation Assessment	12155	Breast/Nipples	12157	Left Breast	
3041004058	Lactation Assessment	12155	Breast/Nipples	12158	Right Breast	
3041004058	Lactation Assessment	12155	Breast/Nipples	12158	Right Breast	
3041004058	Lactation Assessment	12155	Breast/Nipples	12159	Left Nipple/Areola	
3041004058	Lactation Assessment	12155	Breast/Nipples	12159	Left Nipple/Areola	
3041004058	Lactation Assessment	12155	Breast/Nipples	12165	Right Nipple/Areola	
3041004058	Lactation Assessment	12155	Breast/Nipples	12165	Right Nipple/Areola	
3041004058	Lactation Assessment	12155	Breast/Nipples	12166	Intervention	
3041004058	Lactation Assessment	3041000474	Latch	3041000474	Latch	OK
3041004058	Lactation Assessment	3041000825	Feeding Assistance	3041000825	Feeding Assistance	OK
3041004058	Lactation Assessment	3041000840	Position	3041000840	Position	OK

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The Excel Approach

- Enabled working team to collaborate on specifics – a big plus!!
- Allowed a lot of technical system "build" knowledge to develop
- Became a focal point for identifying issues
- The Big Negative - Quickly became cumbersome, not very good for advanced needs (queries, sorts, etc.) even when refined!!

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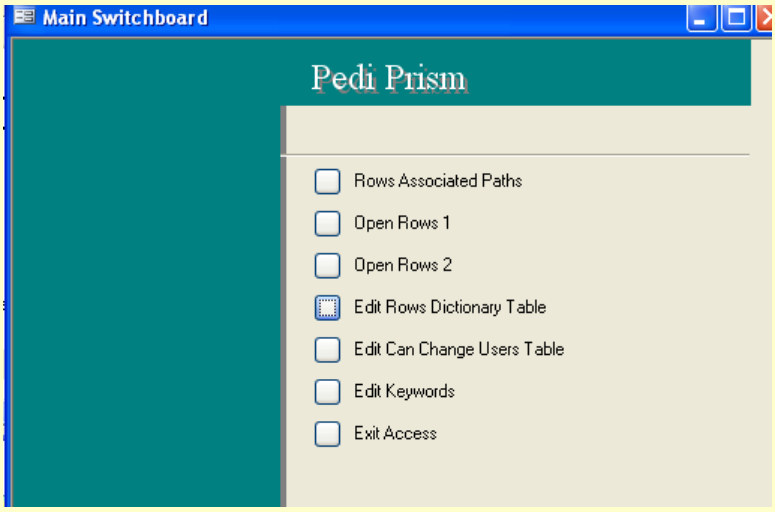
The Next Step – An Interactive Database



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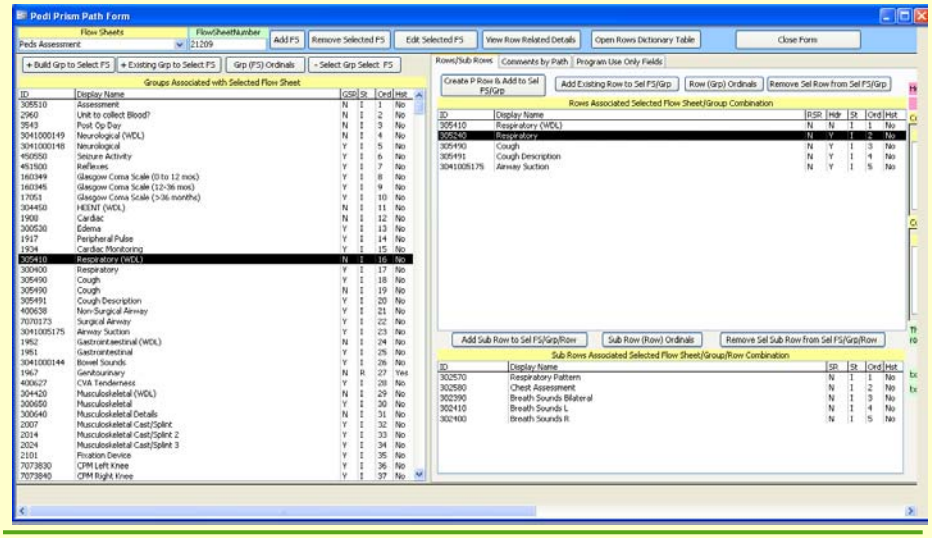
Building A Structure To Understand The Data



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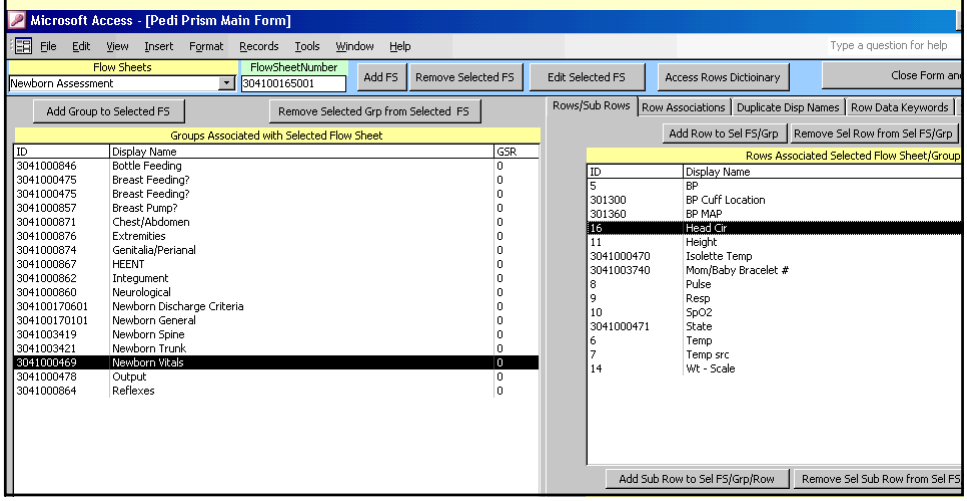
On the **Newborn Assessment** flowsheet…

in the ***Newborn Vitals*** group…

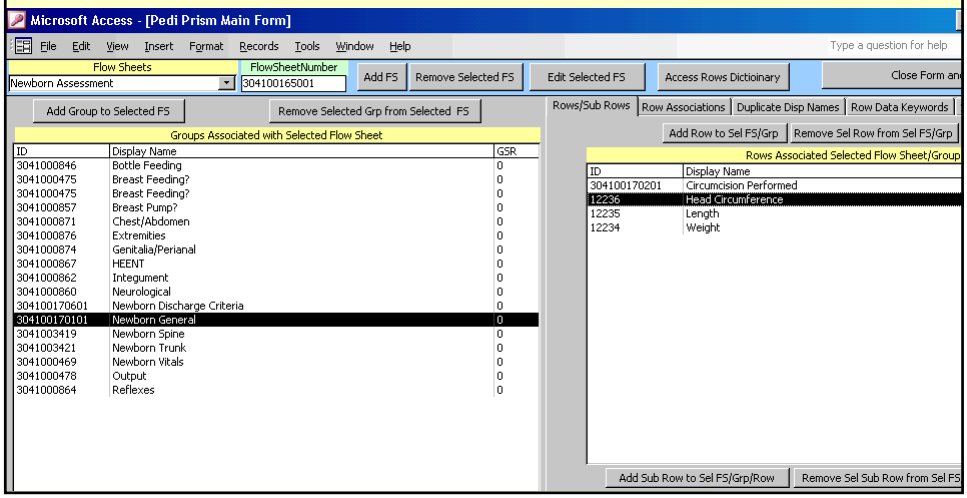
is a row called "**Head Cir**", where one can chart head circumference



On the **Newborn Assessment** flowsheet…

in the ***Newborn General*** group…

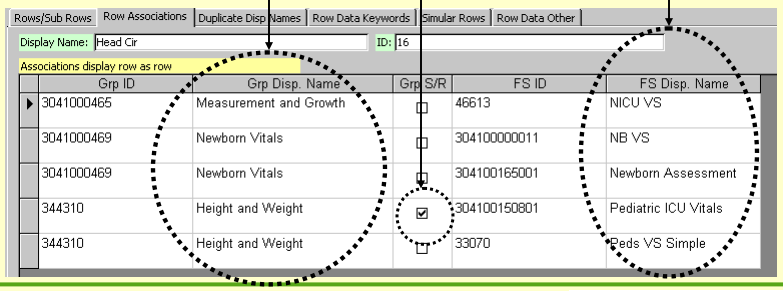
is a row called "**Head Circumference**", where one can chart head circumference



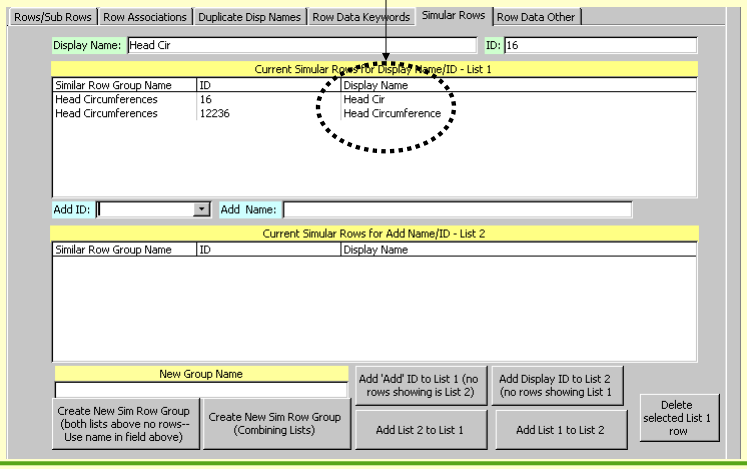
Actually "**Head Cir**" occurs on 5 flowsheets

under 3 different group names…

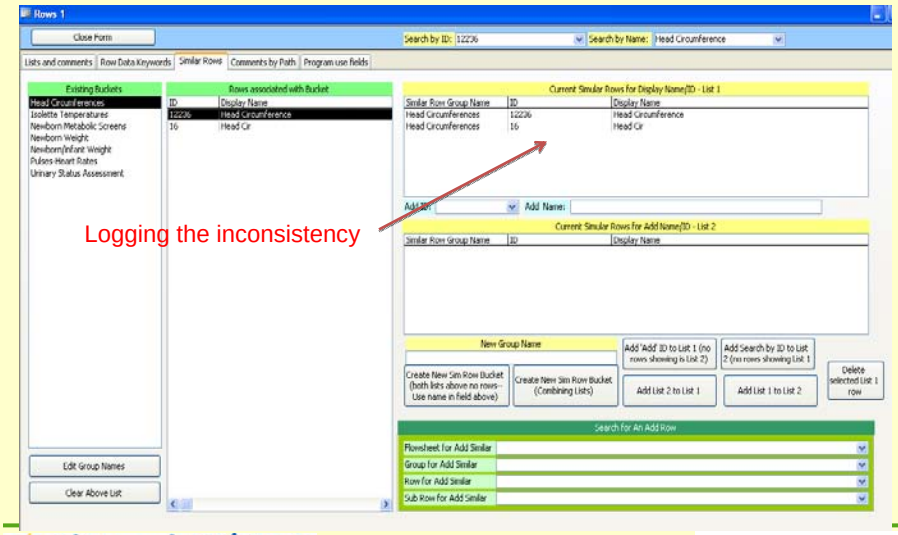
…one of which is hidden at flowsheet startup



NIPUG reviewers have found a true redundancy in competing rows



Tracking That "Head Circumference" Problem



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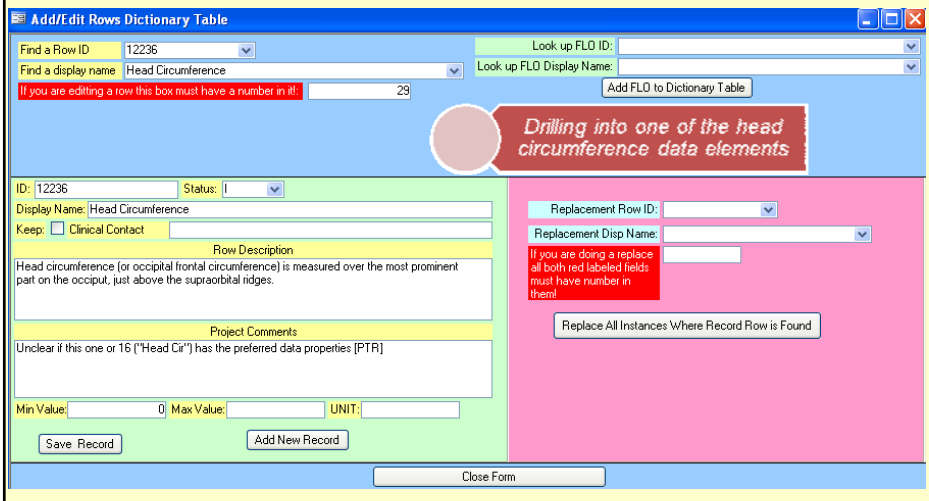
Detailing the "Details"



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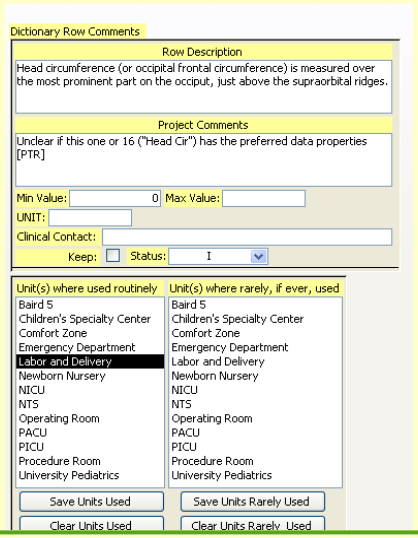
Blowup of Catalog of Field Uses & Properties



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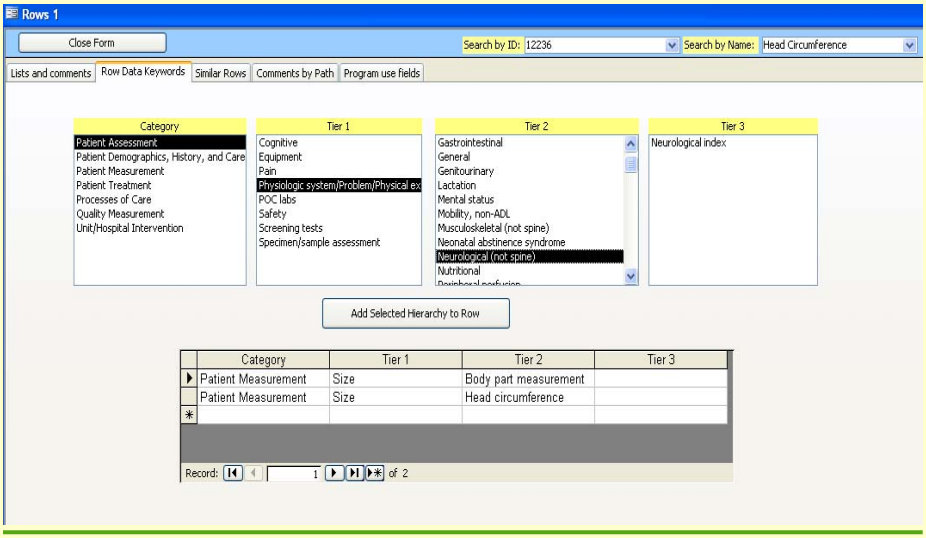
Developing A Data Hierarchy Model



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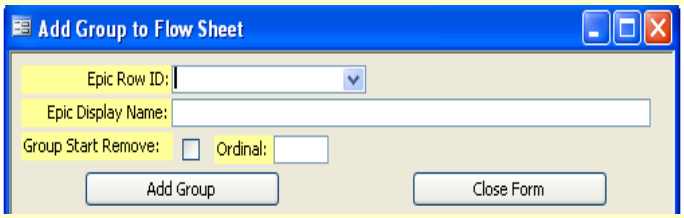
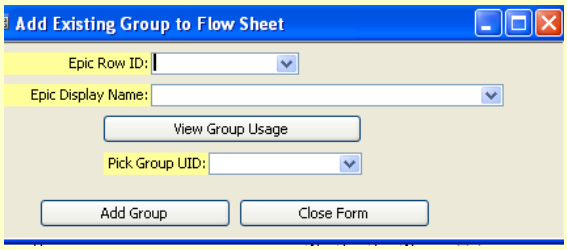
Making Recommendations for Changes





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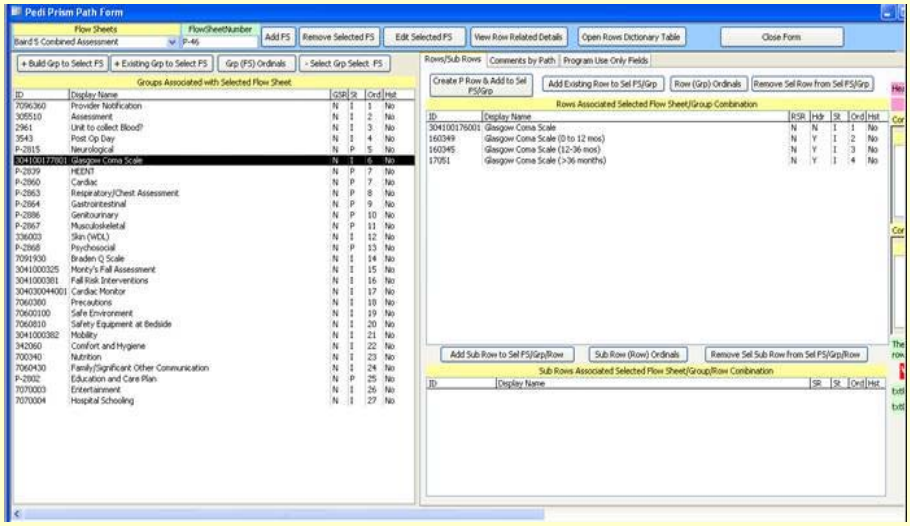
Display of User Designed Flow Sheets



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Lessons Learned

- Figuring out problems after EHR build and implementation depends on systematic analysis – data quality must be "built"
- Sometimes you have to build your own analysis tools to understand data structures
- Clinician can understand data structures and problems associated with data structures in EHR's (shock)!!

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Lessons Learned (cont)

- Hindsight is 20/20 – accept it and use it because "Foresight" is pretty much a white cane – get over it!!
- Understanding complex data systems requires people who understand data structures – not a common trait of clinicians when being asked to make configuration decisions
- You can't anticipate the ramifications of all build decisions

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Lessons Learned (cont)

- The process of building a data structure cataloging tools helped expand understanding of data needs – the journey shapes the final approach
- Good EHR configuration design is inherently an iterative process between computer types and clinicians – neither can dominate!

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Lessons Learned (cont)

- Each EHR environment is somewhat unique so no one has a complete "out of box" solution – ***how you make it your own is important to the ultimate success of the system !!***

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Thank You For Your Attention

Questions??

Contact Information

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