

# Evaluation of UMHS Electronic Medical Record Systems

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# Two electronic medical record systems



Primary electronic medical record (EMR) system at UMHS. General system, used for all patients by 14,000 caregivers.



EMR system for transplants. Contains many transplant-specific features, is used during both in-patient and out-patient treatment.

Can access CareWeb notes but not other data.

# CareWeb (Documents)

**Help** | **References**

**MyCareWeb** | **Logout**

**Support**

**CLIN01**  
CLINICIAN, TRAINING 01

**My Inbox (-)**

**Schedule**

**Caregiver Search**

**Patient Search**

**Patient Lists**

**BIRD, BIG**  
12- Age: 81 Years

**Problem Summary**

**Demographics**

**Appointments/Visits**

**Documents**

**Lab**

**Rad/Nuc**

**Other Results**

**Immunizations**

**Inpt. Med. Profile**

**ED/OR/TB Systems**

**Continuity**

**Medical Docs** | Legal & Consents | Imaged Docs | Create Docs | Discharge Navigator

**1: Select Date Range**

Latest Admission

From: 01/01/1997

To: 08/21/2006

**2: Select Document Attributes** (Hold Ctrl to click multiple selections)

Use Document Favorites Criteria Clear Selections

**Departments**

ALL ▲

JANES ▼

BC

CCC

CCPP ▼

**Services**

ALL ▲

4A

4BC

4W4B

5B ▼

**Document Type**

ALL

Inpatient

Outpatient

Procedures

Summaries

Nursing

Custom

ALL ▲

ADM HSP

ADULT CATH ▼

**Search** | **Show All Documents** | **Hide Search Fields** | [View Your Selected Criteria](#)

Page: First <<Previous **1** | [2](#) | [3](#) | [4](#) | [5](#) | [6](#) | [7](#) | [8](#) | [9](#) | [10](#) Next>> Last

Case/Disc Date (D)	Doc Type	Clinician	Dept
	<a href="#">LET/NOTE-RV</a>	TEST DR, IMAN ATTENDING	OTO
<b>Admit:</b> 04/22/2003	<a href="#">LET/NOTE-RV</a>	TEST DR, IMAN ATTENDING	UROS
08/18/2006	<a href="#">NSG PROG NOTE</a>	BADGLEY, CAROL	NURS
08/17/2006	<a href="#">NURSING NOTE</a>	BROWN, DIANE S.	CCC
08/17/2006	<a href="#">NURSING NOTE</a>	ALBERTSON, DEBERA	CCC
08/17/2006	<a href="#">PAT ED ASSESS</a>	DEVRIES, LORI J.	CCC
08/17/2006	<a href="#">NURSING NOTE</a>	BROWN, DIANE S.	CCC
08/16/2006	<a href="#">NURSING NOTE</a>	WOLOSKE, SHERYL	SUR

# Two electronic medical record systems



Primary electronic medical record (EMR) system at UMHS. General system, used for all patients by 14,000 caregivers.



EMR system for transplants. Contains many transplant-specific features, is used during both in-patient and out-patient treatment.

Can access CareWeb notes, radiology results, and limited other data.

# OTIS (Timeline)



**Name** ASTER, CHARLOTTE MARIE  
**Reg ID** 9001 080 3  
**Dx** Reflux nephropathy (K)

**POD** 1.3 yrs  
**Birthdate** 05/14/45 (61)  
**Gender** Female  
**Study**

Type name or Reg #  
  
 Last name, First name

<b>Timeline</b>	Viewer	Issue List	Notes					<b>HELP</b>
Demographics	Flowsheet	Medications	Labs	Diagnostic Study	Virology	Biopsy	Radiology	DMI
								<input type="button" value="Add New Event"/>

**UM Primary Caregiver** Irina Sadovskaya-Darlington

Dialysis Off

- [Print Facesheet](#)
- [Reports](#)
- [Census Lists](#)
- [Maintenance Menu](#)



# Evaluation methods



- Generalized transition network
- Personas & Scenarios based on interviews with 1 social worker, 2 doctors, and 3 nurses
- Survey  
60 CareWeb users



## OTIS

- Heuristic evaluation
- Usability test  
4 post-operative kidney transplant nurses
- Comparative evaluation  
4 products & research prototypes

# OTIS & CareWeb: Shared users

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← a full range of caregivers including  
doctors, nurses, lab technicians,  
social workers, and administrative  
staff →

# CareWeb & OTIS: where they excel

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“I like having everything online in one place.”

“I think we’ve had a lot less mistakes since we switched over from paper.”

# Overview of findings & recommendations

- **CareWeb**  
specific usability problems and wanted features based on interviews and survey data
- **OTIS**  
specific usability problems, visual issues, and wish list features identified in heuristic evaluation and usability test
- **Future directions: OTIS & CareWeb**

# CareWeb features: Flagging important notes

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**Problem:** CareWeb users would like to be able to highlight some notes as particularly important. Not being able to do this slows down scanning notes.

**Recommendation:** Add a flexible “star” feature (as in Gmail) so that users can select some notes to stand out.

# CareWeb features: Templates

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**Problem:** CareWeb template features are inadequate for most users (65% of survey respondents create their own templates in other applications)

**Recommendation:** Examine how users create and apply their own templates and then support this functionality in CareWeb

*Additional findings & recommendations in report.*

# OTIS: Visual display

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Minimalist display emphasizes data. Timeline is a particular strength.



**Problem:** Current patient is visible but during our usability test, nurses sometimes changed medication without changing the patient.

**Recommendation:** Increase visibility of current patient.

*Additional findings & recommendations in report.*



# OTIS: Visual analytics (proximity)

One or more drugs have errors; make corrections and click Save again.

Date	03/08/07
TACROLIMUS	Either enter a "Dose" or check the "Hold" box
	Dose 0 -UNITS- -ROUTES- -FREQ- Hold <input checked="" type="checkbox"/>
	Special dosage
Myfortic	Dose 320 mg PO BID Hold <input type="checkbox"/>
	Special dosage
Colace	Dose 100 mg PO BID Hold <input type="checkbox"/>
	Special dosage



# OTIS: Visual analytics (closure)

Timeline	Viewer	Issue List	Notes					HELP
Demographics	Flowsheet	Medications	Labs	Diagnostic Study	Virology	Biopsy	Radiology	DMI
<a href="#">Edit</a>								
<b>TRANSPLANT: 12/25/05 (Kidney)</b>		<b>Donor Operative Information: Kidney</b>						
<a href="#">Recipient OR Info</a>								
Donor OR Info		<b>General Information</b>						
		Transplant Date	12/25/05					
		Donor Type	Living Related					
		Cross-Match Date						
		Cross-Match T						
		Cross-Match B						
		<b>Donor Information</b>						
		Name	ARK, JONAH					
		Reg #	9001 020 7					
		ABO	See ABO in <a href="#">Labs Screen</a>					
		Age at Donation	51					
		Gender	Male					
		Relationship to Recipient						
		Donor CMV						
		Donor EBV						
		Donor TORCH						

# OTIS: Usability (single user)

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**Problem:** No undo/redo button for actions.

**Recommendation:** Add support for undo / redo.



**Problem:** Users sometimes click the browser's back "back" button which results in an error message.

**Recommendation:** Revise interaction to be compatible with back and forward buttons

*Additional findings & recommendations in report.*

# OTIS: Usability (single user)

**Transplant Staff Page**

**Name:** ASTER, CHARLOTTE MARIE  
**Reg ID:** 9001 080 3  
**Dx:** Diabetes mellitus - type unspecified (K)  
Pulmonary emphysema (HL)  
Hypertension (K)

**POB:** 1.2 yrs  
**Birthdate:** 05/14/45 (61)  
**Gender:** Female  
**Study:**

Type name or Reg #  
Last name, First name

**Timeline** **Issue List** **Notes** **HELP**

Demograph **Medications** **Labs** **Diagnostic Study** **Virology** **Biopsy** **Radiology** **DMI**

**UM Primary Caregiver** Irina Sadovskaya-Darlington

**Dialysis Off**  
**Print Facesheet Reports**  
**Census Lists**  
**Maintenance Menu**

**System-Wide**

08/04/03 → 10/01/03 → 12/25/05 → 03/10/07

**EVAL** → **LIST Kidney** → **LR** → **LIST Panc**

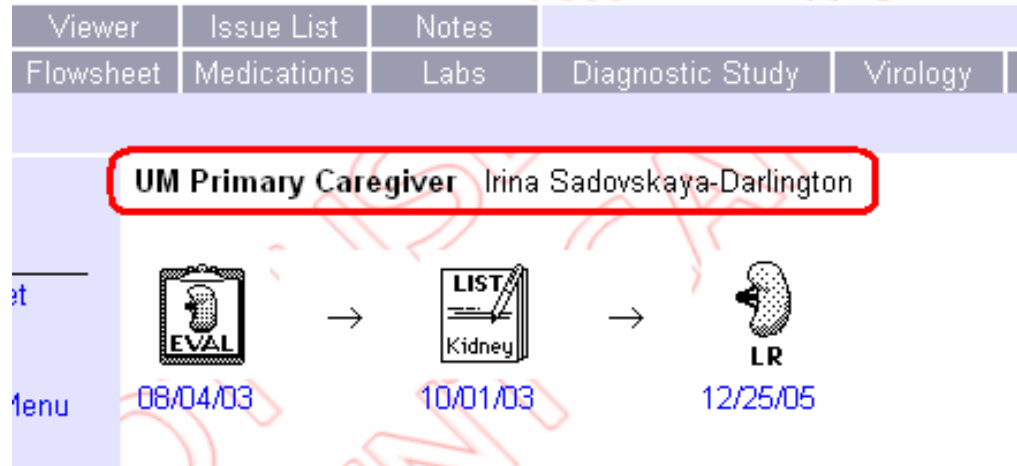
low

**Problem:** Left-side navigation menu does not distinguish between system-wide actions and patient-specific actions.

**Recommendation:** System should use colors, space, and lines to distinguish between these actions.

*Additional findings & recommendations in report.*

# OTIS: Usability (collaborative software)

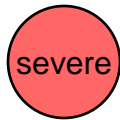


**Problem:** System provides visibility of current and potential collaborators, but does not link to their contact information.

**Recommendation:** Add appropriate links

*Additional findings & recommendations in report.*

# OTIS features: Medications view



**Problem:** Users cannot quickly identify the specific time and full reason a medication changed by using the medications view.

**Recommendation:** Design link feature between medication changes and the notes entered at that date.

POD	1.3 yrs	1.2 yrs	1.2 yrs	172	41
Date	04/04/07	03/12/07	03/08/07	06/15/06	02/04/06
TACROLIMUS			ON-HOLD	1.5 mg PO BID	2 mg PO BID
Myfortic	320 mg PO BID	320 mg PO BID	320 mg PO BID	320 mg PO BID	220 mg PO BID
PREDNISONE					4 mg PO Daily
Colace	100 mg PO BID	100 mg PO BID	100 mg PO BID	100 mg PO BID	100 mg PO BID
Ditropan	15 mg PO BID	15 mg PO BID	15 mg PO BID	15 mg PO BID	15 mg PO BID
FLUCONAZOLE	100 mg PO Daily	100 mg PO Daily	100 mg PO Daily	100 mg PO Daily	100 mg PO Daily
Lipitor	15 mg PO Daily	10 mg PO Daily	10 mg Daily	10 mg Daily	10 mg Daily
Lopressor	100 mg PO BID	100 mg PO BID	100 mg PO BID	100 mg PO BID	100 mg PO BID

*Additional findings & recommendations in report.*

# Future directions for electronic medical records

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- Medical records are boundary objects in the collaboration between caregivers. CSCW principles apply.
- EMR systems are used in hectic hospital environments. Ongoing research suggests that caregiver productivity can be increased by making these systems aware of context.

# Conclusions

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- OTIS and CareWeb offer substantial improvements over paper flow sheets with few drawbacks
- As collaborative tools, OTIS and CareWeb could benefit from further design and evaluation in the context of CSCW