Categorization of Critical User Interactions for Pediatric EHR — A TURF Model

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□ What is TURF?

A TURF Model for Critical User Interactions

What is TURF?

TURF - A Unified Framework of EHR Usability

An Acronym for

Task, User, Representation, & Function

A Theory for

defining, describing, explaining, and predicting usability

A Method for

- evaluating and measuring usability
- designing usability
- categorizing usability and safety problems

A Software Tool for

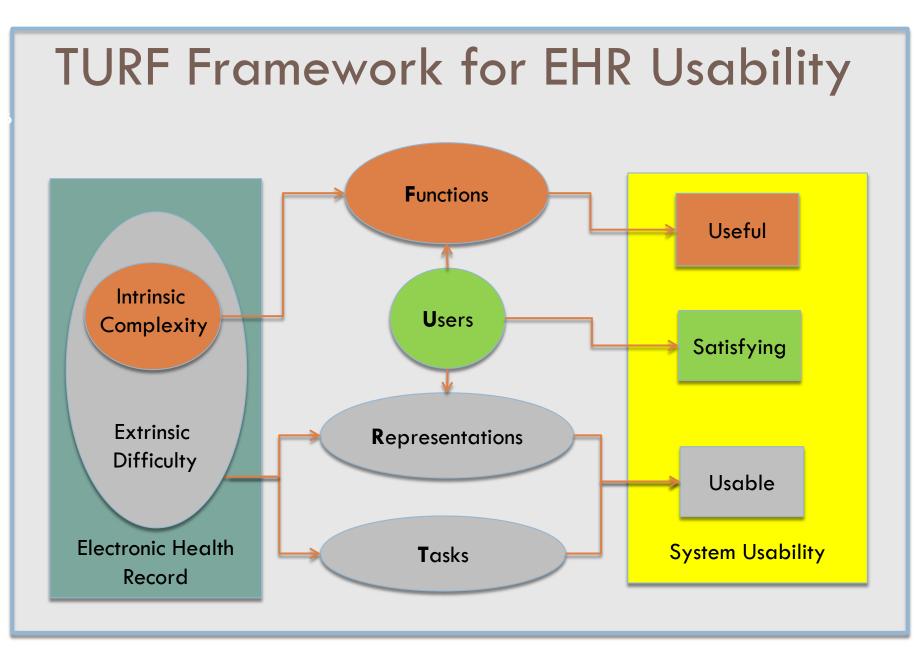
- (partially) automating usability evaluation
- conducting user testing
- building EHR ontology
- generating evidence-based designs
- conducting usability and patient safety analytics

What is Usability?

Under TURF, usability is defined as how

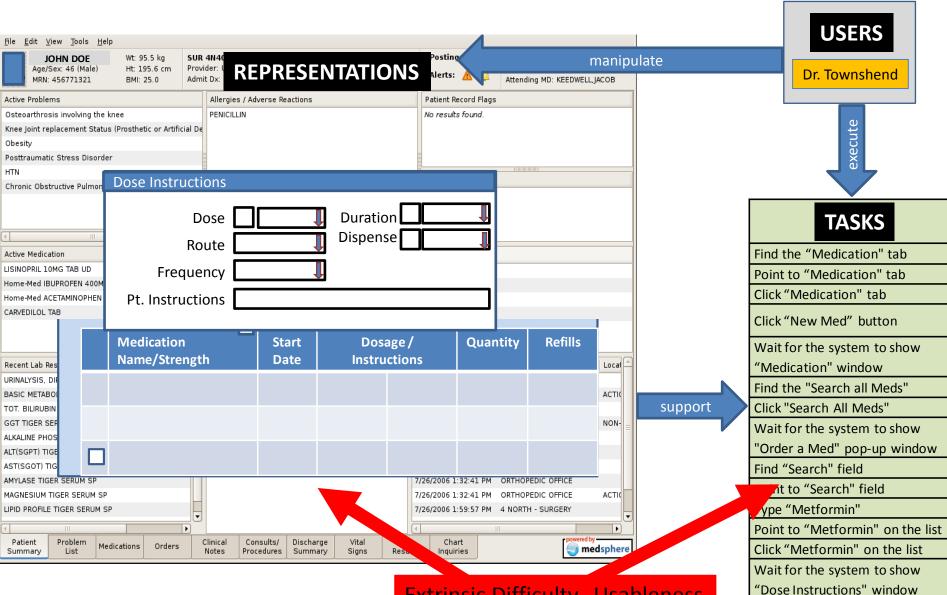
- □useful,
 - usable,
 - satisfying

a system is for the intended users to accomplish goals in the work domain by performing certain sequences of tasks



Zhang, J., & Walji, M. (2011). TURF: Toward a unified framework of EHR usability. *Journal of Biomedical Informatics, 44 (6)*, 1056-1067.

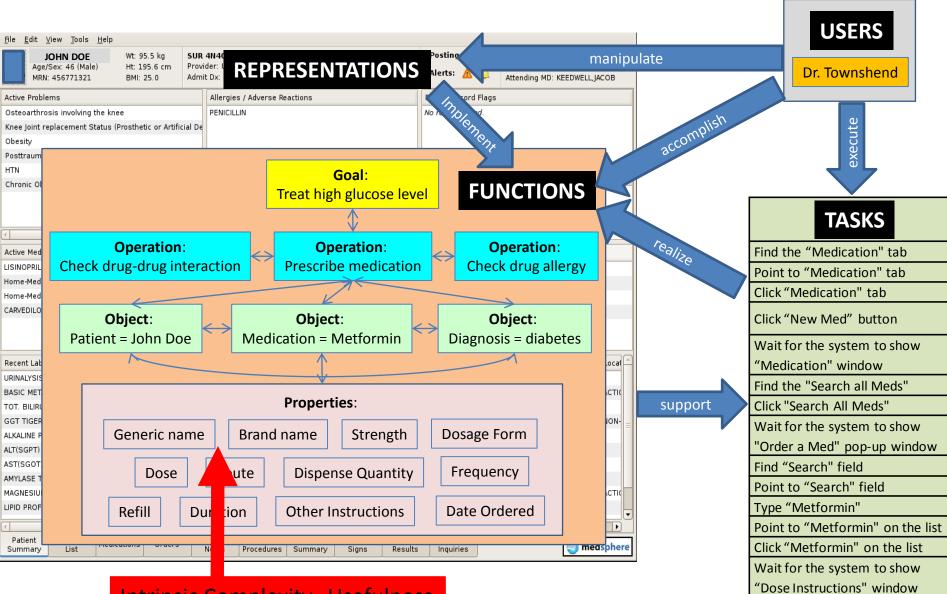
Dr. Townshend prescribes 90 day supply of Metformin 500 mg tablets by mouth twice daily to patient John Doe who is a pre-diabetic patient with a glucose level of 110.



Extrinsic Difficulty--Usableness

Etc. etc. etc.

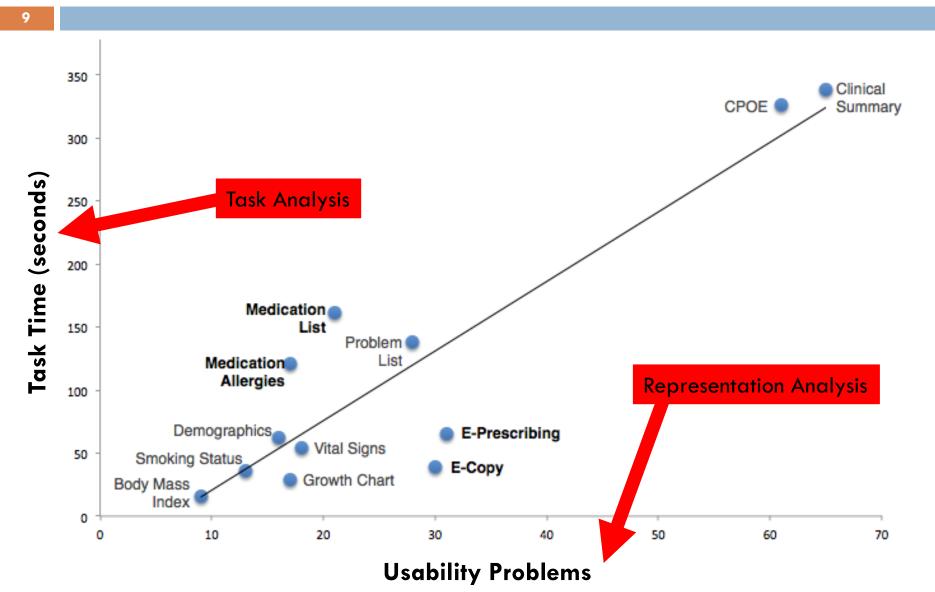
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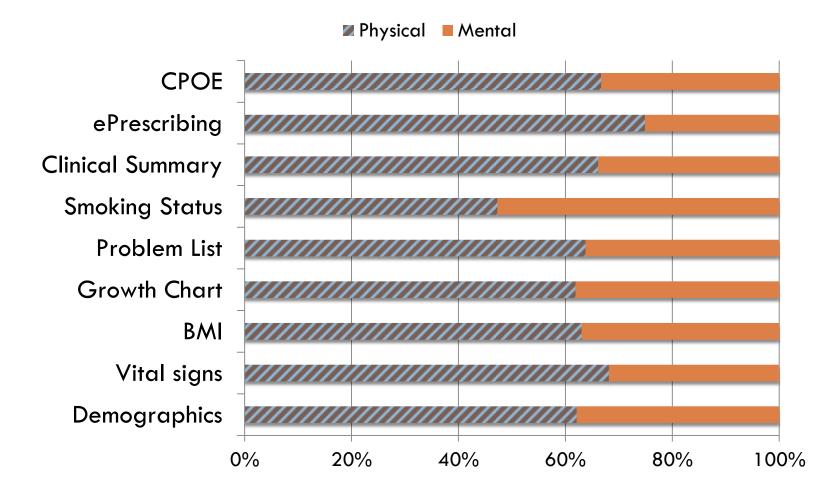
Etc. etc. etc.

Intrinsic Complexity--Usefulness

Measuring Extrinsic Difficulty -- Usableness: Task Time and Usability Problems

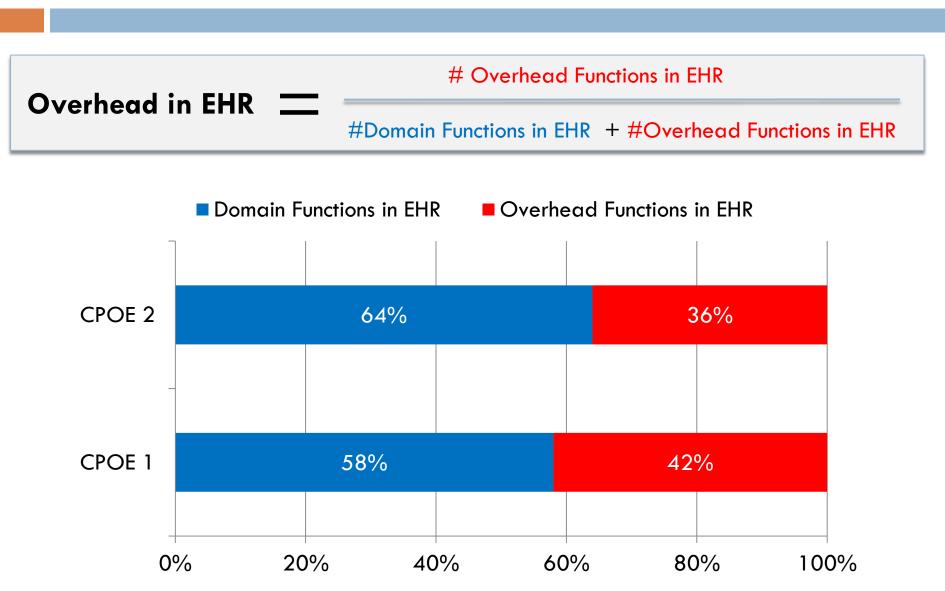


Mental Workload



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Measuring Intrinsic Complexity-- Usefulness: Overhead Function



Measuring Intrinsic Complexity-- Usefulness: Domain Function Completeness

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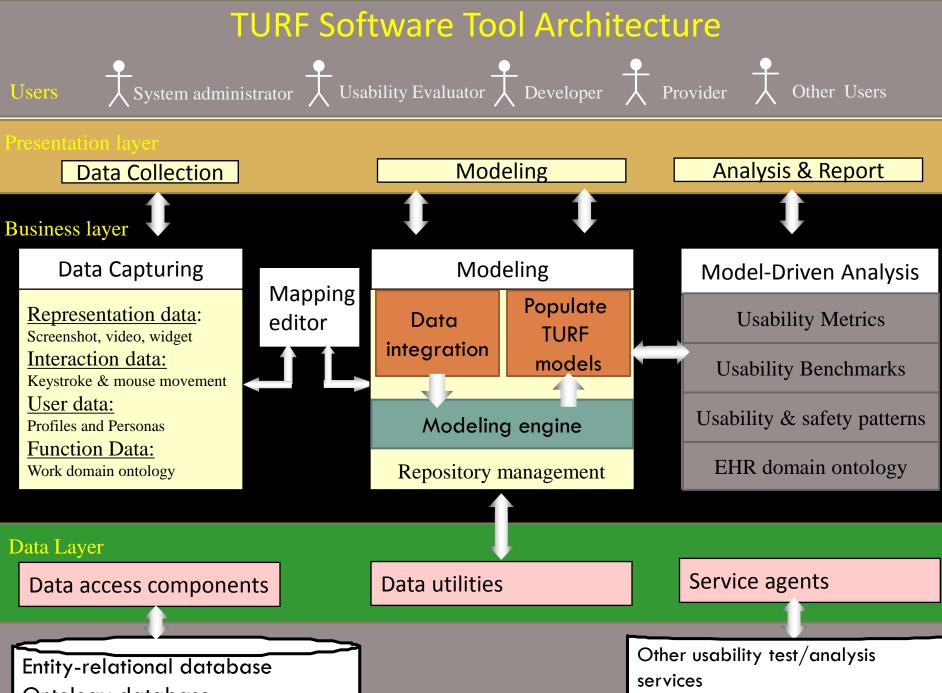
#Domain Functions in EHR

#Domain Functions in Entire Work Domain

A Small EDR System

(From Chen, 2008)

$$\frac{37}{80} = 46\%$$



Ontology database

(e.g., Cogtool, Ulog, Noldus, etc.)



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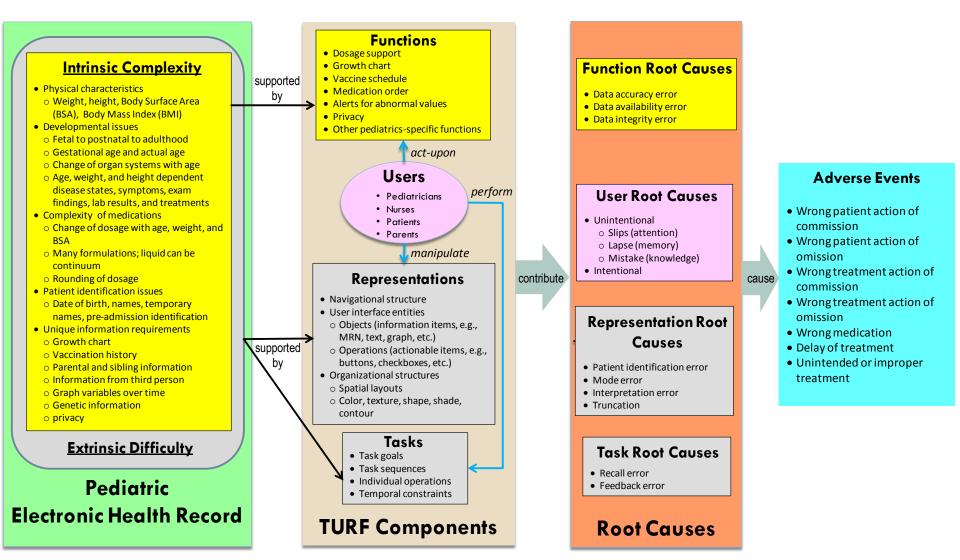
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- Semi-automate usability expert reviews
- Build cognitive models to predict clinical task performance times
- Capture user testing data
- Build EHR ontology from usage data
- Generate evidence-based designs

TURF 1 Beta Release: Summer 2012

TURF Model for Critical Risks

A TURF Model of Critical Risks for Pediatric EHR



Function Root Causes

Description	Example	Potential Risk/Impact
Forced data format	Systolic blood pressure values must be entered as 3-digits (060)	Data entry errors

Function Root Causes

Description	Example	Potential Risk/Impact
Default Values	This pop-up reverts to prior data if a parameter is entered that is not "in	Data entry errors
	range" with NO WARNING to the user.	

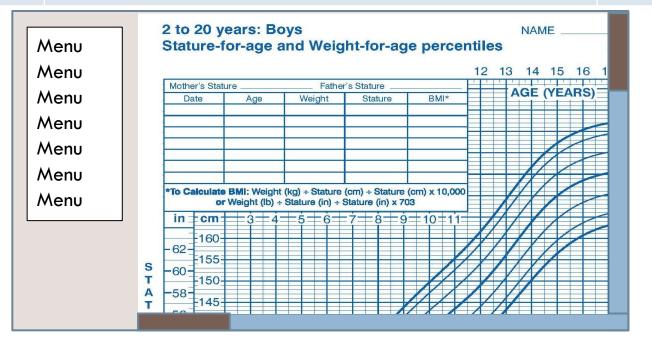
Height/Length Weight	● Inch ○ cm ● Lbs. oz ○ kg
Temperature	● F○ C
Pulse	
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Description	Examples	Potential Risk/Impact
Mode error	A patient's weight and height are entered in pounds and inches, and then displayed in kilograms and meters.	Drug dosage miscalculation

Description	Examples	Potential Risk/Impact
Patient identification error	Multiple patients' data are displayed concurrently. Diagnostic test is ordered for Patient A and thought to be Patient B	Wrong patient procedure

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Description	Example	Potential Risk/Impact
Visibility	Does not allow entire growth chart in one	Missed
error	view. No resizing. Requires 2 slider bars	diagnosis
	to mentally visualize the entire chart.	



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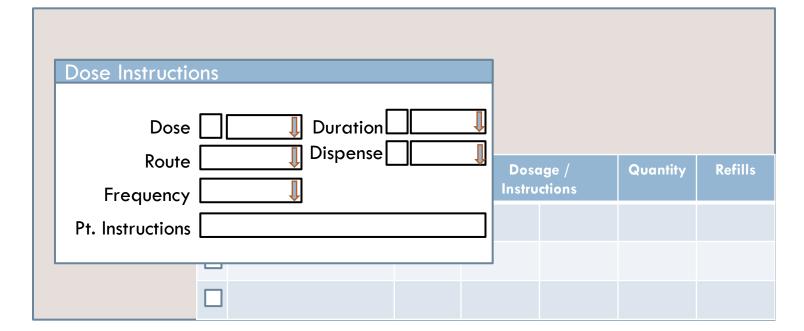
Description	Example	Potential	Unit
		Risk/Impact	-Select-
Truncation error	Drop down fields too narrow to allow the user to view the entire entry	Wrong dosage	Kilogram Kilogram per Sq Kilograms per D Kilograms per C Kilograms per U

Kilograms per N Kilograms per S Kilograms/Millir Kit Liter Liters per Day Liters per Minut Lozenge

Task Root Causes

	-	
- 4		

Description		Potential Risk/Impact
Sequence	No drug name or drug strength is listed in	Medication
context	the pop-up. Need to memorize	error
error	information across multiple windows.	



Conclusions

- Critical user interactions for EHR should be supported by work-centered design addressing root causes associated with users, functions (features), representations (user interface), and tasks (workflow)
- Pediatric EHR should be designed with special considerations of the uniqueness and complexity of pediatric care.

Acknowledgement

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- NIST for additional support
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Preliminary Program under Planning

Pre-AMIA Symposium

EHR Usability for Stage 2 Meaningful Use

November 4, 2012

Chicago

www.sharpc.org