Natural Language Processing in the Clinical Setting

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Departments of Medicine, Health Services, and Biomedical Informatics & Medical Education
University of Washington

Topics today

- The story of moving from paper to electronic notes
- NLP and clinical decision support
- 3 examples: NLP in UW Medicine EMRs
- Summary and discussion

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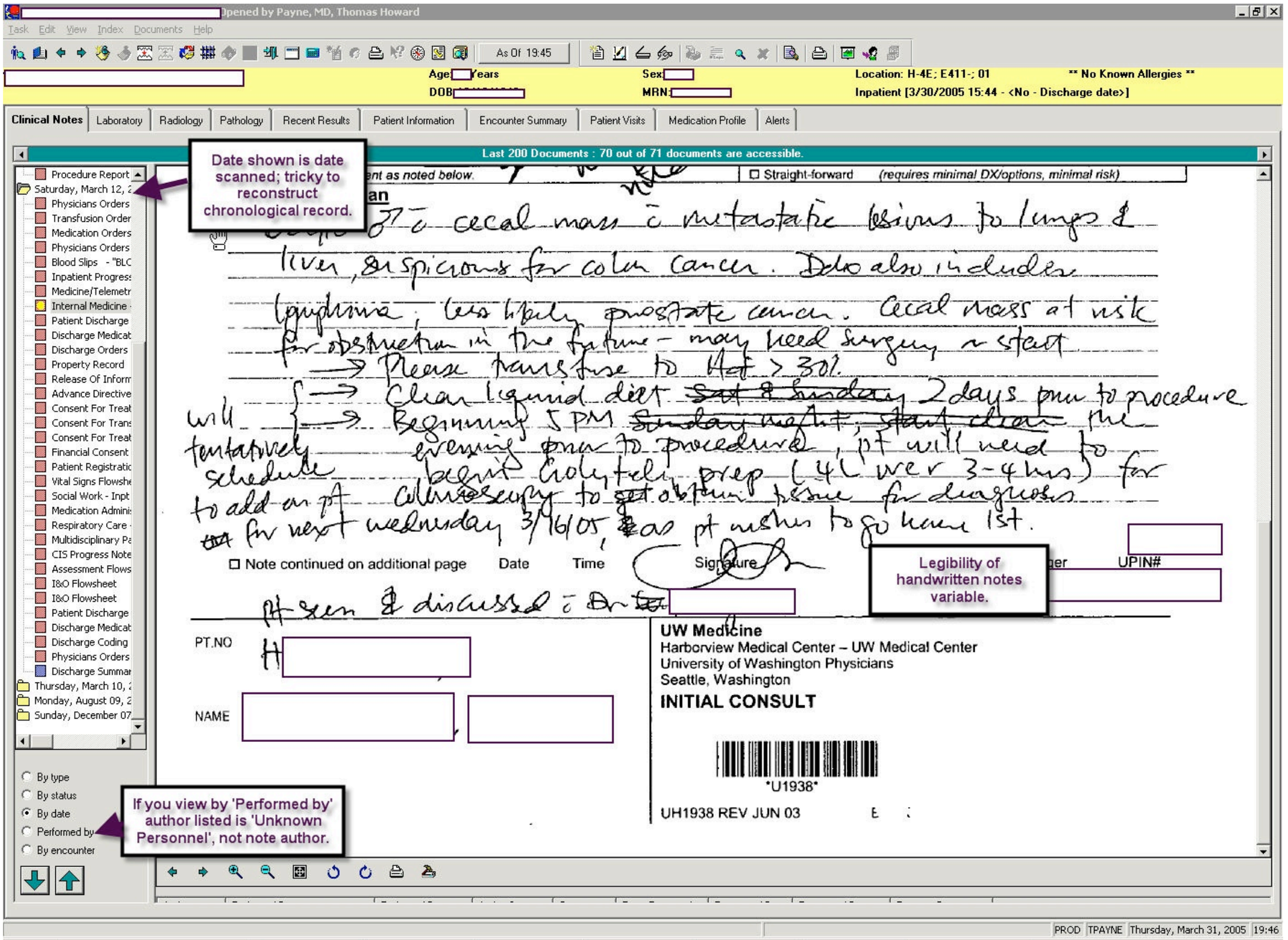
liver, 8x spicrons for colon cancer. Dobo also includes
lymphoma; less likely prostate cancer. Cecal mass
for obstruction in the future - may need surgery r sx
→ Please transfuse to Hct > 30%.
→ Clear liquid diet ~~Sat & Sunday~~ 2 days
→ Beginning 5 PM ~~Sunday night, start clear~~
evening prior to procedure, pt will need
bowel prep (4L over 3-4
colonoscopy to obtain tissue for diagn
next wednesday 3/16/05. as pt wishes to go home 1st


Opened by Payne, MD, Thomas Howard
Task Edit View Index Documents Help
As Of 19:45
Age: Years
Sex:
Location: H-4E; E411-; 01
** No Known Allergies **
DOB:
MRN:
Inpatient [3/30/2005 15:44 - <No - Discharge date>]
Clinical Notes
Laboratory
Radiology
Pathology
Recent Results
Patient Information
Encounter Summary
Patient Visits
Medication Profile
Alerts
Last 200 Documents : 70 out of 71 documents are accessible.
Date shown is date scanned; tricky to reconstruct chronological record.
Procedure Report
Saturday, March 12, 2
Physicians Orders
Transfusion Order
Medication Orders
Physicians Orders
Blood Slips - "BLC
Inpatient Progress
Medicine/Telemetr
Internal Medicine
Patient Discharge
Discharge Medicat
Discharge Orders
Property Record
Release Of Inform
Advance Directive
Consent For Treat
Consent For Trans
Consent For Treat
Financial Consent
Patient Registratic
Vital Signs Flowshe
Social Work - Inpt
Medication Admini
Respiratory Care
Multidisciplinary Pa
CIS Progress Note
Assessment Flows
I&O Flowsheet
I&O Flowsheet
Patient Discharge
Discharge Medicat
Discharge Coding
Physicians Orders
Discharge Summar
Thursday, March 10, 2
Monday, August 09, 2
Sunday, December 07
By type
By status
By date
Performed by
By encounter
If you view by 'Performed by' author listed is 'Unknown Personnel', not note author.
Straight-forward (requires minimal DX/options, minimal risk)
cecal mass c metastatic lesions to lungs & liver, suspicious for colon cancer. DDx also includes lymphoma, less likely prostate cancer. Cecal mass at risk for obstruction in the future - may need surgery r start
→ Please transfuse to Hct > 30%.
→ Clear liquid diet Sat & Sunday 2 days prior to procedure
→ Beginning 5 PM Sunday night, start clear liquid evening prior to procedure, pt will need to drink GoLytely prep (4L over 3-4 hrs) for
colonoscopy to obtain tissue for diagnosis.
will tentatively schedule to add on pt for next Wednesday 3/16/05, as pt wishes to go home 1st.
Note continued on additional page
Date
Time
Signature
Legibility of handwritten notes variable.
UPIN#
Pt seen & discussed c Dr
PT.NO
NAME
UW Medicine
Harborview Medical Center – UW Medical Center
University of Washington Physicians
Seattle, Washington
INITIAL CONSULT
U1938
UH1938 REV JUN 03
PROD
TPAYNE
Thursday, March 31, 2005
19:46

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Task Edit View Index Documents Help

Clinical Notes | Laboratory | Micro | Radiology | Pathology | Other Diagnostics | Recent Results | Patient Information | Patient Visits | Medication Profile | Alerts

Last 200 Documents : 198 out of 201 documents are accessible. (Document Count) In Error Documents Filtered

- September 21, 2006
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- September 08, 2006
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- September 07, 2006
  - 10:52 AM ICU - In
- September 06, 2006
  - 5:33 PM Cardiolog

By type
By status
By date
Performed by
By encounter

Impression and Plan

y/o s/p cardiac transplant in 2002, admitted to Neurology for seizures, c/b traumatic intubation. Transferred to MICU service acutely hypote and hypoxemic status post tracheostomy, now very agitated on the ventilator.

1) Neurology: Neuro following. Bedside 45 minute continuous EEG in attempt to capture possible seizure activity - results described above. Neuro exam largely unchanged. Will get MRI today to further assess extent of cerebral injury.

2) Respiratory: Worsening hypoxia with bilateral infiltrates. BAL reveals mixed flora including neisseria, alph-hem strep: will continue Vanco a Cefepime. Picture consistent with ARDS therefore continue LPV settings for vent. Of concern is his continued agitation in the setting of high C requirements. Given his immobility, hypoxemia, sinus tachycardia, and overall agitation, the concern for pulmonary embolism is high at this tin We will start him on renal prophylaxis with bicarbonate and obtain a CTA to determine whether or not he has a PE. If he does, he should not b anticoagulated with heparin, given his hx of HIT. Will have to start bivalirudin for anticoagulation.

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4) HTN: Continue Metoprolol to 75 mg po TID and Norvasc 10mg PO daily. BP continues to be elevated in the setting of his agitation, as does heartrate. This may be multifactorial in nature, with dehydration, fevers, and pain contributing. It is notable that his agitation did not improve significantly to prn ativan and pain medications.

5) Anemia: Hct stable

6) s/p cardiac transplant: Cards, Dr. , following. Pt's Tacrolimus' levels sporadic. Continually readjusting dosage. Today's level pendir Per pharmacy goal 8-10. Continue to hold TF while administering Tacrolimus.

7) Seizure: Will continue Keppra.

8) DVT prophylaxis: Pt with hx of HITs, but not documented as occurring this hospitalization. Remains on SCDs and Teds.

9) Volume Status: Increased fluid intake over past 24 hours. Net +527ml, but BUN slightly worse at 33 from 26, suggesting some degree of dehydration; continue to hydrate liberally.

10) FEN: TF at goal rate. GI willing to place PEG when appropriate for long term care. Awaiting for improvement in WBC and low-grade fever: before placiing PEG.

11) Dispo: Needs continued ICU care - not ready for transfer to SNF. Need to readdress current status with family.

12) CODE: FULL

Attending Statement: I examined and discussed this patient with the MICU team. I agree with the findings, assessment, and plans of Dr.

Diagnoses:
1. Acute lung injury
2. Pneumonia
3. Persistent brain injury

Why is narrative text valuable?

- Narrative contains history, details of history and exam, and most importantly the thinking of the clinician. (This is a rare overlap between needs of reimbursement, clinical care, teaching, and research.)

- Each note contains kernels of truth. Templates, direct entry aids, copy/paste can hide them.

- In UW Medicine there are electronic notes from ~1.4 million visits and 68,000 admissions each year → great potential to improve decision-making and to learn.

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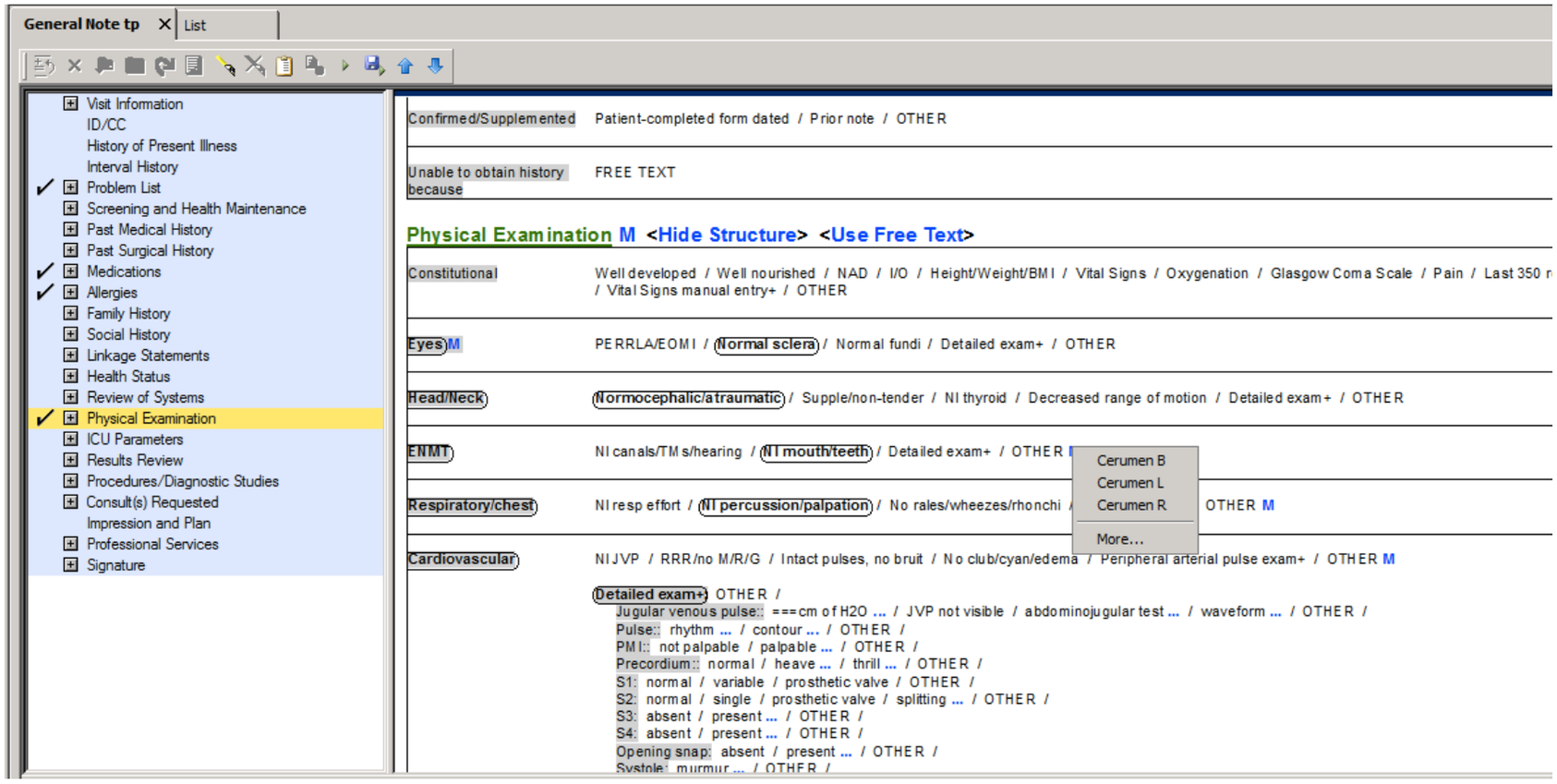
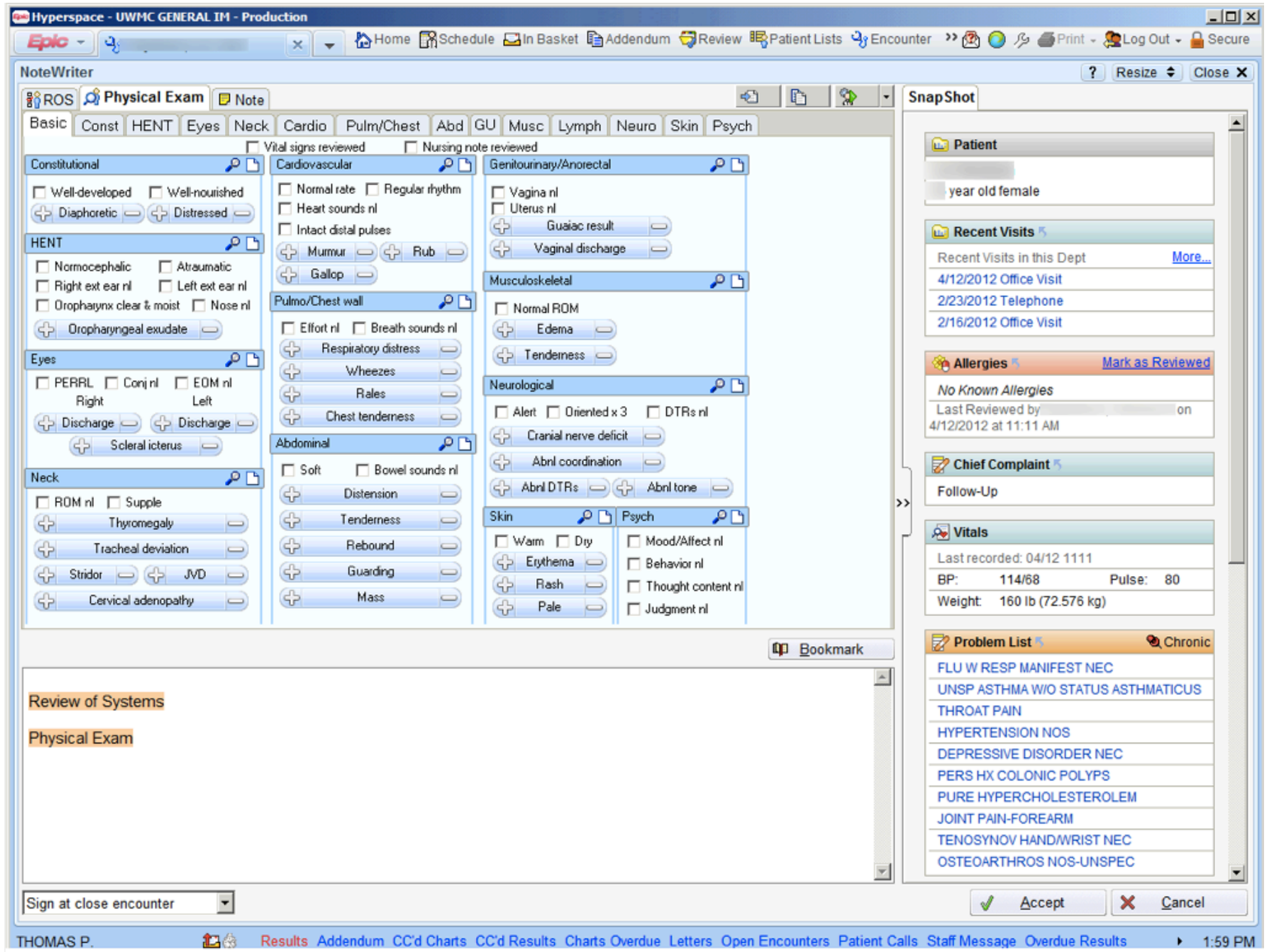
Tools for structured note entry



Tools for structured note entry



Problems with structured note entry

- Training requirement higher
- In our experience, most physicians don't like to write with them.
- Most physicians don't like to read them (except narrative portion).
- Important detail may be lost.

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Can Electronic Clinical Documentation Help Prevent Diagnostic Errors?

Gordon D. Schiff, M.D., and David W. Bates, M.D.

The United States is about to invest nearly $50 billion in health information technology (HIT) in an attempt to push the country to a tipping point with respect to t
puterized re
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reduce the c
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to design e
ords (EHRs)
workflow ar
Although cl
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Electroni
to reduce th
errors, but the other benefits of electronic records are less clear.[2] We must ensure that electronic clinical documentation works effectively to improve care if more benefits are to be achieved. Yet

many questions about it persist. For example, can it be leveraged to improve quality without adversely affecting clinicians' efficiency? Will the quality of electronic notes

the sentiments and claims of many physicians, who argue that electronic documentation in its current incarnation is time-consuming and can degrade diagnostic thinking — by distract-

ing physicians from the patient, discouraging independent data gathering and assessment, and perpetuating errors.[4] But we envision a redesigned documenta-
anticipates new
proving diagno-
relies on the pu-
agnosticians" of
agnostic process
able, not heroic,
umentation will
ort. Systems de-
icians will need
documentation
of the next gen-
and policymak-
ead by adopting
approach than
n which billing
uation and man-
viders are forced
ng boxes rather
fully document-
thinking.

There are numerous ways in which EHRs can diminish diagnostic errors (see table). The first lies in filtering, organizing, and providing access to information. Making accurate diagnoses has

> paper records, shifting to electronic systems could substantially improve clinicians' knowledge about the patient. The problem of having too much information is now surpassing that of having too little, and it will become increasingly difficult to review all the patient information that is

N ENGL J MED 2010; 362:1066-9

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○ By type
○ By status
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○ Performed by
○ By encounter

ID:

y/o s/p cardiac transplant (2002) admitted s/p seizure, presented with hypoxemia and hypotension. Treated for aspiration pneumonia. Persistent altered mental status without sedation meds from TBI suffered during seizure.

INTERVAL HISTORY

No major events overnight. Patient was breathing over vent for much of the night.

ALLERGIES

heparin
spironolactone

MEDICATIONS

Amlodipine 5mg tab 10 mg 2 tab PO QDay
Azathioprine 50mg tab 50 mg 1 tab Feeding Tube QTuThSaSu
Azathioprine 50mg tab 0.5 tab PO QMWF
Cefepime 1 g 100 mL/hr IVPB Q12 Hours
Docusate 250mg/25mL soln 250 mg 25 mL Feeding Tube BID
Ferrous sulfate 300mg/5mL soln 300 mg 5 mL Feeding Tube QDay
Lansoprazole 30mg soluble tab 30 mg 1 tab Feeding Tube QDay
Levetiracetam soln (conc 100mg/mL) 1000 mg 10 mL Feeding Tube BID
Metoprolol 50mg tab + Metoprolol 25mg tab 75 mg Feeding Tube TID
Morphine 4mg/mL inj IV Q4 Hours
Nystatin powder 15g 1 application Topical TID
PredniSONE 5mg tab 5 mg 1 tab Feeding Tube QDay
Tacrolimus susp (conc 0.5mg/mL) 10 mg 20 mL Feeding Tube Q12 Hours
Vancomycin/Dextrose 5% 1 g 200 mL 200 mL/hr IVPB Q12 Hours

INFUSIONS

Dextrose 5% in Water 100 mL + Insulin REGULAR 100 units 100 mL IV Infusion
Dextrose 5% in Water 100 mL + Morphine 100 mg 100 mL IV Infusion
Dextrose 5% in Water 20 mL + Lorazepam 40 mg 20 mL IV Infusion
Sterile Water for Injection 850 mL + Sodium bicarbonate 150 mEq IV Infusion

VITALS (MOST RECENT AND 24 HOUR RANGE)

ABG Results:

7.45 / 31 / 109 / 21 / on 50% FiO2
AMV rate of 14, Vt 320, PEEP 8

Temp C	36.5	36.5 -- 38.2	RR	17	14 -- 42
SBP Non-Inv	156	92 -- 180	O2 Sat	100	91 -- 100
DBP Non-Inv	83	49 -- 103	O2 Percent	50.0	50.0 -- 50.0
HR	107	80 -- 135	O2 Flow Rate		--

I & O *(Cumulative Total as of:) 09/21/06 06:00*

Intake - 24 Hr (CIS)	2680
Output - 24 Hr (CIS)	2153

WEIGHT

Current Wt - kg [09/21/2006 06:00]	51.8
Previous Wt - kg [09/20/2006 03:00]	51.7

Med reconciliation accurate?

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Output - 24 Hr (CIS) 2153 Previous Wt - kg [09/20/2006 03:00] 51.7

PHYSICAL EXAM:

Gen: increased HR and respiratory effort, is not more interactive
CV: tachycardic, no m/g/r
Lung: rhonci throughout bilaterally
Abdo: few BS, remains soft, ND, no masses
LE: SCDs in place, no pedal edema, right foot brace
UE: arm braces in place b/l
Neuro: does not follow commands, PERRL, non-purposeful movements times four extremities

Early signs of sepsis?

LABORATORY STUDIES (TIME AND DATE SHOWN FOR MOST RECENT RESULTS DISPLAYED)

RESULTS FROM TODAY 09/21/06 04:18		RESULTS FROM YESTERDAY 09/20/06 15:00	
141 / 107 / 33	Ca 9.2, ICa 1.27, Mg 1.8, Phos 4.1	140 / 110 / 26	Ca 8.6, ICa 1.27, Mg 2.5, Phos 4.5
4.4 / 23 / 0.7		4.7 / 20 / 0.6	
11.50 / 10.3 / 30 / 241	PT 17.0, INR 1.4, PTT 43	10.80 / 10.3 / 31 / 217	PT 17.4, INR 1.4, PTT 42

Other recommendations within imaging reports?

IMAGING:

9/21: CXR: no change from previous, continued bilateral opacities

9/20: CXR: Bilateral opacities have increased. New right PICC

9/19: EEG - profound generalized slowing without variability and little reactivity, no epileptiform activity - c/w "profound generalized cerebral dysfunction of any cause"

9/7 Brain MRI: Multiple hemorrhagic contusions/shear injuries bilaterally with small amount of subarachnoid hemorrhage along the left tempor lobe. FLAIR signal abnormality in the splenium of the corpus callosum, likely representing shear injury. Extensive sinus mucosal disease.

9/4 Chest CT: Small left pneumothorax. Partial interval improvement in lower lobe aeration, with moderate residual lower lobe consolidation ar atelectasis. No new areas of consolidation. Moderate generalized edema and small bilateral pleural effusions likely reflect volume overload.

9/4 Abdo/Pelvis CT: Small left pneumothorax. Moderate bibasal atelectasis and/or consolidation. There is prominent subcutaneous edema. Sr bilateral pleural effusions and small volume ascites also likely reflect generalized edema.

TTE (8/30/06):

1. The left ventricular cavity is small. There is normal left ventricular wall thickness. Left ventricular systolic function is normal.
2. There is no pneumopericardium present now. There may have been, but currently the pericardial space appears normal
3. Valve structure/function is normal
4. Incidentally noted is a pacemaker in the right heart.
5. Review of the patient's chest xrays shows that the patient in fact had pneumomediastinum, not pneumopericardium.
6. Patients history of a transplanted heart is confirmed by records review. The heart is remarkably without the typical findings of a transplanted such as biatrial enlargement, RV enlargement, tricuspid regurgitation.

CT Head (08/31/2006):

1. No interval change since 8/29/06 at 10 AM in terms of bilateral cerebral contusions and small subarachnoid hemorrhage. 2. Marked interval increase in opacification of paranasal sinuses.

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Diagnoses:
1. Acute lung injury
2. Pneumonia
3. Persistent brain injury

Broader differential?
Appropriate care?
Code status in EMR accurate?

In compliance with billing rules?

DIABETES MELLITUS SUMMARY

Problem List

- Atrial Fibrillation (427.31)
- Diabetes mellitus type 2 (250.00)
- Hyperlipidemia (272.2)
- Hypertension (401.1)
- OSA - Obstructive sleep apnea |... (327.23)
- Osteoarthritis (715.96)

Allergies

NKA

Home Medications

- aspirin: 325 mg Daily
- Flexeril 5 mg: tid
- hydrochlorothiazide-triamterene 25 mg-37.5 mg: Daily
- metformin: 1000 mg bid
- metoprolol: 150 mg bid
- multivitamin: 3x/Weekly
- omega-3 polyunsaturated fatty acids: 1000 mg tid
- omeprazole: 40 mg Daily
- simvastatin: 60 mg At Bedtime

Diabetes Mellitus Events

BP :	127/65 mmHg	(09/22/08)	124/84 mmHg	(09/03/08)	
Wt :	127.200 kg (280 lbs)	(09/22/08)	126.500 kg (278 lbs)	(09/03/08)	
BMI :	45 Est. BMI*	(09/22/08)	45	(09/03/08)	
Eye Exam :	not documented	( )			
Foot Exam :	not documented	( )			
HbA1c :	H 9.2 %	(08/14/08)	H 6.9 %	(05/06/08)	
LDL :	106 mg/dL	(05/06/08)	139 mg/dL	(01/31/08)	
Cr :	1.0 mg/dL	(09/01/08)	1.3 mg/dL	(08/31/08)	
MicroAlb/Cr :	H 75.0 mcg/mg Creat	(05/06/08)			
Glu :	H 136 mg/dL	(09/01/08)	H 139 mg/dL	(08/31/08)	
K+ :	3.6 mmol/L	(09/01/08)	4.0 mmol/L	(08/31/08)	
Smoking Hx :	Non Smoker	(09/22/08)	Non Smoker	(09/03/08)	
Anti-platelet :	aspirin	(05/31/07)			

Diabetes Mellitu

This Patient	Targe
	1:Annu
	2:HbA
	3:BP <
	4:Annu
	5:LDL
	6:Annu
	7:Annu
	8:Annu

(as of 07/27/08)

Discern Analytics / PowerVision - Performance

Task Edit View Tools Components Window Help

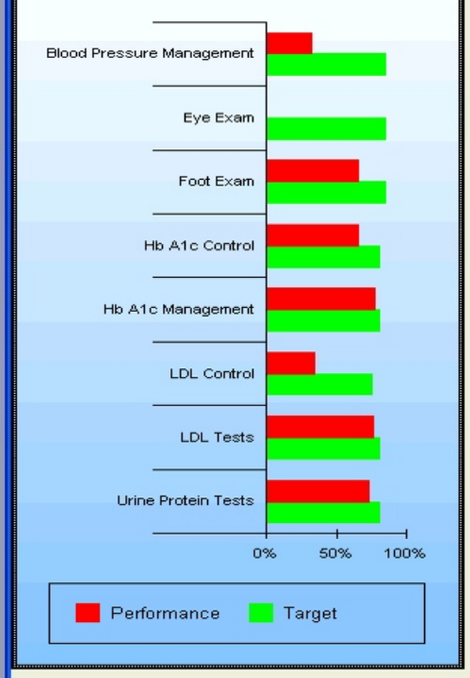
Explorer

Primary ...
Jensen, Brett
Madison, Matthew
Norton, Joel
Sutariya, Bharat
Vitale, John
Wavada, Theresa

Age Group
> 75
17 - 35
35 - 55
55 - 75

Gender
Female
Male
Unknown

DM Performance



Grid

Condition Description	Condition Display	Primary Care Physician	Gender	Age Group

Test	Detail	# of Patients
Blood Pressure Management	blood pressure controlled	7
	blood pressure not controlled	10
	blood pressure not in measurement group	5
	blood pressure refused	1
	Total	23
Eye Exam	eye exam not done within 1 year (high risk); not excluded	7
	eye exam not done within 2 years (low risk); not excluded	15
	eye exam refused	1
	Total	23
Foot Exam	Foot exam not in measurement group	7
	foot exam done	13
	foot exam not applicable	1
	foot exam refused	2
	Total	23
Hb A1c Control	HbA1C not in measurement group	5
	HbA1c controlled	15
	HbA1c not controlled	3
	Total	23
Hb A1c Management	HbA1C not in measurement group	5
	HbA1c done	17
	HbA1c refused	1
	Total	23
LDL Control	LDL controlled	8
	LDL not controlled	8
	LDL not in measurement group	7
	Total	23
LDL Tests	LDL done	16
	LDL not in measurement group	5
	LDL refused	2
	Total	23
Urine Protein Tests	urine protein test done	16

Ready SOLCORE BL4571 3:59 PM

DIABETES MELLITUS SUMMARY

Problem List

- Atrial Fibrillation (427.31)
- Diabetes mellitus type 2 (250.00)
- Hyperlipidemia (272.2)
- Hypertension (401.1)
- OSA - Obstructive sleep apnea |... (327.23)
- Osteoarthritis (715.96)

Allergies

NKA

Home Medications

- aspirin: 325 mg Daily
- Flexeril 5 mg: tid
- hydrochlorothiazide-triamterene 25 mg-37.5 mg: Daily
- metformin: 1000 mg bid
- metoprolol: 150 mg bid
- multivitamin: 3x/Weekly
- omega-3 polyunsaturated fatty acids: 1000 mg tid
- omeprazole: 40 mg Daily
- simvastatin: 60 mg At Bedtime

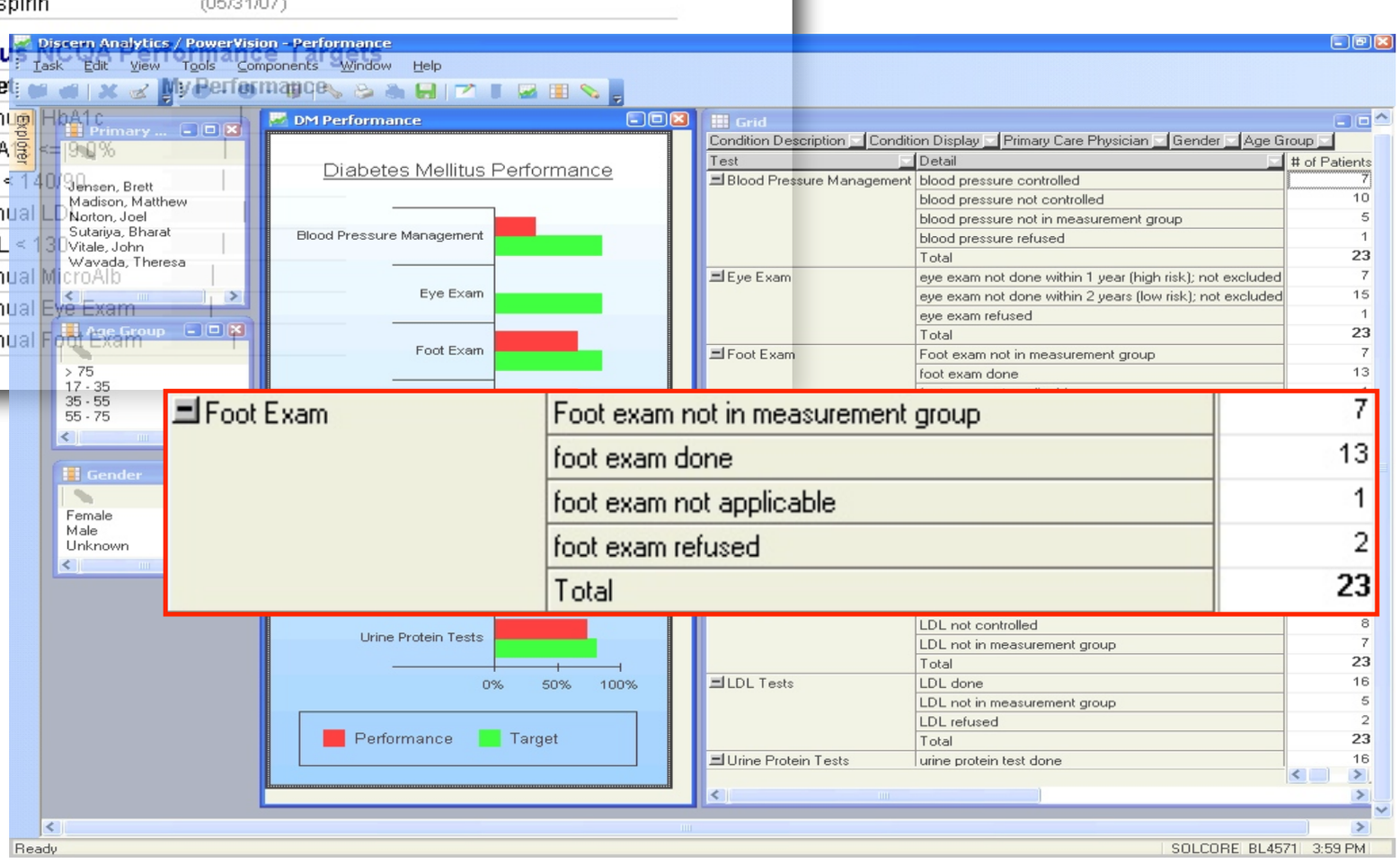
Diabetes Mellitus Events

BP :	127/65 mmHg	(09/22/08)	124/84 mmHg	(09/03/08)	
Wt :	127.200 kg (280 lbs)	(09/22/08)	126.500 kg (278 lbs)	(09/03/08)	
BMI :	45 Est. BMI*	(09/22/08)	45	(09/03/08)	
Eye Exam :	not documented	( )			
Foot Exam :	not documented	( )			
HbA1c :	H 9.2 %	(08/14/08)	H 6.9 %	(05/06/08)	
LDL :	106 mg/dL	(05/06/08)	139 mg/dL	(01/31/08)	
Cr :	1.0 mg/dL	(09/01/08)	1.3 mg/dL	(08/31/08)	
MicroAlb/Cr :	H 75.0 mcg/mg Creat	(05/06/08)			
Glu :	H 136 mg/dL	(09/01/08)	H 139 mg/dL	(08/31/08)	
K+ :	3.6 mmol/L	(09/01/08)	4.0 mmol/L	(08/31/08)	
Smoking Hx :	Non Smoker	(09/22/08)	Non Smoker	(09/03/08)	
Anti-platelet :	aspirin	(05/31/07)			

Diabetes Mellitus Recent Performance Targets

This Patient	Target
●	1:Annual HbA1c
●	2:HbA <= 9.0%
●	3:BP < 140/90
●	4:Annual LDL
●	5:LDL < 130
●	6:Annual MicroAlb
●	7:Annual Eye Exam
●	8:Annual Foot Exam

(as of 07/27/08)



Analysis of UHC Core Measures data within UW Medicine

Current availability of data elements	HF	AMI	OPPS SCIP	All 3 measures
Structured, codified, machine-readable format	3 (17%)	6 (15%)	1 (11%)	10 (15%)
Free text from canonical single source	9 (50%)	11 (28%)	6 (67%)	26 (39%)
Free text from canonical multiple sources	1 (6%)	1 (3%)	0 (0%)	2 (3%)
Handwritten documentation, human interference required	5 (28%)	22 (55%)	2 (22%)	29 (43%)

85%

Analysis of 67 metrics reported to University Healthcare Consortium for heart failure (HF), acute myocardial infarction (AMI), and outpatient surgical care improvement project (OPPS SCIP) metrics. Together, these measures include 67 distinct metrics that require reporting to UHC. Supporting data in source systems (ORCA EMR, echocardiology, Docusys OR system, Reg/ADT, and other systems) for reporting these 67 metrics were analyzed.

bhi biomedical and health informatics

ITHS Institute of Translational Health Sciences

Slide courtesy of Tony Black, Biomedical Informatics Core, Institute of Translational Health Sciences, University of Washington

The Challenge of Measuring Quality of Care From the Electronic Health Record

Carol P. Roth, RN, MPH
Yee-Wei Lim, MD, PhD
Joshua M. Pevnick, MD
Steven M. Asch, MD, MPH
Elizabeth A. McGlynn, PhD

QA Tools: Required Clinical Variables by Anticipated Accessibility

Accessible	n	Percentage	Hard to Access	n	Percentage
Demographics	482	100	Disease-specific history	142	30
Diagnosis	346	72	Care site	133	28
Prescription	167	35	Physical exam	67	14
Past medical history	148	31	Refusal	60	13
Procedure date	117	24	Patient education	53	11
Lab date	81	17	Social history	52	11
Problem/chief complaint	57	12	Treatment	25	5
Vital sign/weight/height	46	10	Diagnostic test result	18	4
Allergy	42	9	Imaging result	17	4
Lab result	38	8	Contraindication	15	3
Medication history	28	6	Pathology	11	2
Diagnostic test date	22	5	Family history	11	2
Imaging date	22	5	ECG result	6	1
Medications, current	13	3	X-ray result	2	<1
Vaccination	9	2			
X-ray date	6	1			
EKG date	6	1			

American Journal of Medical Quality, Vol. 24, No. 5, Sep/Oct 2009

Topics today

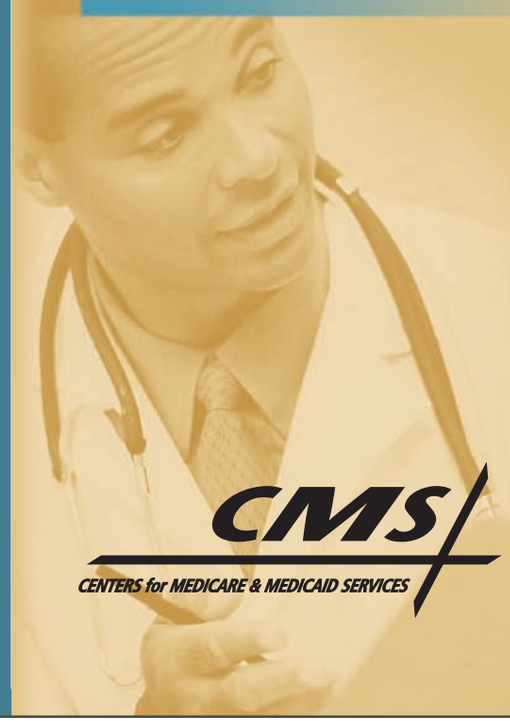
- The story of moving from paper to electronic notes
- NLP and clinical decision support
- 3 examples: NLP in UW Medicine EMRs
- Summary and discussion

tpayne@u.washington.edu

Medicare Learning Network

DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

Evaluation & Management Services Guide



CMS
CENTERS for MEDICARE & MEDICAID SERVICES

July 2009
ICN: 006764

B. History of Present Illness

HPI is a chronological description of the development of the patient's present illness from the first sign and/or symptom or from the previous encounter to the present. HPI elements are:

- Location. For example, pain in left leg;
- Quality. For example, aching, burning, radiating;
- Severity. For example, 10 on a scale of 1 to 10;
- Duration. For example, it started three days ago;
- Timing. For example, it is constant or it comes and goes;
- Context. For example, lifted large object at work;
- Modifying factors. For example, it is better when heat is applied; and
- Associated signs and symptoms. For example, numbness.

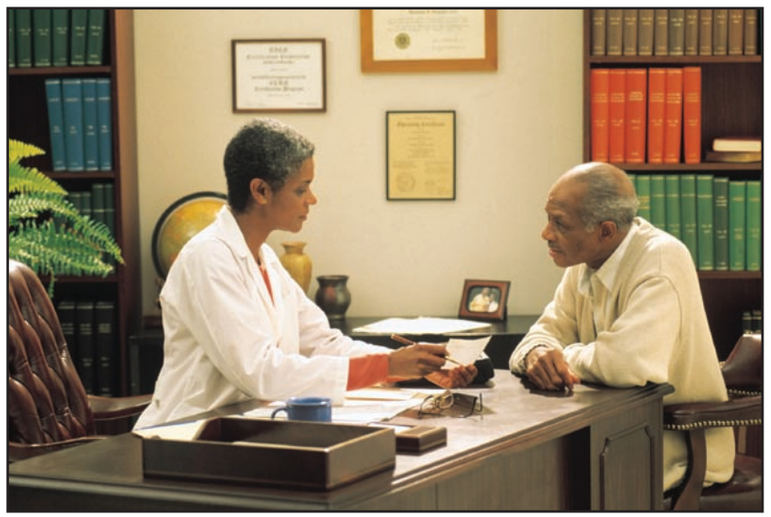
There are two types of HPIs:

1. Brief, which includes documentation of one to three HPI elements. In the following example, three HPI elements – location, severity, and duration – are documented:
   - CC: A patient seen in the office complains of left ear pain.
   - Brief HPI: Patient complains of dull ache in left ear over the past 24 hours.
2. Extended, which includes documentation of at least four HPI elements or the status of at least three chronic or inactive conditions. In the following example, five HPI elements – location, severity, duration, context, and modifying factors – are documented:
   - Extended HPI: Patient complains of dull ache in left ear over the past 24 hours. Patient states he went swimming two days ago. Symptoms somewhat relieved by warm compress and ibuprofen.

C. Review of Systems

ROS is an inventory of body systems obtained by asking a series of questions in order to identify signs and/or symptoms that the patient may be experiencing or has experienced. The following systems are recognized:

- Constitutional Symptoms (e.g., fever, weight loss);
- Eyes;
- Ears, Nose, Mouth, Throat;
- Cardiovascular;
- Respiratory;
- Gastrointestinal;
- Genitourinary;
- Musculoskeletal;
- Integumentary (skin and/or breast);
- Neurological;
- Psychiatric;
- Endocrine;
- Hematologic/Lymphatic; and
- Allergic/Immunologic.



There are three types of ROS:

1. Problem pertinent, which inquires about the system directly related to the problem identified in the HPI. In the following example, one system – the ear – is reviewed:
   - CC: Earache.
   - ROS: Positive for left ear pain. Denies dizziness, tinnitus, fullness, or headache.
2. Extended, which inquires about the system directly related to the problem(s) identified in the HPI and a limited number (two to nine) of additional systems. In the following example, two systems – cardiovascular and respiratory – are reviewed:
   - CC: Follow up visit in office after cardiac catheterization. Patient states “I feel great.”
   - ROS: Patient states he feels great and denies chest pain, syncope, palpitations, and shortness of breath. Relates occasional unilateral, asymptomatic edema of left leg.
3. Complete, which inquires about the system(s) directly related to the problem(s) identified in the HPI plus all additional (minimum of 10) body systems. In the following example, 10 signs and symptoms are reviewed:
   - CC: Patient complains of “fainting spell.”
   - ROS:
     - Constitutional: weight stable, + fatigue.
     - Eyes: + loss of peripheral vision.
     - Ear, Nose, Mouth, Throat: no complaints.
     - Cardiovascular: + palpitations; denies chest pain; denies calf pain, pressure, or edema.
     - Respiratory: + shortness of breath on exertion.
     - Gastrointestinal: appetite good, denies heartburn and indigestion. + episodes of nausea. Bowel movement daily; denies constipation or loose stools.
     - Urinary: denies incontinence, frequency, urgency, nocturia, pain, or discomfort.
     - Skin: + clammy, moist skin.
     - Neurological: + fainting; denies numbness, tingling, and tremors.
     - Psychiatric: denies memory loss or depression. Mood pleasant.

D. Past, Family, and/or Social History

PFSH consists of a review of the patient’s:

- Past history including experiences with illnesses, operations, injuries, and treatments;
- Family history including a review of medical events, diseases, and hereditary conditions that may place him or her at risk; and
- Social history including an age appropriate review of past and current activities.

The two types of PFSH are:

1. Pertinent, which is a review of the history areas directly related to the problem(s) identified in the HPI. The pertinent PFSH must document one item from any of the three history areas. In the following example, the patient’s past surgical history is reviewed as it relates to the current HPI:
   - Patient returns to office for follow up of coronary artery bypass graft in 1992. Recent cardiac catheterization demonstrates 50 percent occlusion of vein graft to obtuse marginal artery.

II. Examination

An examination may involve several organ systems or a single organ system. The extent of the examination performed is based upon clinical judgment, the patient's history, and nature of the presenting problem.

The chart below depicts the body areas and organ systems that are recognized according to the Current Procedural Terminology (CPT) book:

Recognized Body Areas and Organ Systems

BODY AREAS	ORGAN SYSTEMS
■ Head, including face ■ Neck ■ Chest, including breasts and axilla ■ Abdomen ■ Genitalia, groin, buttocks ■ Back ■ Each extremity	■ Eyes ■ Ears, Nose, Mouth, and Throat ■ Cardiovascular ■ Respiratory ■ Gastrointestinal ■ Genitourinary ■ Musculoskeletal ■ Skin ■ Neurologic ■ Hematologic/Lymphatic/Immunologic ■ Psychiatric

There are two types of examinations that can be performed during a patient's visit:

1. General multi-system examination, which involves the examination of one or more organ systems or body areas. According to the *1997 Documentation Guidelines for Evaluation and Management Services,* each body area or organ system contains two or more of the following examination elements:

   - Constitutional Symptoms (e.g., fever, weight loss);
   - Eyes;
   - Ears, Nose, Mouth, Throat;
   - Neck;
   - Respiratory;
   - Cardiovascular;
   - Chest (breasts);
   - Gastrointestinal;
   - Genitourinary;
   - Lymphatic;
   - Musculoskeletal;
   - Integumentary;
   - Neurological; and
   - Psychiatric.

The elements required for general multi-system examinations are depicted in the following chart.

General Multi-System Examinations

TYPE OF EXAMINATION	DESCRIPTION
Problem Focused	Include performance and documentation of 1 - 5 elements identified by a bullet in 1 or more organ system(s) or body area(s).
Expanded Problem Focused	Include performance and documentation of at least 6 elements identified by a bullet in 1 or more organ system(s) or body area(s).
Detailed	Include at least 6 organ systems or body areas. For each system/area selected, performance and documentation of at least 2 elements identified by a bullet is expected. Alternatively, may include performance and documentation of at least 12 elements identified by a bullet in 2 or more organ systems or body areas.
Comprehensive	*1997 Documentation Guidelines for Evaluation and Management Services*: Include at least 9 organ systems or body areas. For each system/area selected, all elements of the examination identified by a bullet should be performed, unless specific directions limit the content of the examination. For each area/system, documentation of at least 2 elements identified by bullet is expected. *1995 Documentation Guidelines for Evaluation and Management Services*: Eight organ systems ***must*** be examined. If body areas are examined and counted, they must be over and above the 8 organ systems.

According to the *1997 Documentation Guidelines for Evaluation and Management Services*, the 10 single organ system examinations are:

- Cardiovascular;
- Ear, Nose, and Throat;
- Eye;
- Genitourinary;
- Hematologic/Lymphatic/Immunologic;
- Musculoskeletal;
- Neurological;
- Psychiatric;
- Respiratory; and
- Skin.

Some important points that should be kept in mind when documenting the number of diagnoses or management options are:

- For each encounter, an assessment, clinical impression, or diagnosis should be documented which may be explicitly stated or implied in documented decisions regarding management plans and/or further evaluation.
    - For a presenting problem with an established diagnosis, the record should reflect whether the problem is:
        - Improved, well controlled, resolving, or resolved.
        - Inadequately controlled, worsening, or failing to change as expected.
    - For a presenting problem without an established diagnosis, the assessment or clinical impression may be stated in the form of differential diagnoses or as a "possible," "probable," or "rule out" diagnosis
- The initiation of, or changes in, treatment should be documented. Treatment includes a wide range of management options including patient instructions, nursing instructions, therapies, and medications.
- If referrals are made, consultations requested, or advice sought, the record should indicate to whom or where the referral or consultation is made or from whom advice is requested.

Amount and/or Complexity of Data to be Reviewed

The amount and/or complexity of data to be reviewed is based on the types of diagnostic testing ordered or reviewed. Indications of the amount and/or complexity of data being reviewed include:

- A decision to obtain and review old medical records and/or obtain history from sources other than the patient (increases the amount and complexity of data to be reviewed);
- Discussion of contradictory or unexpected test results with the physician who performed or interpreted the test (indicates the complexity of data to be reviewed); and
- The physician who ordered a test personally reviews the image, tracing, or specimen to supplement information from the physician who prepared the test report or interpretation (indicates the complexity of data to be reviewed).

Some important points that should be kept in mind when documenting amount and/or complexity of data to be reviewed include:

- If a diagnostic service is ordered, planned, scheduled, or performed at the time of the E/M encounter, the type of service should be documented.
- The review of laboratory, radiology, and/or other diagnostic tests should be documented. A simple notation such as "White blood count elevated" or "Chest x-ray unremarkable" is acceptable. Alternatively, the review may be documented by initialing and dating the report that contains the test results.
- A decision to obtain old records or obtain additional history from the family, caretaker, or other source to supplement information obtained from the patient should be documented.
- Relevant findings from the review of old records and/or the receipt of additional history from the family, caretaker, or other source to supplement information obtained from the patient should be documented. If there is no relevant information beyond that already obtained, this fact should be documented. A notation of "Old records reviewed" or "Additional history obtained from family" without elaboration is not sufficient.
- Discussion about results of laboratory, radiology, or other diagnostic tests with the physician who performed or interpreted the study should be documented.
- The direct visualization and independent interpretation of an image, tracing, or specimen previously or subsequently interpreted by another physician should be documented.

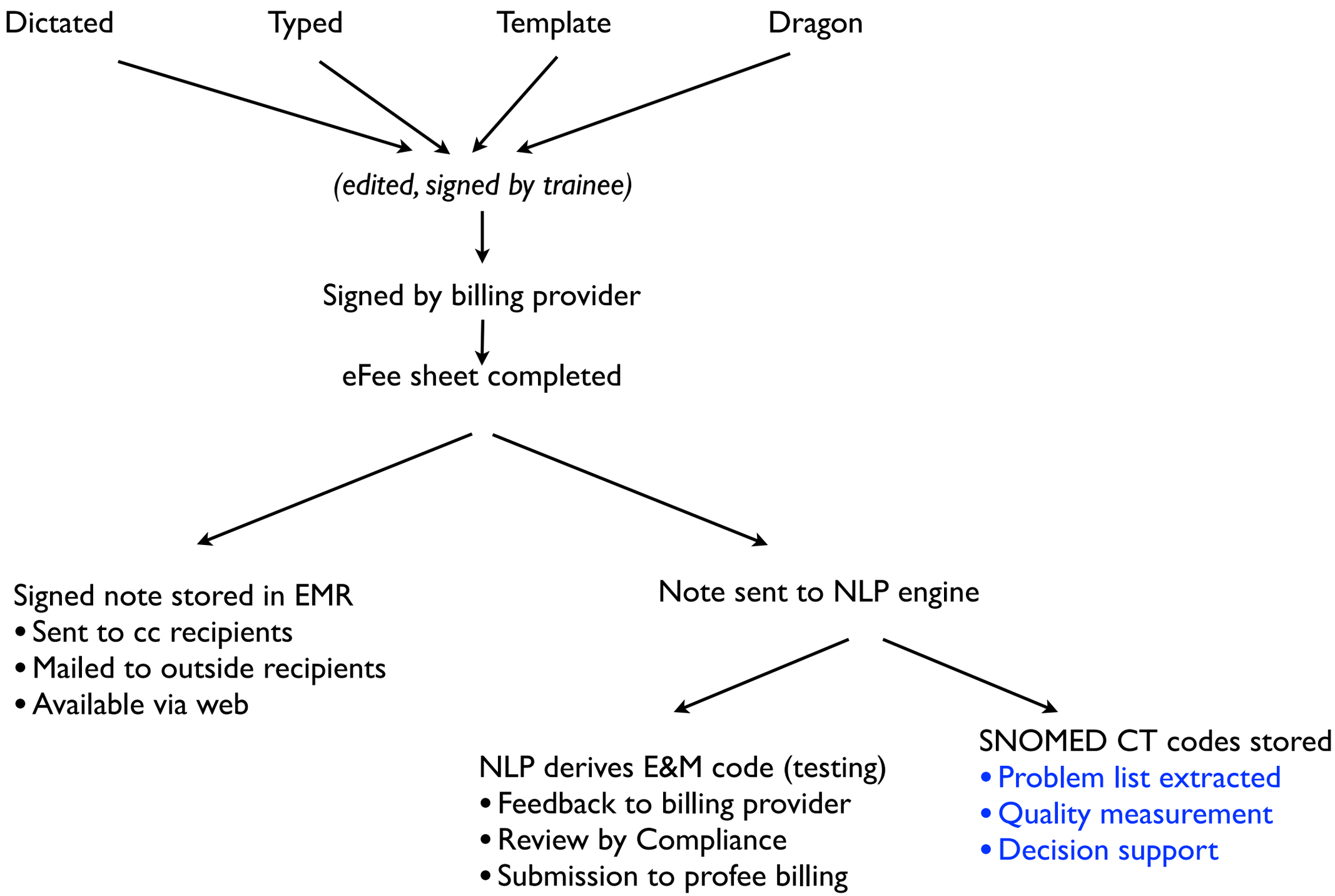
TABLE OF RISK

Level of Risk	Presenting Problem(s)	Diagnostic Procedure(s) Ordered	Management Options Selected
Minimal	◦ One self-limited or minor problem, eg, cold, insect bite, tinea corporis	◦ Laboratory tests requiring venipuncture ◦ Chest x-rays ◦ EKG/EEG ◦ Urinalysis ◦ Ultrasound, eg, echocardiography ◦ KOH prep	◦ Rest ◦ Gargles ◦ Elastic bandages ◦ Superficial dressings
Low	◦ Two or more self-limited or minor problems ◦ One stable chronic illness, eg, well controlled hypertension, non-insulin dependent diabetes, cataract, BPH ◦ Acute uncomplicated illness or injury, eg, cystitis, allergic rhinitis, simple sprain	◦ Physiologic tests not under stress, eg, pulmonary function tests ◦ Non-cardiovascular imaging studies with contrast, eg, barium enema ◦ Superficial needle biopsies ◦ Clinical laboratory tests requiring arterial puncture ◦ Skin biopsies	◦ Over-the-counter drugs ◦ Minor surgery with no identified risk factors ◦ Physical therapy ◦ Occupational therapy ◦ IV fluids without additives
Moderate	◦ One or more chronic illnesses with mild exacerbation, progression, or side effects of treatment ◦ Two or more stable chronic illnesses ◦ Undiagnosed new problem with uncertain prognosis, eg, lump in breast ◦ Acute illness with systemic symptoms, eg, pyelonephritis, pneumonitis, colitis ◦ Acute complicated injury, eg, head injury with brief loss of consciousness	◦ Physiologic tests under stress, eg, cardiac stress test, fetal contraction stress test ◦ Diagnostic endoscopies with no identified risk factors ◦ Deep needle or incisional biopsy ◦ Cardiovascular imaging studies with contrast and no identified risk factors, eg, arteriogram, cardiac catheterization ◦ Obtain fluid from body cavity, eg, lumbar puncture, thoracentesis, culdocentesis	◦ Minor surgery with identified risk factors ◦ Elective major surgery (open, percutaneous or endoscopic) with no identified risk factors ◦ Prescription drug management ◦ Therapeutic nuclear medicine ◦ IV fluids with additives ◦ Closed treatment of fracture or dislocation without manipulation
High	◦ One or more chronic illnesses with severe exacerbation, progression, or side effects of treatment ◦ Acute or chronic illnesses or injuries that pose a threat to life or bodily function, eg, multiple trauma, acute MI, pulmonary embolus, severe respiratory distress, progressive severe rheumatoid arthritis, psychiatric illness with potential threat to self or others, peritonitis, acute renal failure ◦ An abrupt change in neurologic status, eg, seizure, TIA, weakness, sensory loss	◦ Cardiovascular imaging studies with contrast with identified risk factors ◦ Cardiac electrophysiological tests ◦ Diagnostic Endoscopies with identified risk factors ◦ Discography	◦ Elective major surgery (open, percutaneous or endoscopic) with identified risk factors ◦ Emergency major surgery (open, percutaneous or endoscopic) ◦ Parenteral controlled substances ◦ Drug therapy requiring intensive monitoring for toxicity ◦ Decision not to resuscitate or to de-escalate care because of poor prognosis

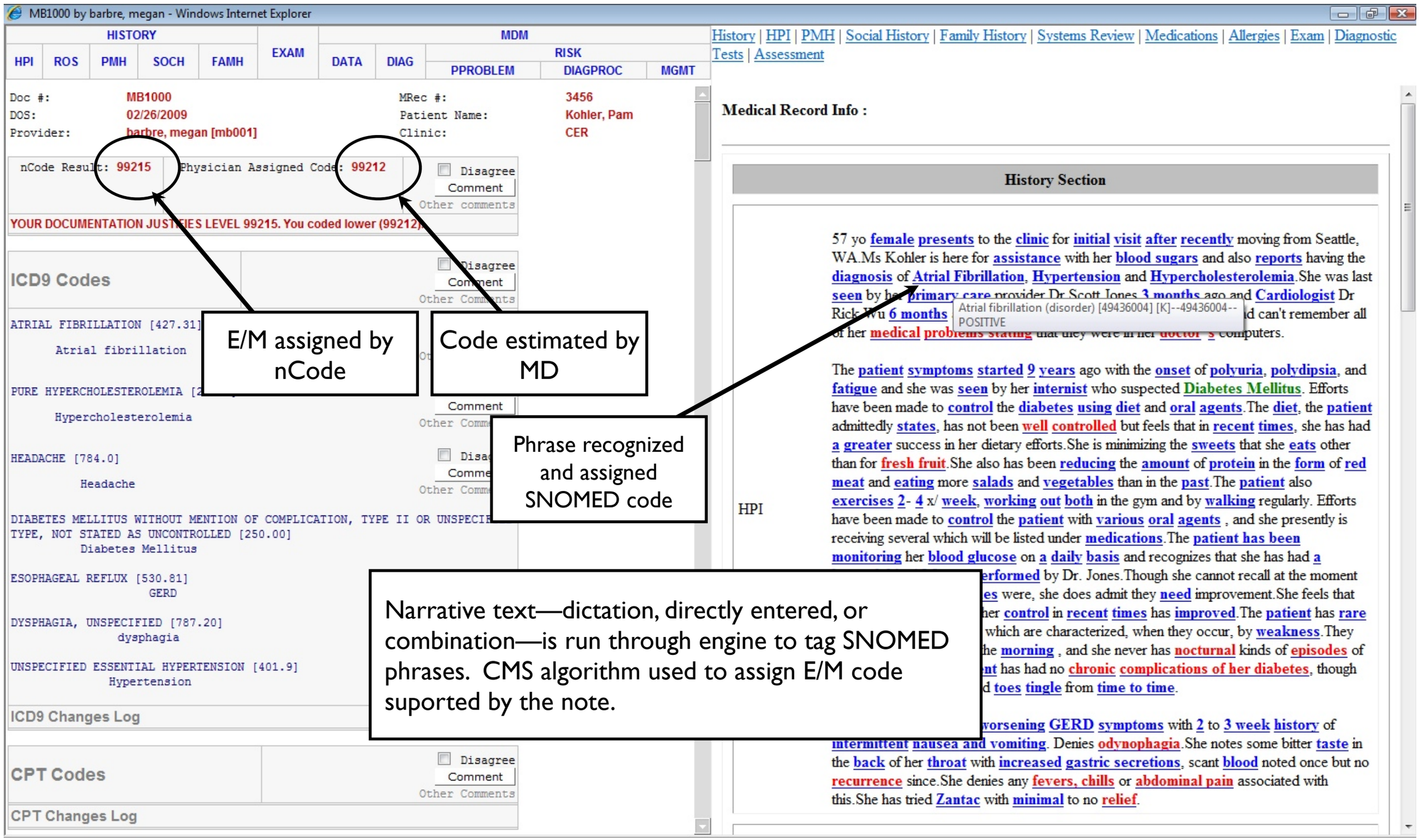
NLP in professional fee coding

- Our EMR contains a set of tools to process narrative text documents to tag phrases with SNOMED CT codes, and then to apply algorithms to assign E&M code supported by the document.
- Handles qualifiers, negation, and applies rules to increase tagging precision
- Gives feedback to provider for every note, in 3 seconds.
- Calibrated to standards set by compliance officer: 93% accurate in comparison with panel of profee coding professionals.

Note workflow, showing incorporation of natural language processing



NLP tagging, then CMS E/M rules applied



11/14/09

Result Type: Internal Medicine - Outpt Record
Service Date: June 27, 2007 15:36
Result Status: Authenticated
Performed By:
Verified By:
Encounter Info:

* Final Report *

CC/ID: -year-old man who is here for follow-up of several medical problems. Primarily a counseling visit with 25 minutes spent face to face the majority of time spent counseling about the plan below.

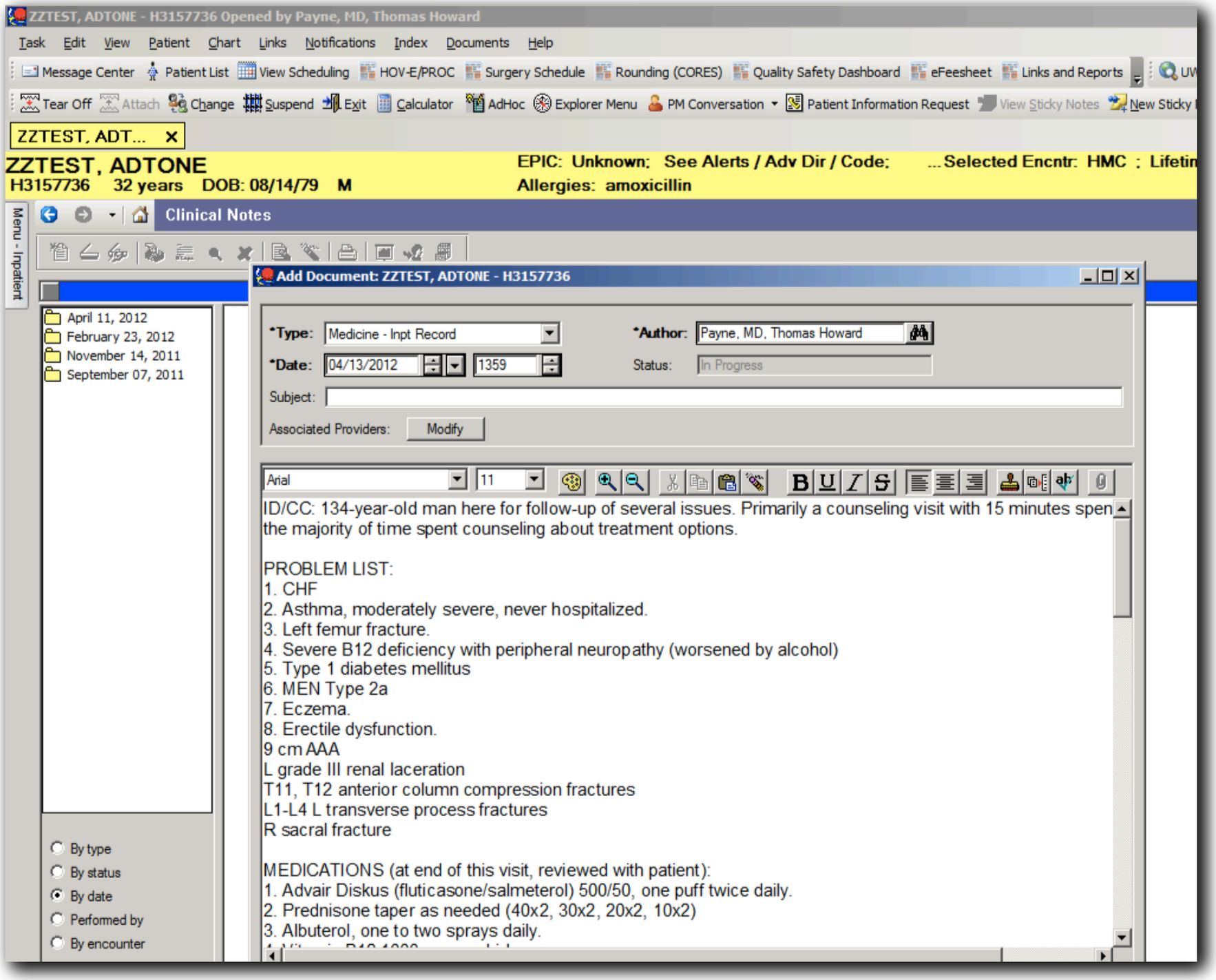
PROBLEM LIST:
1. ADVANCED DIRECTIVE - see below
2. Parkinsons disease since 1980. Tremor improved with gamma knife right thalamotomy at Northwest Hospital August 2004.
3. Dementia. First noted 2002. History of medication related severe agitation, psychosis, now much improved.
4. Postherpetic neuralgia, left chest wall pain since November 2002. Some degree of perseveration and somatatization about this and other related bodily complaints related to dementia.
5. Chronic shoulder pain with severe osteoarthritis.
6. Peptic ulcer March 2004 due to nonsteroidal anti-inflammatory drugs.
7. Inguinal hernia. Somewhat symptomatic but easily reducible.

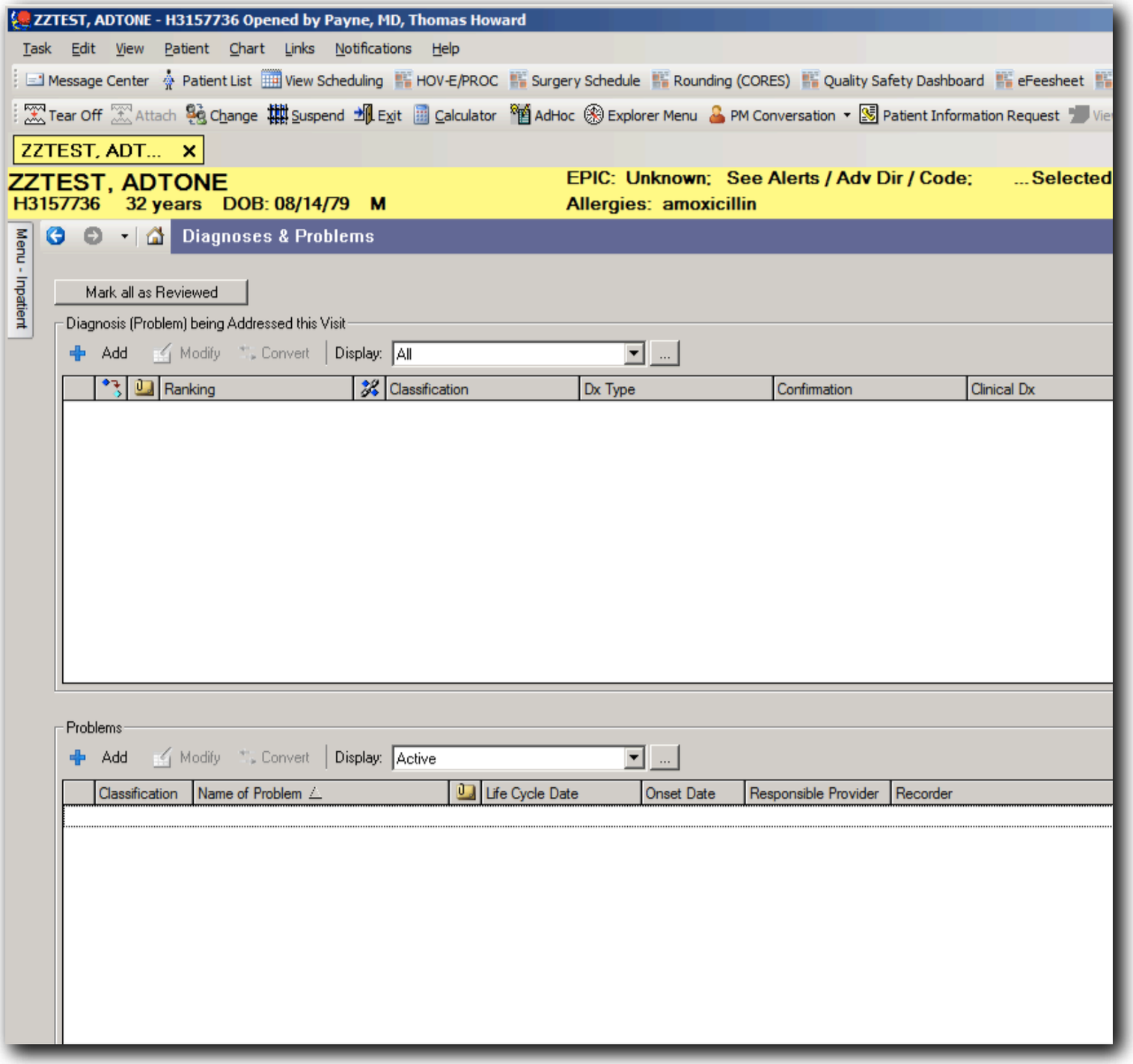
ADVANCED DIRECTIVE: Patient gave a very clear directive on June 22, 2005 that he not be resuscitated in the event of cardiac arrest, that he not receive airway intubation, that he not receive artificial nutrition via a feeding tube. He would like to be transferred to the hospital for severe, acute issues, with other medical interventions to be decided on a case by case basis.

PAST MEDICAL HISTORY:
1. Cholecystectomy.
2. Kidney stones.
3. Basal cell carcinoma, ear.

INTERVAL HISTORY:
1. Inguinal hernia. Pain stable. There on most days. Comes and goes. Better with lying flat. No N/V.

2. Chronic shoulder pain. Now reports good pain relief at night with bedtime dosing only of methadone but worse pain during the day. Interfering with daily activities. Methadone was recently refilled by fax.


ZZTEST, ADTONE - H3157736 Opened by Payne, MD, Thomas Howard
Task Edit View Patient Chart Links Notifications Index Documents Help
Message Center Patient List View Scheduling HOV-E/PROC Surgery Schedule Rounding (CORES) Quality Safety Dashboard eFeesheet Links and Reports
Tear Off Attach Change Suspend Exit Calculator AdHoc Explorer Menu PM Conversation Patient Information Request View Sticky Notes New Sticky
ZZTEST, ADT...
ZZTEST, ADTONE
H3157736 32 years DOB: 08/14/79 M
EPIC: Unknown: See Alerts / Adv Dir / Code: ...Selected Encntr: HMC : Lifetin
Allergies: amoxicillin
Menu - Inpatient
Clinical Notes
April 11, 2012
February 23, 2012
November 14, 2011
September 07, 2011
By type
By status
By date
Performed by
By encounter
Add Document: ZZTEST, ADTONE - H3157736
*Type: Medicine - Inpt Record
*Author: Payne, MD, Thomas Howard
*Date: 04/13/2012 1359
Status: In Progress
Subject:
Associated Providers: Modify
Arial 11
ID/CC: 134-year-old man here for follow-up of several issues. Primarily a counseling visit with 15 minutes spen
the majority of time spent counseling about treatment options.
PROBLEM LIST:
1. CHF
2. Asthma, moderately severe, never hospitalized.
3. Left femur fracture.
4. Severe B12 deficiency with peripheral neuropathy (worsened by alcohol)
5. Type 1 diabetes mellitus
6. MEN Type 2a
7. Eczema.
8. Erectile dysfunction.
9 cm AAA
L grade III renal laceration
T11, T12 anterior column compression fractures
L1-L4 L transverse process fractures
R sacral fracture
MEDICATIONS (at end of this visit, reviewed with patient):
1. Advair Diskus (fluticasone/salmeterol) 500/50, one puff twice daily.
2. Prednisone taper as needed (40x2, 30x2, 20x2, 10x2)
3. Albuterol, one to two sprays daily.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EPIC: Unknown; See Alerts / Adv Dir / Code: ...Selected
Allergies: amoxicillin
Menu - Inpatient
Diagnoses & Problems
Mark all as Reviewed
Diagnosis (Problem) being Addressed this Visit
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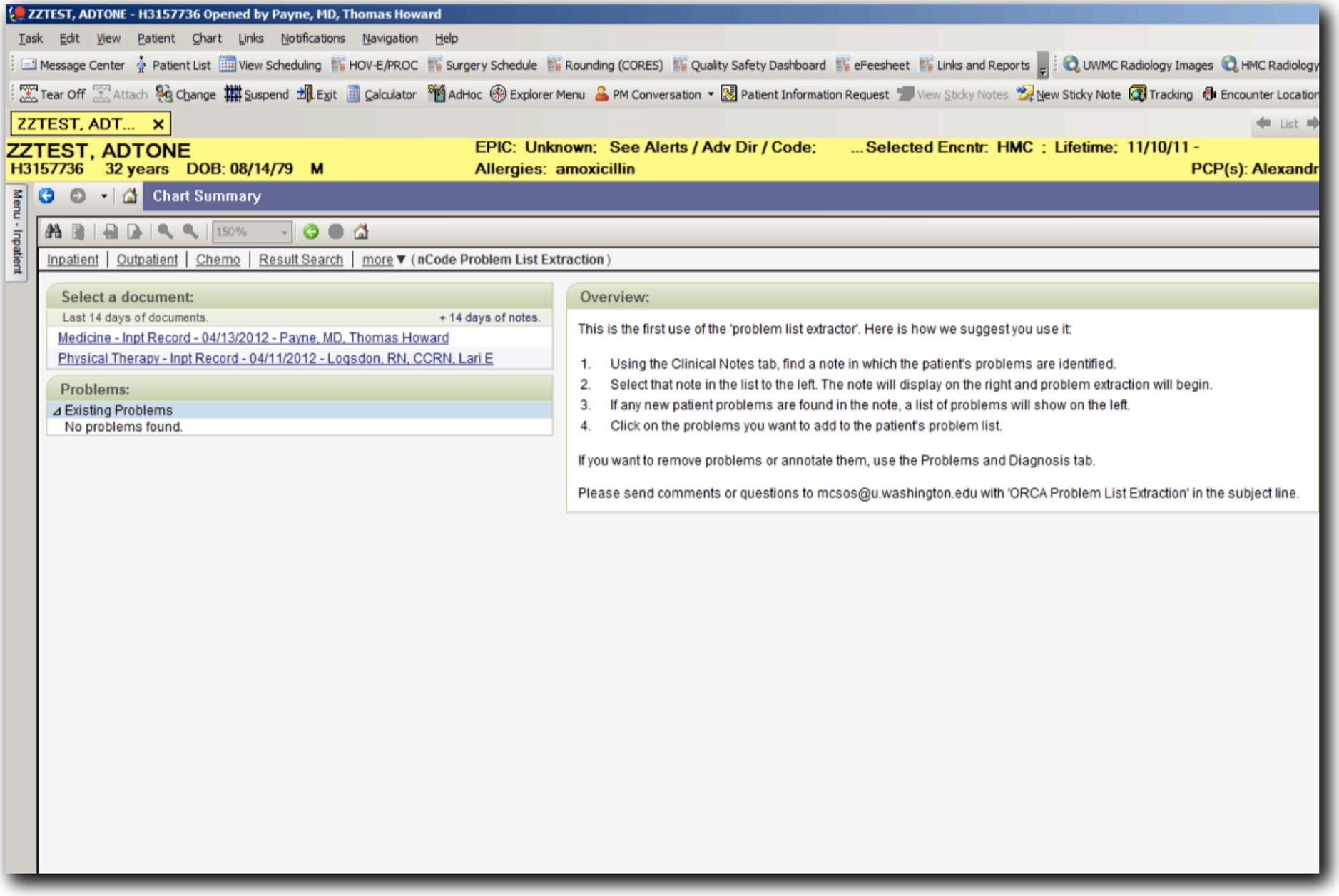
Ranking Classification Dx Type Confirmation Clinical Dx
Problems
Add Modify Convert Display: Active
Classification Name of Problem Life Cycle Date Onset Date Responsible Provider Recorder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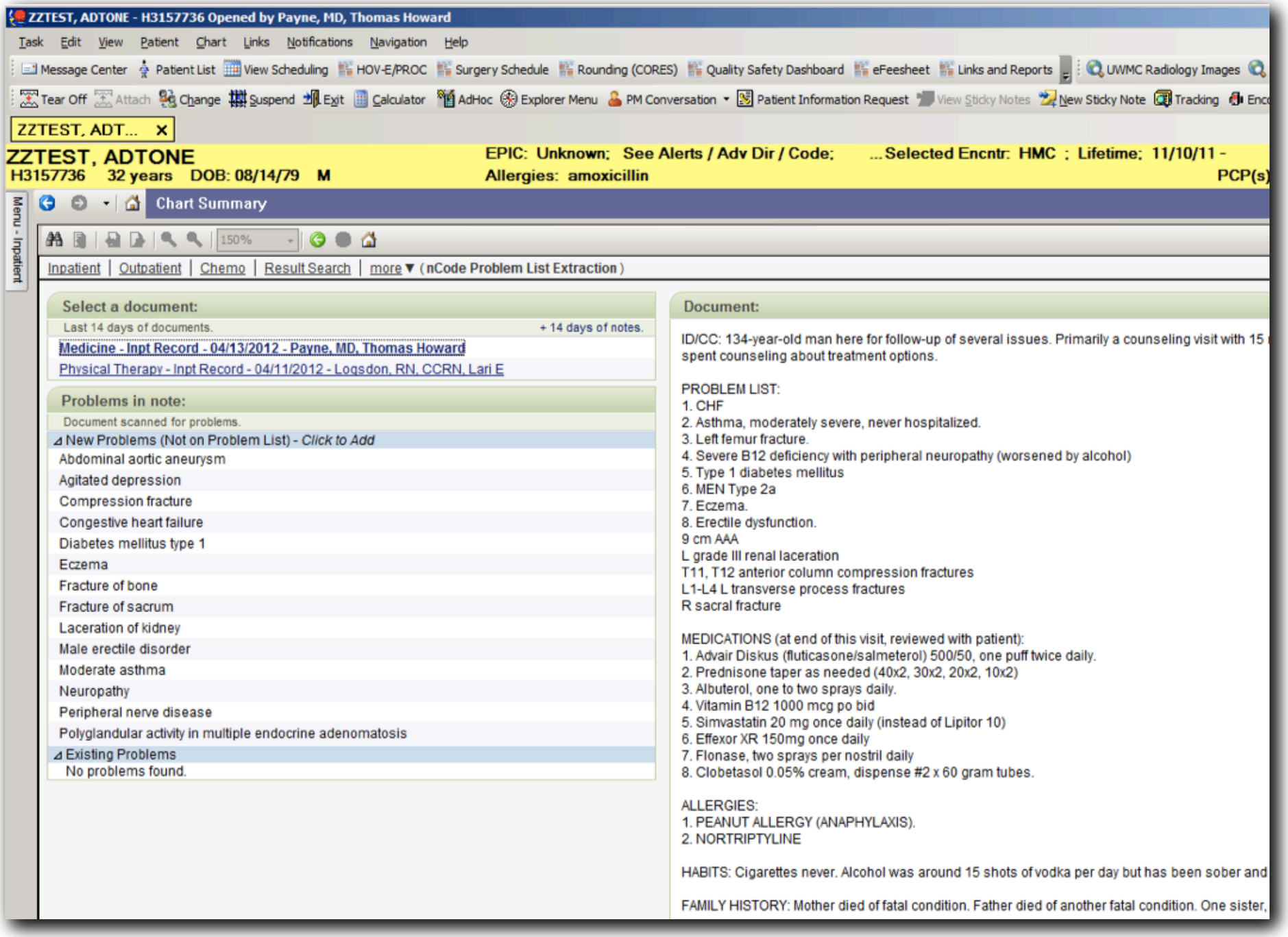
Tear Off Attach Change Suspend Exit Calculator AdHoc Explorer Menu PM Conversation Patient Information Request View Sticky Notes New Sticky Note Tracking Encounter Location
ZZTEST, ADT...
ZZTEST, ADTONE
H3157736 32 years DOB: 08/14/79 M
EPIC: Unknown; See Alerts / Adv Dir / Code; ...Selected Encntr: HMC : Lifetime: 11/10/11 -
Allergies: amoxicillin
PCP(s): Alexandr
Menu - Inpatient
Chart Summary
150%
Inpatient | Outpatient | Chemo | Result Search | more ▼ (nCode Problem List Extraction)
Select a document:
Last 14 days of documents.
+ 14 days of notes.
Medicine - Inpt Record - 04/13/2012 - Payne, MD, Thomas Howard
Physical Therapy - Inpt Record - 04/11/2012 - Logsdon, RN, CCRN, Lari E
Problems:
Existing Problems
No problems found.
Overview:
This is the first use of the 'problem list extractor'. Here is how we suggest you use it:
1. Using the Clinical Notes tab, find a note in which the patient's problems are identified.
2. Select that note in the list to the left. The note will display on the right and problem extraction will begin.
3. If any new patient problems are found in the note, a list of problems will show on the left.
4. Click on the problems you want to add to the patient's problem list.
If you want to remove problems or annotate them, use the Problems and Diagnosis tab.
Please send comments or questions to mcsos@u.washington.edu with 'ORCA Problem List Extraction' in the subject line.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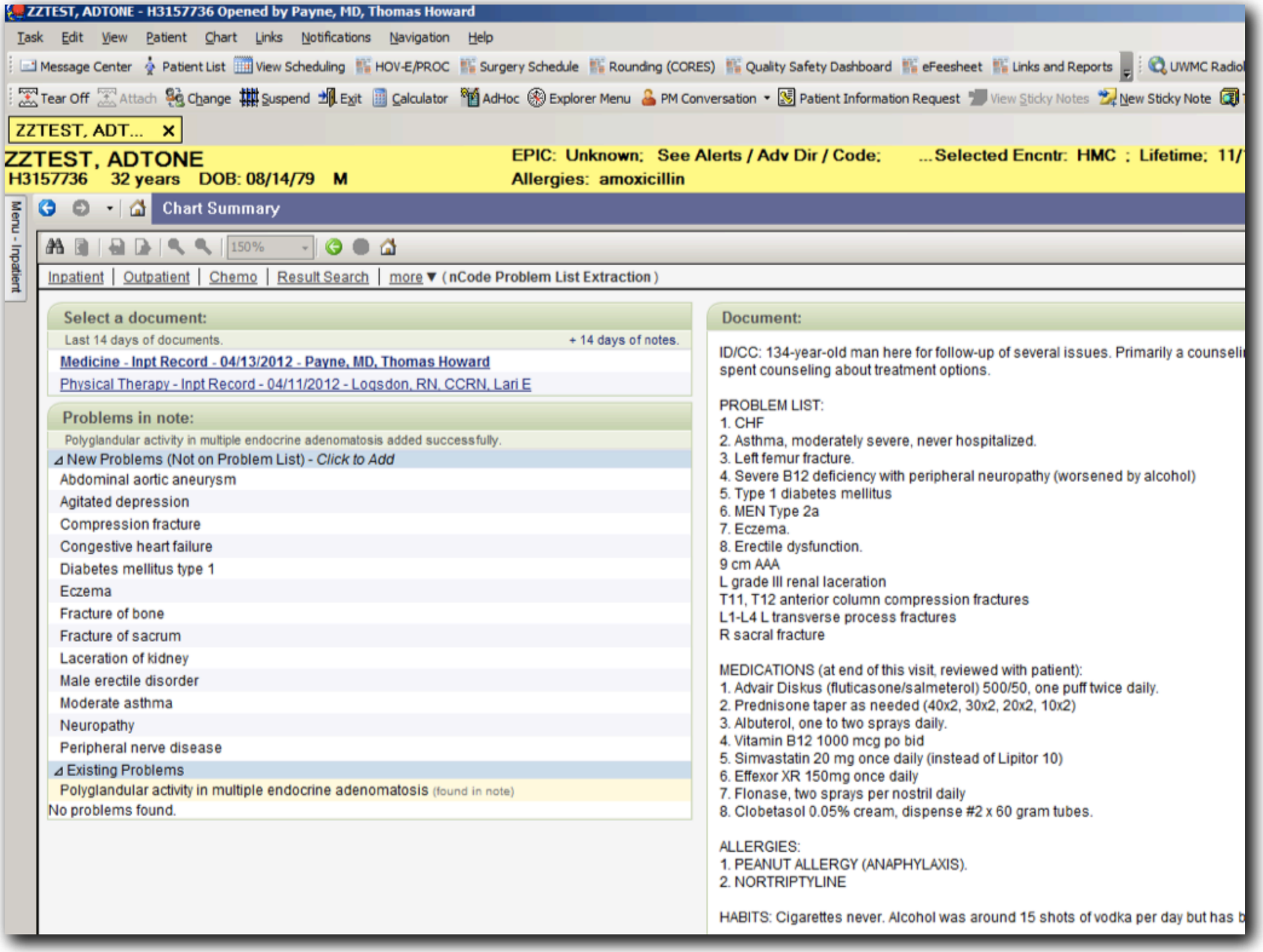
ZZTEST, ADT...
ZZTEST, ADTONE
H3157736 32 years DOB: 08/14/79 M
EPIC: Unknown; See Alerts / Adv Dir / Code; ...Selected Encntr: HMC ; Lifetime: 11/10/11 -
Allergies: amoxicillin
PCP(s)
Menu - Inpatient
Chart Summary
150%
Inpatient | Outpatient | Chemo | Result Search | more ▼ (nCode Problem List Extraction)
Select a document:
Last 14 days of documents.
+ 14 days of notes.
Medicine - Inpt Record - 04/13/2012 - Payne, MD, Thomas Howard
Physical Therapy - Inpt Record - 04/11/2012 - Logsdon, RN, CCRN, Lari E
Problems in note:
Document scanned for problems.
New Problems (Not on Problem List) - Click to Add
Abdominal aortic aneurysm
Agitated depression
Compression fracture
Congestive heart failure
Diabetes mellitus type 1
Eczema
Fracture of bone
Fracture of sacrum
Laceration of kidney
Male erectile disorder
Moderate asthma
Neuropathy
Peripheral nerve disease
Polyglandular activity in multiple endocrine adenomatosis
Existing Problems
No problems found.
Document:
ID/CC: 134-year-old man here for follow-up of several issues. Primarily a counseling visit with 15
spent counseling about treatment options.
PROBLEM LIST:
1. CHF
2. Asthma, moderately severe, never hospitalized.
3. Left femur fracture.
4. Severe B12 deficiency with peripheral neuropathy (worsened by alcohol)
5. Type 1 diabetes mellitus
6. MEN Type 2a
7. Eczema.
8. Erectile dysfunction.
9 cm AAA
L grade III renal laceration
T11, T12 anterior column compression fractures
L1-L4 L transverse process fractures
R sacral fracture
MEDICATIONS (at end of this visit, reviewed with patient):
1. Advair Diskus (fluticasone/salmeterol) 500/50, one puff twice daily.
2. Prednisone taper as needed (40x2, 30x2, 20x2, 10x2)
3. Albuterol, one to two sprays daily.
4. Vitamin B12 1000 mcg po bid
5. Simvastatin 20 mg once daily (instead of Lipitor 10)
6. Effexor XR 150mg once daily
7. Flonase, two sprays per nostril daily
8. Clobetasol 0.05% cream, dispense #2 x 60 gram tubes.
ALLERGIES:
1. PEANUT ALLERGY (ANAPHYLAXIS).
2. NORTRIPTYLINE
HABITS: Cigarettes never. Alcohol was around 15 shots of vodka per day but has been sober and
FAMILY HISTORY: Mother died of fatal condition. Father died of another fatal condition. One sister,


ZZTEST, ADTONE - H3157736 Opened by Payne, MD, Thomas Howard
Task Edit View Patient Chart Links Notifications Navigation Help
Message Center Patient List View Scheduling HOV-E/PROC Surgery Schedule Rounding (CORES) Quality Safety Dashboard eFeesheet Links and Reports
Tear Off Attach Change Suspend Exit Calculator AdHoc Explorer Menu PM Conversation Patient Information Request View Sticky Notes New Sticky Note
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Physical Therapy - Inpt Record - 04/11/2012 - Logsdon, RN, CCRN, Lari E
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Polyglandular activity in multiple endocrine adenomatosis added successfully.
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Compression fracture
Congestive heart failure
Diabetes mellitus type 1
Eczema
Fracture of bone
Fracture of sacrum
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Male erectile disorder
Moderate asthma
Neuropathy
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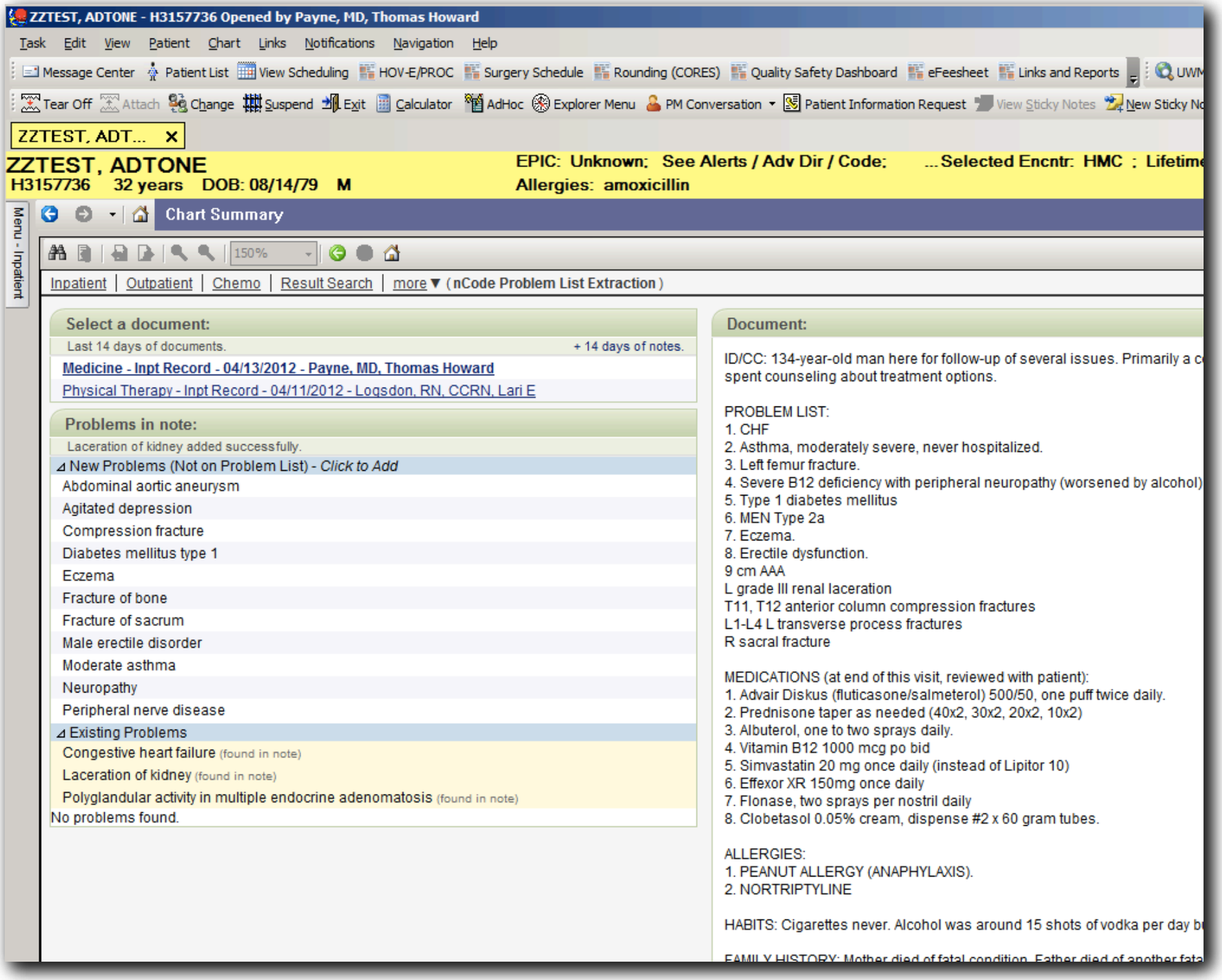
ZZTEST, ADTONE - H3157736 Opened by Payne, MD, Thomas Howard
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EPIC: Unknown; See Alerts / Adv Dir / Code: ...Selected Encntr: HMC ; Lifetime
Allergies: amoxicillin
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Select a document:
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+ 14 days of notes.
Medicine - Inpt Record - 04/13/2012 - Payne, MD, Thomas Howard
Physical Therapy - Inpt Record - 04/11/2012 - Logsdon, RN, CCRN, Lari E
Problems in note:
Laceration of kidney added successfully.
New Problems (Not on Problem List) - Click to Add
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Agitated depression
Compression fracture
Diabetes mellitus type 1
Eczema
Fracture of bone
Fracture of sacrum
Male erectile disorder
Moderate asthma
Neuropathy
Peripheral nerve disease
Existing Problems
Congestive heart failure (found in note)
Laceration of kidney (found in note)
Polyglandular activity in multiple endocrine adenomatosis (found in note)
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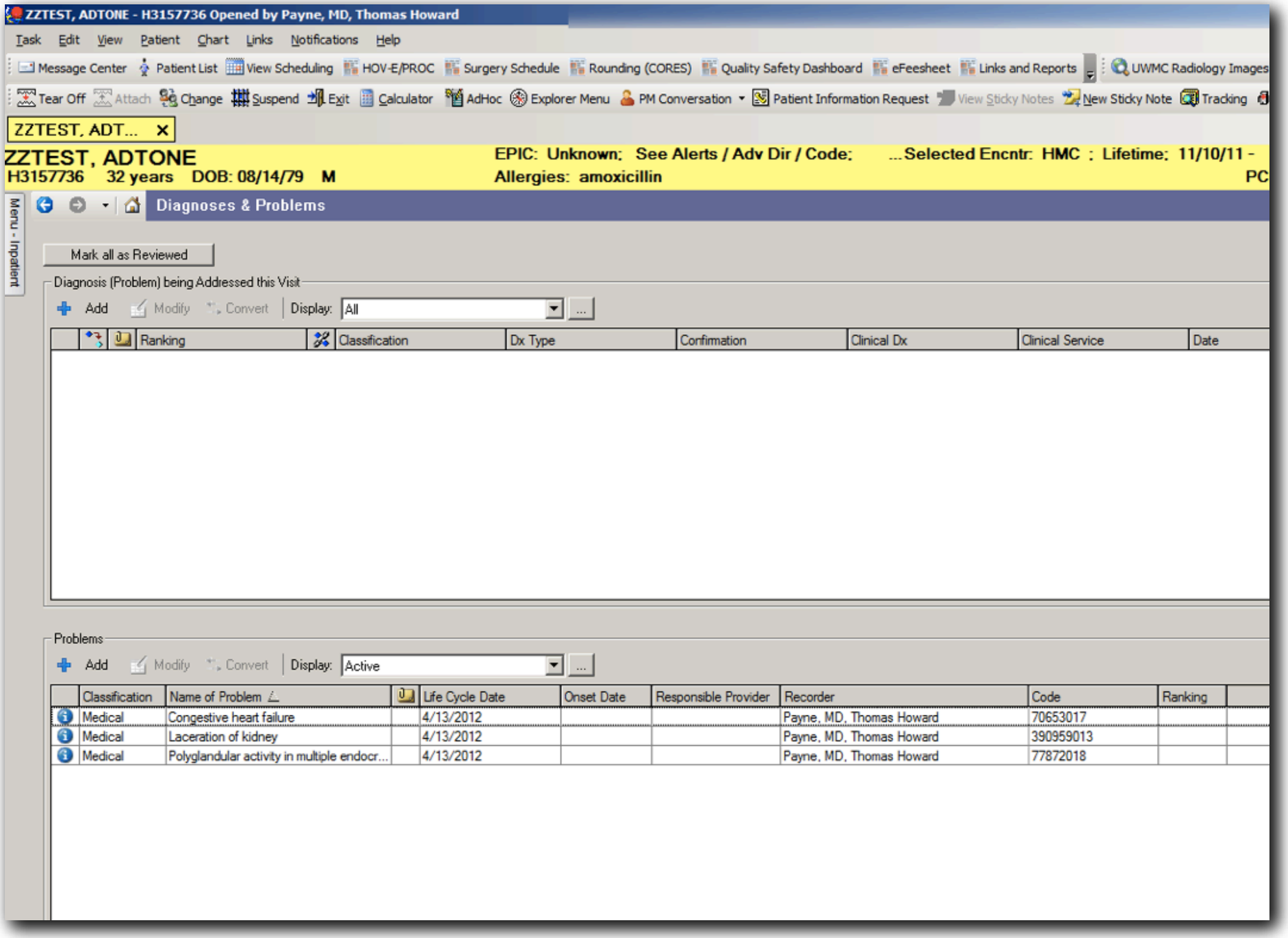
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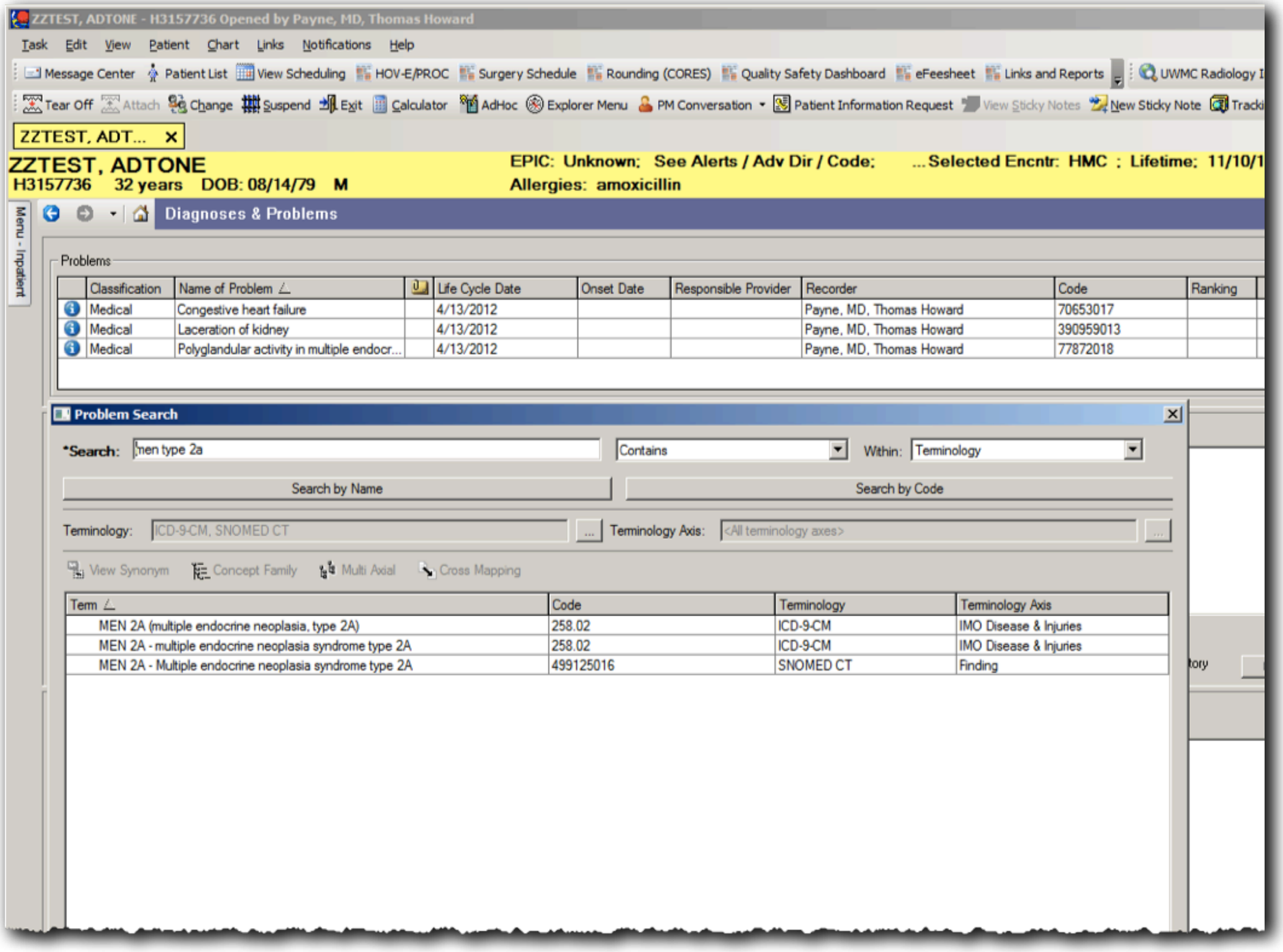
EPIC: Unknown; See Alerts / Adv Dir / Code: ...Selected Encntr: HMC ; Lifetime: 11/10/11 -
Allergies: amoxicillin
PC
Menu - Inpatient
Diagnoses & Problems
Mark all as Reviewed
Diagnosis (Problem) being Addressed this Visit
Add Modify Convert Display: All
Ranking Classification Dx Type Confirmation Clinical Dx Clinical Service Date
Problems
Add Modify Convert Display: Active
Classification Name of Problem Life Cycle Date Onset Date Responsible Provider Recorder Code Ranking
Medical Congestive heart failure 4/13/2012 Payne, MD, Thomas Howard 70653017
Medical Laceration of kidney 4/13/2012 Payne, MD, Thomas Howard 390959013
Medical Polyglandular activity in multiple endocr... 4/13/2012 Payne, MD, Thomas Howard 77872018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Diagnoses & Problems
Problems
Classification | Name of Problem | Life Cycle Date | Onset Date | Responsible Provider | Recorder | Code | Ranking
Medical | Congestive heart failure | 4/13/2012 | | | Payne, MD, Thomas Howard | 70653017 |
Medical | Laceration of kidney | 4/13/2012 | | | Payne, MD, Thomas Howard | 390959013 |
Medical | Polyglandular activity in multiple endocr... | 4/13/2012 | | | Payne, MD, Thomas Howard | 77872018 |
Problem Search
*Search: men type 2a
Contains
Within: Terminology
Search by Name
Search by Code
Terminology: ICD-9-CM, SNOMED CT
Terminology Axis: <All terminology axes>
View Synonym Concept Family Multi Axial Cross Mapping
Term | Code | Terminology | Terminology Axis
MEN 2A (multiple endocrine neoplasia, type 2A) | 258.02 | ICD-9-CM | IMO Disease & Injuries
MEN 2A - multiple endocrine neoplasia syndrome type 2A | 258.02 | ICD-9-CM | IMO Disease & Injuries
MEN 2A - Multiple endocrine neoplasia syndrome type 2A | 499125016 | SNOMED CT | Finding

CT CHEST VENOUS PROTOCOL
CT ABDOMEN / PELVIS
INDICATION
Motorcycle crash.
Comparison: Trauma series same date and outside noncontrast CT chest abdomen and pelvis same date.
PROCEDURE:
Reconstruction thickness: 2.5mm. Interval: 2.5 mm
Superior extent: Thoracic inlet. Inferior extent: Ischial tuberosities
Intravenous contrast: Positive.
Oral contrast: Not used.
MPR's: Coronal, Chest, Abdomen and Pelvis, venous.

FINDINGS: **** CHEST ****
Aorta and great vessels: Normal for a venous phase study.
Mediastinal hematoma: Absent
Pericardial fluid: Absent
Endotracheal tube: Absent
Intercostal tubes: Absent
Right lung: Mild dependent upper lobe consolidation likely represents atelectasis.

IMPRESSION:
Multiple left rib fractures and left clavicular fracture.
Moderate left pneumothorax. The left lung is partially collapsed.
Right sacral fracture and left pelvic ring disruption with associated small extraperitoneal hematoma. Please refer to dedicated CT pelvis for details.
There is mild hydronephrosis of the right kidney, which may be secondary to a 4-mm renal calculus at the level of the distal ureter. Delayed abdominal radiograph is recommended.
Small amount of fluid surrounding the gallbladder, and nonspecific finding of uncertain clinical significance.
Comment:
Small left hemothorax.
Left apical extrapleural hematoma associated with rib fractures.
The above described fluid next to the gallbladder may simply represent the gallbladder wall. No definite fluid around the gallbladder or liver is identified.
Better visualized on CT cystogram, is the right pelvic calcification described above, which is external to the ureter and represents a phlebolith. No evidence of ureteral calculi.
Right adnexal cyst. Recommend nonemergent pelvic ultrasound for further evaluation to exclude cystic ovarian neoplasm.
Small hiatal hernia.
High-density fluid is present posterior and adjacent to the inferior aspect of the descending colon. This is contiguous with the pelvic retroperitoneal hematoma, and given the absence of abnormalities of the colon most likely represents extension of the retroperitoneal hematoma, which is not increased in size since the prior study.

subcutaneous tissues and body wall. There is left gluteal subcutaneous hematoma.
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Moderate left pneumothorax. The left lung is partially collapsed.
Right sacral fracture and left pelvic ring disruption with associated small extraperitoneal hematoma. Please refer to dedicated CT pelvis for details.
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Discussed with admitting surgical service at 8:30 p.m.

Radiology Critical Results

A new interface that highlights critical radiology results in ORCA and Epic is now operational. A critical radiology result is a finding that the radiologist believes would need immediate or urgent intervention, a finding that will be unexpected to the referring physician and seriously adverse to the patient's health, or one that

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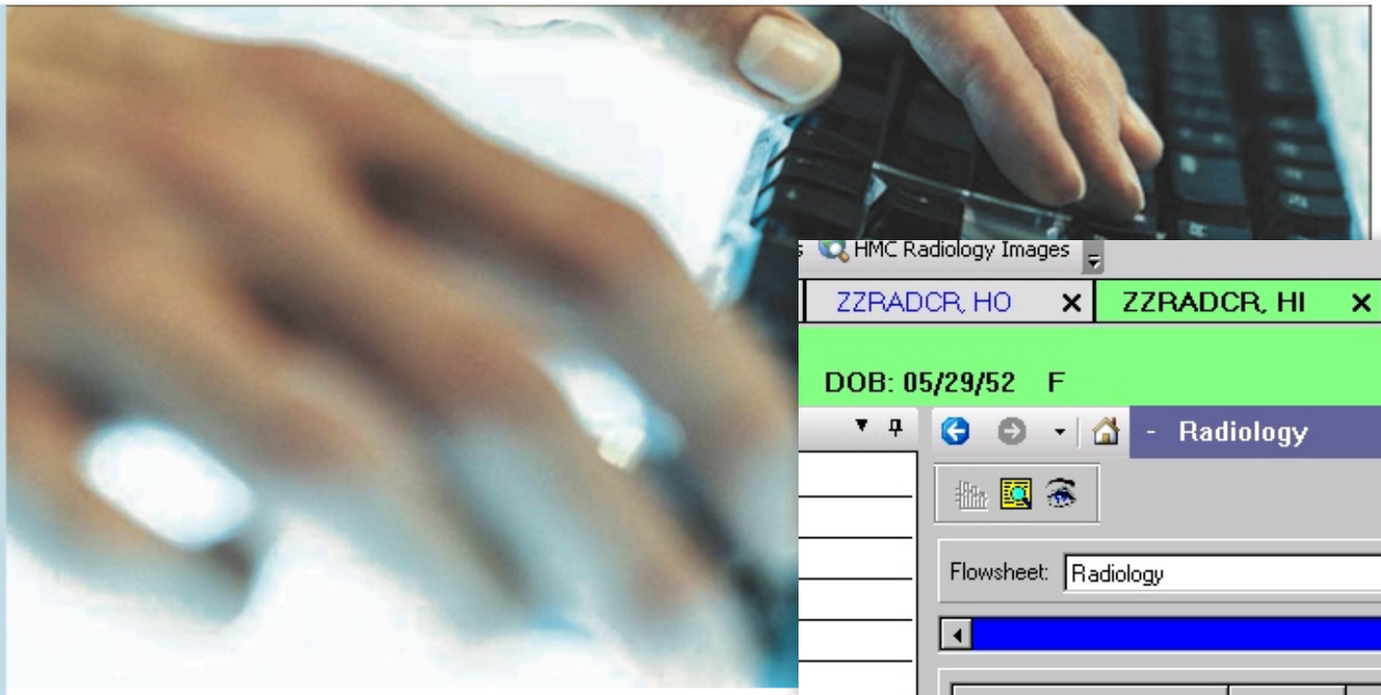

HMC Radiology Images

ZZRADCR, HO | ZZRADCR, HI

DOB: 05/29/52 F

Allergies: Allergies Not Recorde

- Radiology

Flowsheet: Radiology ... Level:

Event Date	Event	Result	Ref. Range	Sta
3/31/2011 10:36 AM	XR Chest	XR Chest C		Authent
3/31/2011 10:13 AM	XR Chest	XR Chest		Authent
3/29/2011 11:27 AM	XR Chest	XR Chest C (c)		Modifie

Non critical results in blue

Critical results in red with 'C' (To be changed in the future to !)

Add

Height and Weight (last 12 months)

Result	Last Date	Last
Height for Calculation (cm)	12/20/11	169
Weight - kg (kg)	12/20/11	79.9
Weight for Calculation (kg)	12/13/11	81

More...

Vitals / Frequent Assessment (last 2 months)

Result	Last Date	Last Value	
Cardiac Rhythm	12/16/11	Normal Sinus	
Cardiac Rhythm - Ectopy	12/16/11	None	
Orientation	12/13/11	Oriented x 4 (p	
Behavior / Affect	12/13/11	Appropriate, C	
Weight for Calculation (kg)	12/13/11	81	
Weight for Calc Scale Source	12/13/11	Bed	
Height for Calculation (cm)	12/20/11	169.6	169.6 - 178
kg (kg)	12/20/11	79.9	79.9 - 79.9

Radiology (last 6 months)

Result	Last Value	
CT Chest	! Authenticated	Show Last 2...
XR Chest 2 Views	Authenticated	Show Last 5...
XR Chest Special Views	Authenticated	
MRA Head	Modified	
MRA Neck	Modified	

Pathology (last 12 months)

ld be includ-

Topics today

- The story of moving from paper to electronic notes
- NLP and clinical decision support
- 3 examples: NLP in UW Medicine EMRs
- Summary and discussion

tpayne@u.washington.edu

Speech technologies are mainstream

NLP can help clinical decision support

- Summarization
- Enhanced search
- Extracting key encoded information from narrative, such as problem lists but potentially far more
- Focus our attention on needs that might be overlooked
- As narrative text grows, so does the need for NLP

tpayne@u.washington.edu

Summary

- Much of the clinical note content clinicians create is in narrative.
- That content can help us make better decisions, esp if aided by NLP.
- NLP today fits into the workflow of EMRs to capture important content from narrative.
- We need to better match EMRs with human strengths and workflow.

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