



More than Looks Alone: Cognitive Support in an Emergency Department Information System

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INTRODUCTION

- Emergency departments (ED) are best described as high-acuity, information intensive, communication dependent environments^{1,2}
- We propose that information display systems designed with applied cognitive principles will improve team situational awareness (SA) and, ultimately, ED workflow
- Our objectives are to (a) determine the information needs of ED providers, (b) build a Work Domain Ontology including these information goals, needs, and constraints, (c) create a simulated data set of patients to populate the dashboard, (d) iteratively design and evaluate the dashboard, and (e) experimentally investigate the impact of our display on ED work

BACKGROUND

- Visual displays have been shown to improve situational awareness³ and high team SA improves team performance⁴
- Work-centered design using the TURF⁵ framework and Work-Domain Ontology enables the design and evaluation of products for usability^{5,6}

METHOD

- To understand clinical information needs we carried out focus group discussions, observed shifts in ED, distributed surveys and analyzed existing commercial products
- We formalized the knowledge representation gathered using a **Work-Domain Ontology** including tasks and information required in clinical practice
- A discrete event simulation was used to generate a **simulated patient data set**.

DASHBOARD DEVELOPMENT

- Using the TURF framework (including understanding Tasks, Users, Representation, and Functions)
- Implementation of three-tier web application, consisting of a representation, service and database layer.
- Flexible enough to exchange data source, once meta-data specified in service layer.
- GUI requests read-only data frequently to keep the information timely
- Dashboard augments current systems but enables additional perspective on data

DASHBOARD PROTOTYPES

Bed	Triage	Patient	Age	LoS	Provider	Resident	Nurse
T1A	2	Name, F.	61Y, F		1:23 BK	..qm...	
T2							
T3							
T4	3	Name 2, F.	32Y, M	3:11	BK	clm	
T5	2	Name 5, F.	92Y, M	0:54	BK	clm	
T6							
T7	1	Name G, F.	50Y, M	0:08	BK	clm	
T8	3	Name A, F.	36Y, F	2:47	BK	clm	
TWH	4	Name Z, F.	25Y, F	4:14	BK	..qm..	

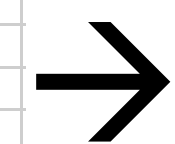


Figure 1: Mock up of current ED trackboard

Figure 2: Iteration Provider View

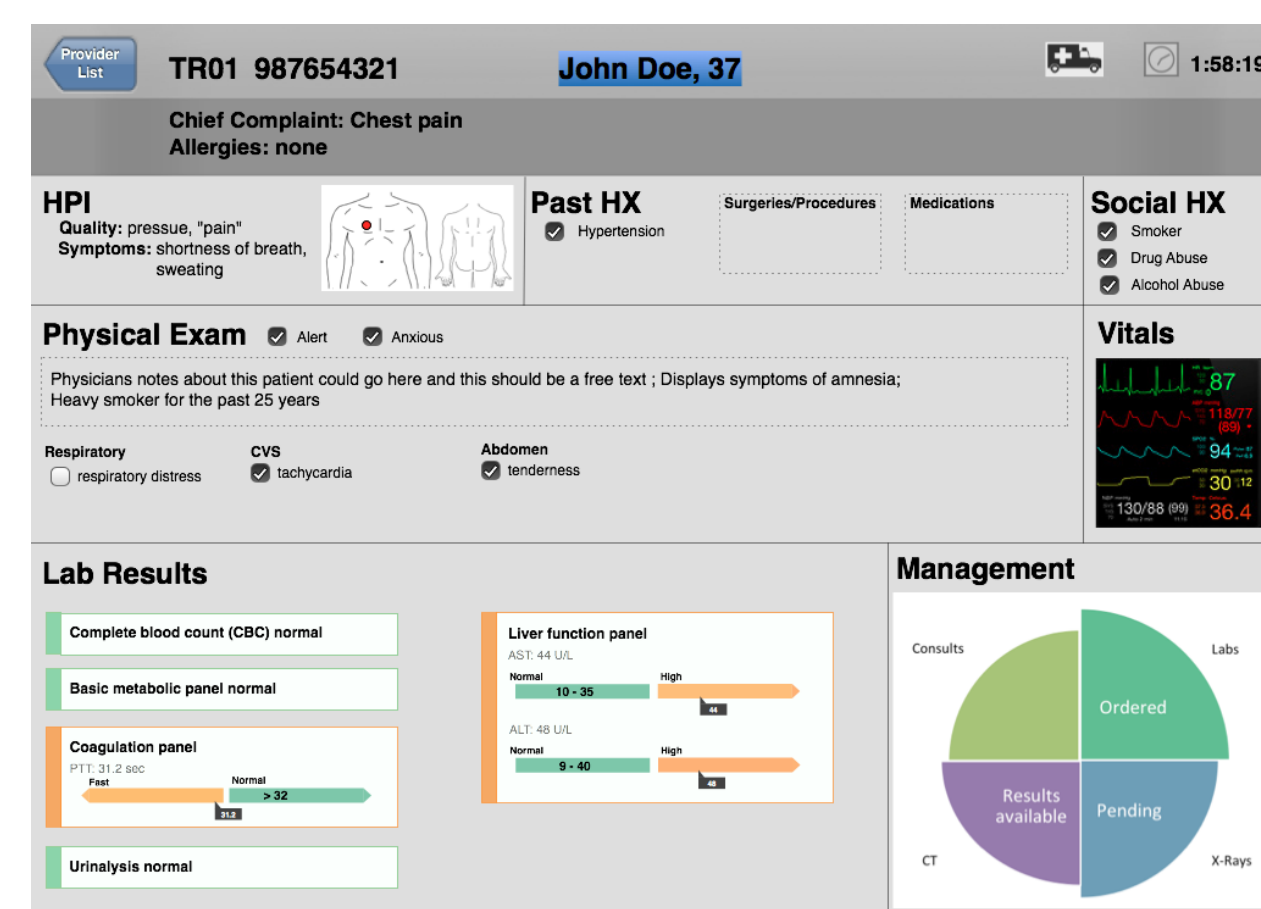


Figure 3: Patient View providing a snapshot of patient status

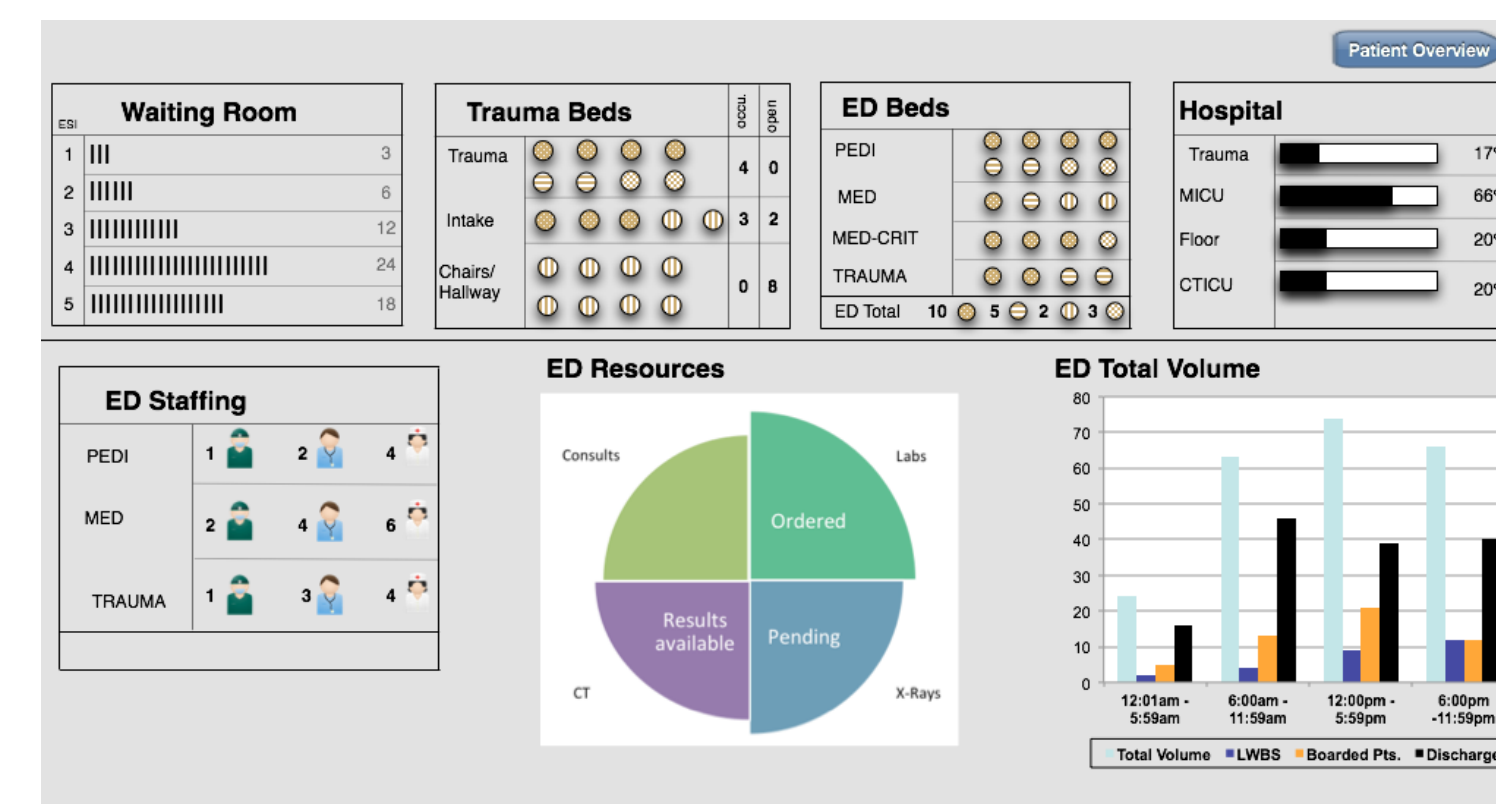


Figure 4: ED Wide View giving an overview of management information

ITERATIVE DESIGN AND EVALUATION

- Evaluate optimal visualization by information type⁷ in situ and in vivo
- Usability assessment of dashboard
- Observational and experimental studies exploring workflow and decision making changes

SUMMARY OF CONCLUSIONS

- Results indicate potential for integration of clinical information needs utilizing TURF framework in the creation of a cognitively inspired dashboard display
- We believe optimized information display presented just in time to ED providers decreases errors and improves patient safety

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