



Examples of the EHR

What is Biomedical & Health Informatics?
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Oregon Health & Science University



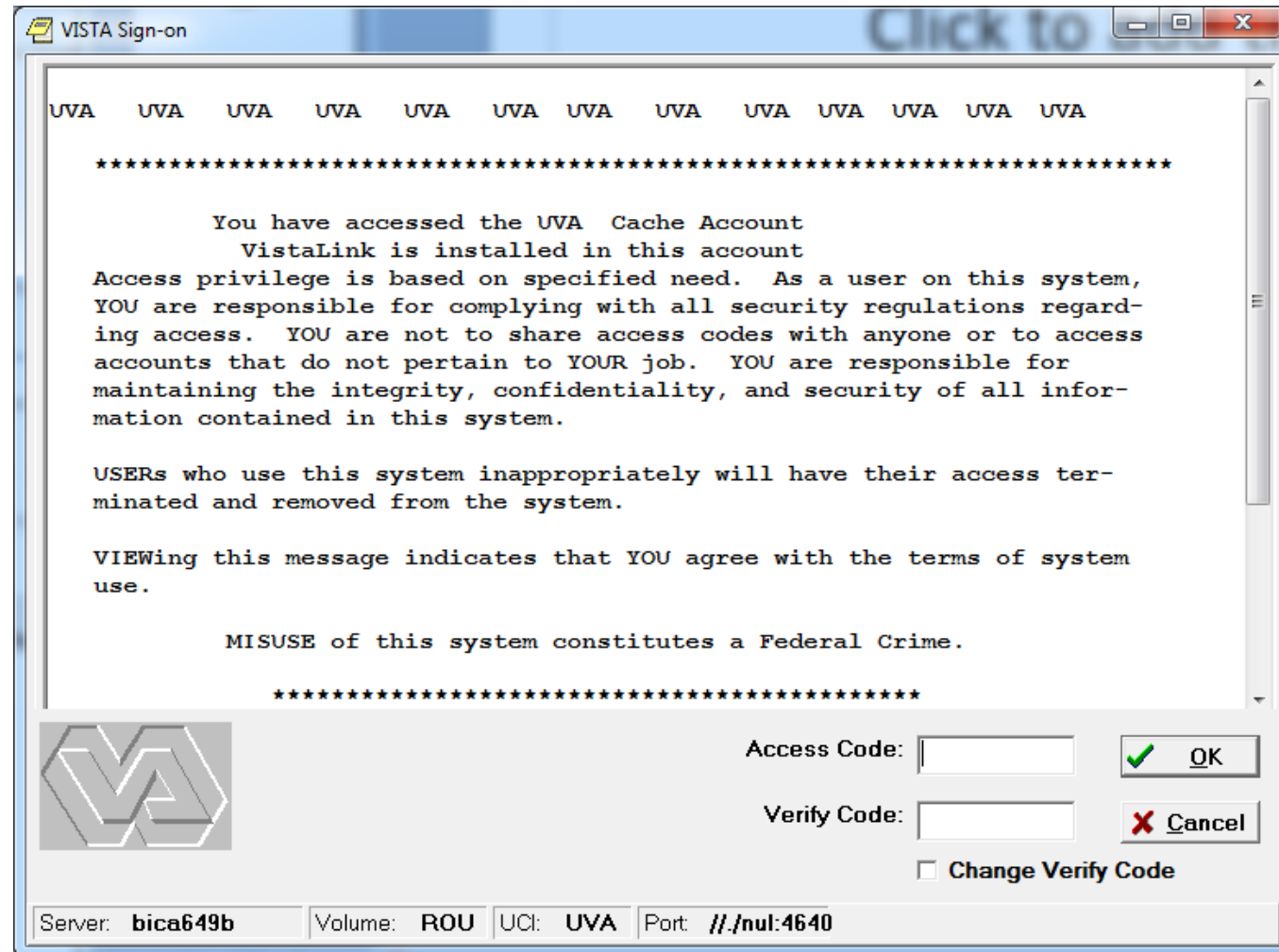
Examples of the EHR

- Using the Veterans Health Information Systems and Technology Architecture (VistA)
- Why VistA?
 - State-of-the-art EHR that has transformed healthcare in the Veteran's Health Administration (VHA) (Perlin, 2006; Byrne, 2010)
 - Not that pretty, but has all of the modern features of the EHR, e.g., clinical decision support (CDS), computerized provider order entry (CPOE), etc.
 - Distributed under open-source model, unlike most other vendors who do not even allow screen shots to be shown outside their customers' institutions
- Fascinating story (Allen, 2017), but VistA now being phased out in favor of Cerner EHR adopted by Department of Defense
 - <https://www.ehrm.va.gov/>

Some details about VistA

- Server written in M (formerly called MUMPS), accessed via command-line interface
 - Runs in commercial Intersystems Cache (on many platforms) or open-source GT.M (Linux only)
- Client (called CPRS) written in Delphi and provides graphical user interface
 - Only runs on Windows (just about all versions)

Logging on to CPRS, the front end to VistA



Choosing a patient

Patient Selection

Patient List

No Default
 Providers
 Team/Personal
 Specialties

Clinics
 Wards
 All

Patients (All Patients)

Seven, Inpatient

Eight, Inpatient
Eight, Outpatient
Eight, Patient
Eighteen, Inpatient
Eighteen, Outpatient
Eighteen, Patient
Eighty, Inpatient
Eighty, Outpatient

OK
Cancel

Save Patient List Settings

Notifications

Info	Patient	Location	Urgency	Alert Date/Time	Message
	ONE, PATIE (O0001)	GM	Moderate	09/07/2010@08:13	New order(s) placed.
	EIGHTY, OU (E0680)		Moderate	08/30/2010@10:07	Discontinued Consult WHC
	EIGHTY, OU (E0680)		Moderate	08/30/2010@10:07	New consult PSYCH (Today)
	SEVEN, INP (S0807)	3E NO...	Moderate	08/30/2010@07:44	Abnormal labs - [TSH, T-3 RU]
	SEVEN, INP (S0807)	3E NO...	Moderate	08/30/2010@07:44	Labs results - [TSH, T-3 RU]

Process Info Process All Process Forward Show Comments Remove



Cover sheet – overview

Vista CPRS in use by: Doctor,One (BROKERSERVER)

File Edit View Tools Help

SEVEN,INPATIENT **3E S 3E-100-4** Primary Care Team Unassigned
 666-00-0807 Mar 09,1945 (65) Provider: DOCTOR,ONE Attending: Doctor,Two Flag VistaWeb Postings
 Remote Data A

Active Problems	Allergies / Adverse Reactions	Postings
Depression *Tachycardia Hypertrophy (BENIGN) OF PROSTATE WITHOUT URINARY OBSTRUCTION *Phlebitis And Thrombophlebitis Of Femoral Vein (DEEP) Graves' Disease	Pet Hair Keflex	Allergies

Active Medications	Clinical Reminders	Due Date
No Active Medications Found	Depression Screening PC Nutritional Screening Influenza Vaccine Pneumococcal vaccine (Pneumovax)	Dec 07,08 DUE NOW DUE NOW DUE NOW

Recent Lab Results	Vitals	Appointments/Visits/Admissions
No Orders Found.	T 98.6 F Aug 20,2010 11:30 (37.0 C) P 68 Aug 20,2010 11:30 R 24 Aug 20,2010 11:30 BP 194/88 Aug 20,2010 11:30 HT 70 in Aug 20,2010 11:30 (177.8 cm) WT 199 lb Aug 20,2010 11:30 (90.3 kg) PN 0 Aug 20,2010 11:30 POX 98 Aug 20,2010 11:30 BMI 28.61 Aug 20,2010 11:30	Aug 03,10 09:00 Endocrine Inpatient Appointment Jul 23,10 08:00 Inpatient Stay 3e North Jul 15,10 13:00 General Medicine Action Required Jul 01,10 14:00 General Medicine Action Required Jun 20,10 13:00 General Medicine Action Required Jun 10,10 10:00 General Medicine Action Required May 24,10 13:00 Inpatient Stay 3e North May 20,10 08:00 General Medicine Action Required May 18,10 08:00 General Medicine Action Required May 10,10 15:00 General Medicine Action Required

Cover Sheet | Problems | Meds | Orders | Notes | Consults | Surgery | D/C Summ | Labs | Reports



Drilling down to details of a problem

* Phlebitis And Thrombophlebitis Of Femoral Vein (DEEP)

Phlebitis and thrombophlebitis of femoral vein (deep) (451.11)

Onset: 8/10
Status: ACTIVE/ACUTE
SC Cond: NO
Exposure: None

Provider: DOCTOR, ONE
Clinic:

Recorded: 8/22/10, by DOCTOR, ONE
Entered: 8/22/10, by DOCTOR, ONE
Updated: 8/22/10

----- Audit History -----
8/22/10: DATE OF ONSET changed by DOCTOR, ONE from to 8/10
8/22/10: SERVICE changed by DOCTOR, ONE from UNSPECIFIED to MEDICINE

Print Close

Details of an allergy

Causative agent: KEFLEX
Nature of Reaction: Allergy

Signs/symptoms: HIVES

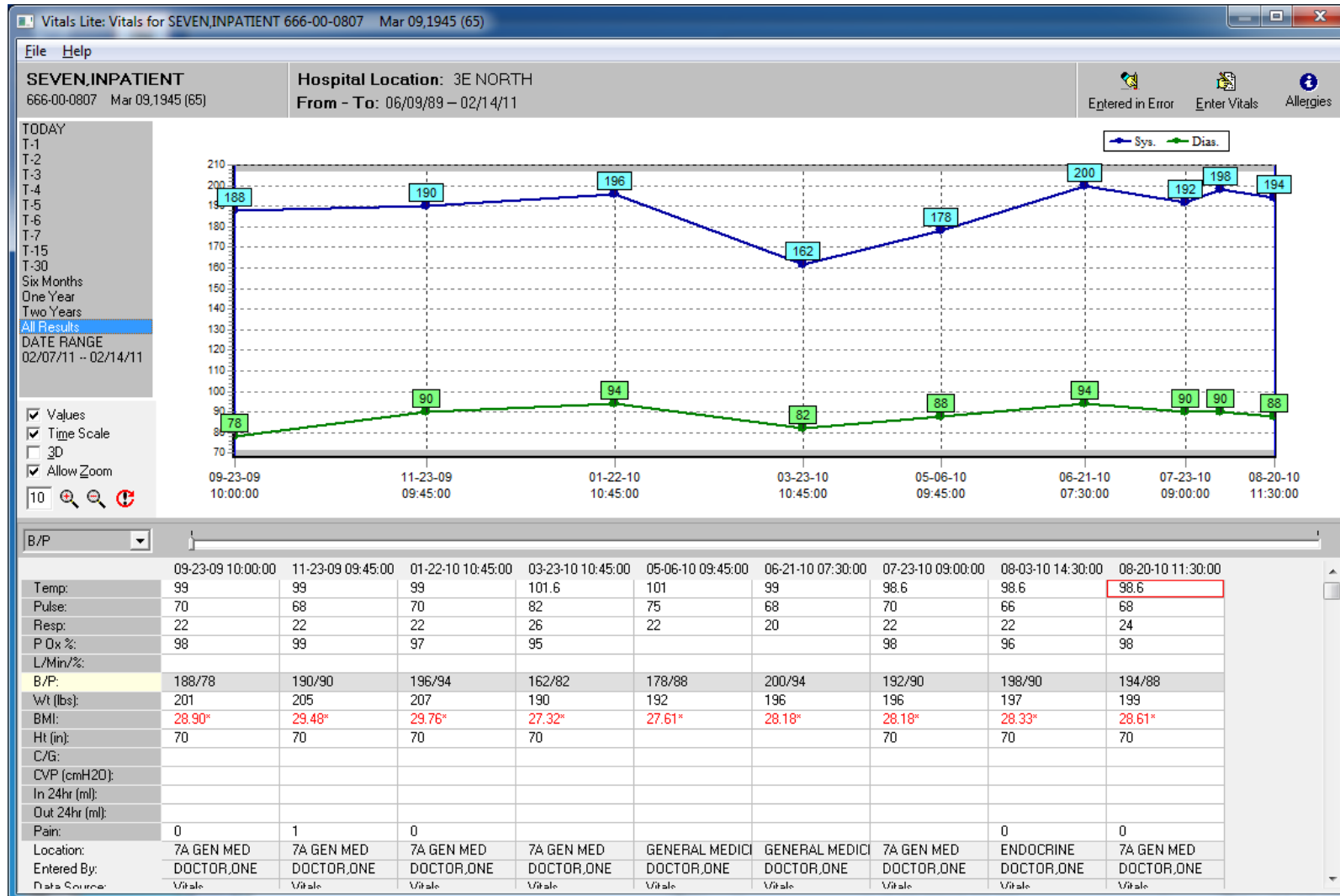
Drug Classes: CEPHALOSPORIN 1ST GENERATION

Originator: DOCTOR, ONE (PHYSICIAN)
Originated: Aug 22, 2010@15:11
Obs dates/severity: AUG 22, 2010

Verified: No
Observed/Historical: Observed

Add New Entered in Error Print Close

Viewing vital signs over time



More details on problems

Vista CPRS in use by: Doctor,One (BROKERSERVER)

File Edit View Action Tools Help

SEVEN,INPATIENT **3E S 3E-100-4** Primary Care Team Unassigned
 666-00-0807 Mar 09,1945 (65) Provider: DOCTOR.ONE Attending: Doctor.Two

Flag VistaWeb Postings
 Remote Data A

View options: Active, Inactive, Both active and inactive, Removed

New problem

Active Problems (5 of 5)

St...	Description	Onset ...	Last U...	Provider	Service
A	Depression	2009	Sep 02 20	Doctor,One	
A *	Tachycardia Patient presents with tachycardia and Graves ophthalmopathy	Aug 02 20	Aug 29 20	Doctor,One	Medical
A	Graves' Disease Patient requires dietary counseling to reduce iodine intake.	2005	Aug 24 20	Doctor,One	Medicine
A *	Phlebitis and thrombophlebitis of femoral vein (deep)	Aug 2011	Aug 22 20	Doctor,One	Medicine
A	Hypertrophy (Benign) of Prostate without Urinary obstruction	2009	Aug 22 20	Doctor,One	Medicine

Cover Sheet | Problems | Meds | Orders | Notes | Consults | Surgery | D/C Summ | Labs | Reports



List of active orders

Vista CPRS in use by: Doctor,One (BROKERSERVER)

File Edit View Action Options Tools Help

SEVEN,INPATIENT **3E S 3E-100-4** Primary Care Team Unassigned
 666-00-0807 Mar 09,1945 (65) Provider: DOCTOR.ONE Attending: Doctor.Two

Flag VistaWeb Postings
 Remote Data A

View Orders Active Orders (includes Pending & Recent Activity) - ALL SERVICES

Active Orders (includes Pending & Recent Activity)

Service	Order	Start / Stop	Provider	Nurse	Clerk	Chart
Diet	REGULAR Diet	Start: 08/23/10	Clinical Coordinator,O			
Lab	TSH BLOOD SERUM SP LB #17674	Start: 06/10/10 11:00	Doctor,O			
	T-3 RU BLOOD SERUM SP LB #17674	Start: 06/10/10 11:00	Doctor,O			
	T-4 BLOOD SERUM SP LB #17674	Start: 06/10/10 11:00	Doctor,O			
	FREE T-4 BLOOD SERUM SP LB #17674	Start: 06/10/10 11:00	Doctor,O			
	TSH BLOOD SERUM SP LB #17672	Start: 05/24/10 11:00	Doctor,O			
	T-3 RU BLOOD SERUM SP LB #17672	Start: 05/24/10 11:00	Doctor,O			
	T-4 BLOOD SERUM SP LB #17672	Start: 05/24/10 11:00	Doctor,O			
	FREE T-4 BLOOD SERUM SP LB #17672	Start: 05/24/10 11:00	Doctor,O			
	TSH BLOOD SERUM SP LB #17670	Start: 08/03/10 11:00	Doctor,O			
	T-3 RU BLOOD SERUM SP LB #17670	Start: 08/03/10 11:00	Doctor,O			
	T4, FREE & TOTAL BLOOD SERUM SP LB #17670	Start: 08/03/10 11:00	Doctor,O			

Write Delayed Orders

Write Orders

- Diet Order
- Vital Signs
- Inpatient Medications
- Outpatient Medications
- Infusion
- Non VA Meds
- Metoprolol Tartrate 50MG
- Aspirin 81 MG Non VA
- Laboratory
- Inpt Labs Routine Menu...
- Imaging
- Consult
- Diabetic Nutrition Consult
- Clinician Add Order Menu...
- NPO/Dressing Change

Cover Sheet | Problems | Meds | **Orders** | Notes | Consults | Surgery | D/C Summ | Labs | Reports



Viewing the patient's notes

The screenshot displays the VistA CPRS interface for a patient named SEVEN, INPATIENT. The patient's ID is 666-00-0807, and they were born on March 09, 1945 (65 years old). The provider is DOCTOR.ONE, and the attending physician is Doctor.Two. The patient is currently in room 3E S 3E-100-4, and their primary care team is unassigned.

The interface shows a list of the last 100 signed notes. The selected note is dated August 23, 2010, at 20:17, titled "SCI GENERAL NOTE, 3E NORTH, ONE DOCTOR". The note content includes:

- LOCAL TITLE:** SCI GENERAL NOTE
- DATE OF NOTE:** AUG 23, 2010@20:17
- ENTRY DATE:** AUG 23, 2010@20:19
- AUTHOR:** DOCTOR, ONE
- EXP COSIGNER:**
- URGENCY:**
- STATUS:** COMPLETED

REASON FOR VISIT/CHIEF COMPLAINT:
Evaluation and management of chronic problem(s)

Weight gain

INTERVAL HISTORY:
weight gain

PHYSICAL EXAMINATION:
Temperature: 98.6 F [37.0 C] (08/20/2010 11:30)
Pulse: 68 (08/20/2010 11:30)
Respiration: 24 (08/20/2010 11:30)
BP: 194/88 (08/20/2010 11:30)
Pain: 0 (08/20/2010 11:30)
Height: 70 in [177.8 cm] (08/20/2010 11:30)
Weight: 199 lb [90.5 kg] (08/20/2010 11:30)

INTERVAL LABS:

ASSESSMENT & PLAN:
Diet Modification

/es/ ONE DOCTOR
Signed: 08/23/2010 20:22

The interface also shows a navigation bar at the bottom with tabs for Cover Sheet, Problems, Meds, Orders, Notes, Consults, Surgery, D/C Summ, Labs, and Reports.



Writing a new note

The screenshot displays the VistA CPRS interface. At the top, the window title is "VistA CPRS in use by: Doctor,One (BROKERSERVER)". The menu bar includes File, Edit, View, Action, Options, Tools, and Help. The patient information section shows "SEVEN, INPATIENT" with ID "666-00-0807", birth date "Mar 09, 1945 (65)", and provider "DOCTOR.ONE". The primary care team is "Unassigned" and the attending physician is "Doctor.Two".

The "Last 100 Signed Notes" list on the left includes:

- New Note in Progress
 - Feb 14, 11 ADMISSION EVAL/ASSESSMENT, 3E NORTH, DO
- All signed notes
 - Aug 23, 10 SCI GENERAL NOTE, 3E NORTH, ONE DOCTOR
 - Aug 22, 10 Adverse React/Allergy, 7A GEN MED, ONE DOCTOR
 - Aug 03, 10 OPHTHALMOLOGIST CONSULT NOTE, GENERAL

The selected note, titled "ADMISSION EVAL/ASSESSMENT" dated "Feb 14, 2011@07:09" by "Doctor,One", contains the following text:

Adm: 07/23/10 3E NORTH

81 y o man with DM, Neuropathy, hypertension, non-ulcer dyspepsia, here for F/U. On last visit, AAA was suspected on exam, but has been RULED OUT by abd sono.

Reports he continue to have nausea when first gets up in AM, has difficulty swallowing food. (Prior EGD 8-02 was grossly nl, but bx showed H. pylori). Also gets bloating sx p-prandially. Cimetidine not helpful. Has changed his diet some. Reports sx all started after an episode of "stomch flu" which never fully resolved. Got better until last episode of "food Poisoning".

Home glucoses 120 - 150.
BP 160/84 L arm, seated, reg cuff
Lungs: clear
Heart: reg rhythm, nl sis2, II/VI SEM apex
Abd: nl BS, soft, non-tender, no masses/megaly
Exts: no edema A: GI sx are predominant complaint.

EGD sched for 06-10-03. F/U 1 week after EGD, with Chem Profile and A1C before visit.

At the bottom of the interface, there are tabs for "Templates", "Reminders", and "Encounter". A navigation bar at the very bottom includes "Cover Sheet", "Problems", "Meds", "Orders", "Notes", "Consults", "Surgery", "D/C Summ", "Labs", and "Reports".



Viewing labs

Vista CPRS in use by: Doctor,One (BROKERSERVER)

File Edit View Tools Help

SEVEN,INPATIENT 3E S 3E-100-4 Primary Care Team Unassigned
 666-00-0807 Mar 09,1945 (65) Provider: DOCTOR.ONE Attending: Doctor.Two

Flag VistaWeb Postings
 Remote Data A

Lab Results

- Most Recent
- Cumulative
- All Tests by Date
- Selected Tests by Date
- Worksheet
- Graph
- Microbiology
- Anatomic Pathology - All Reports
- Blood Bank

Headings

- Cbc Profile
- Chem Profile
- Ria-(serum)
- Cell Count (csf)
- Urinalysis
- Miscellaneous Tests

Date Range

- Date Range...
- Today
- One Week
- Two Weeks
- One Month
- Six Months
- One Year
- Two Years
- All Results

Cumulative [From: EARLIEST RESULT to Feb 14,2011]

---- CBC PROFILE ----

BLOOD	08/23 2010 15:00	08/23 2010 13:00	08/23 2010 13:00	08/23 2010 13:00	08/23 2010 09:00	Reference Units	Ranges
WBC	15.0 H					k/cmm	3.5 - 8.3
RBC	4.50 L					M/cmm	4.7 - 6.1
HGB	14.3				14.3	g/dL	14 - 18
HCT	41 L			41 L		%	42 - 52
MCV	88.0		88.0			cmu	80 - 94
MCH	31	31				uug	27 - 35
MCHC	31 L					gm/dL	33 - 36
RDW	14					%	11 - 14
PLT	145					K/cmm	140 - 420
LYMPH %							
Comments:	a						
a. Correction	MCH reported incorrectly as 88 by [10000000086-VA500]. Changed to 31 on Aug 24, 2010@17:05 by [10000000086-VA500]. MCH flagged incorrectly as H* by [10000000086-VA500]. Changed to normal on Aug 24, 2010@17:05 by [10000000086-VA500].						

---- CHEM PROFILE ----

SERUM	08/23 2010 11:00	08/23 2010 11:00	08/23 2010 10:00	08/23 2010 09:00	08/23 2010 09:00	Reference Units	Ranges

KEY: "L" = Abnormal Low, "H" = Abnormal High, "*" = Critical Value

Cover Sheet | Problems | Meds | Orders | Notes | Consults | Surgery | D/C Summ | Labs | Reports



Including critical values

Vista CPRS in use by: Doctor,One (BROKERSERVER)

File Edit View Tools Help

SEVEN,INPATIENT 3E S 3E-100-4 Primary Care Team Unassigned
 666-00-0807 Mar 09,1945 (65) Provider: DOCTOR,ONE Attending: Doctor,Two

Flag VistaWeb Postings
 Remote Data ? A

Lab Results

- Most Recent
- Cumulative
- All Tests by Date
- Selected Tests by Date
- Worksheet
- Graph
- Microbiology
- Anatomic Pathology - All Reports
- Blood Bank

Most Recent

Oldest Previous Collected Next Newest
 << < **Aug 23, 2010 15:00** > >>

Most Recent Lab Result

Test	Result	Flag	Units	Ref Range
GLUCOSE	310	H*	MG/DL	84 - 128
UREA NITROGEN	14			
SODIUM	145			
CHLORIDE	89			
CO2	30			
CREATININE	1.0			
POTASSIUM	7.5			
CALCIUM	10.00			

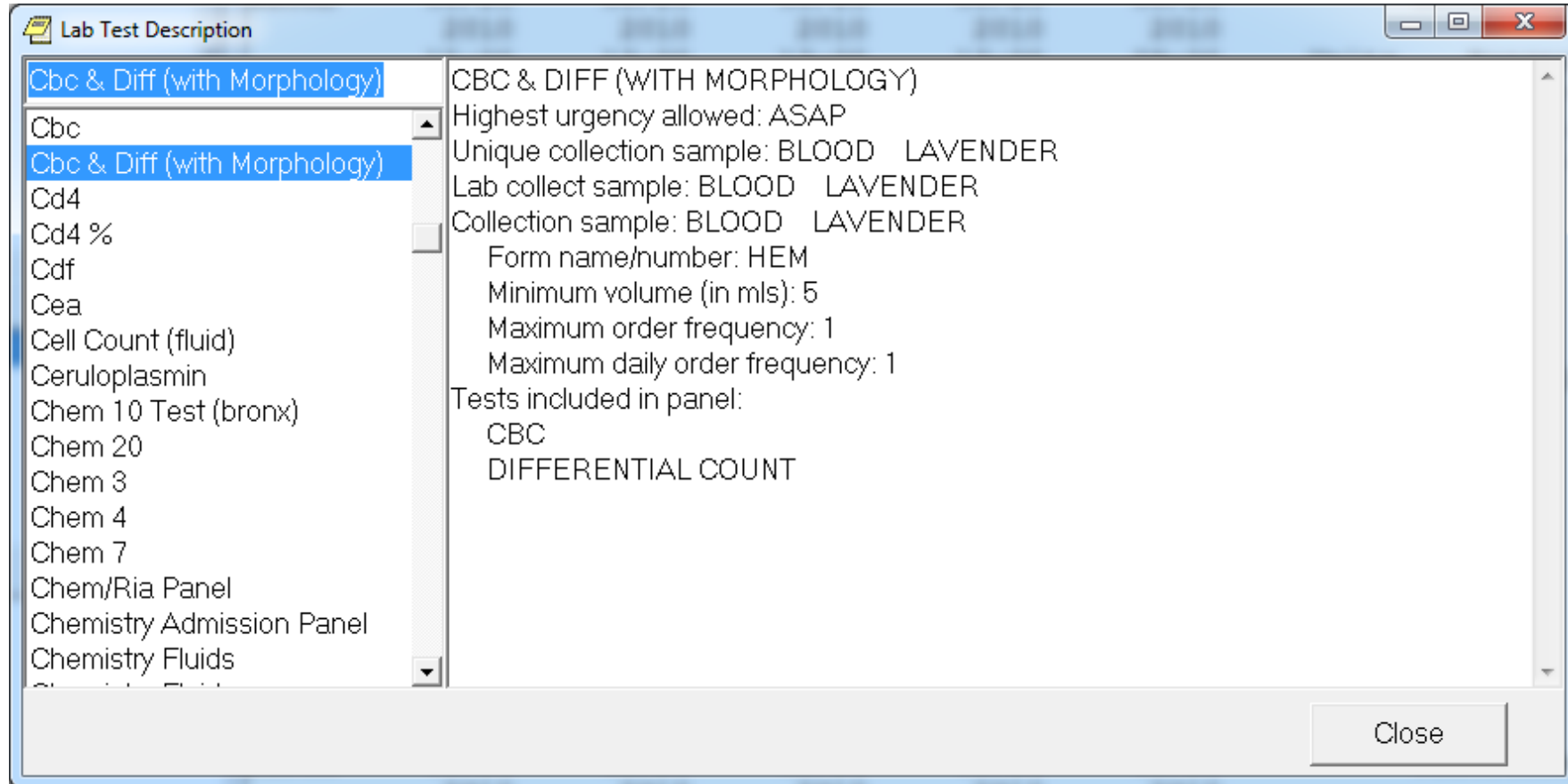
Specimen: BLOOD; Accession: CH 0825 3; Provider: DOCTOR,ONE
 Report Released Date/Time: Aug 25, 2010@10:53
 Performing Lab: ALBANY VA MEDICAL CENTER VA MEDICAL CENTER ALBANY, NY 12180-0097

KEY: "L" = Abnormal Low, "H" = Abnormal High, "*" = Critical Value

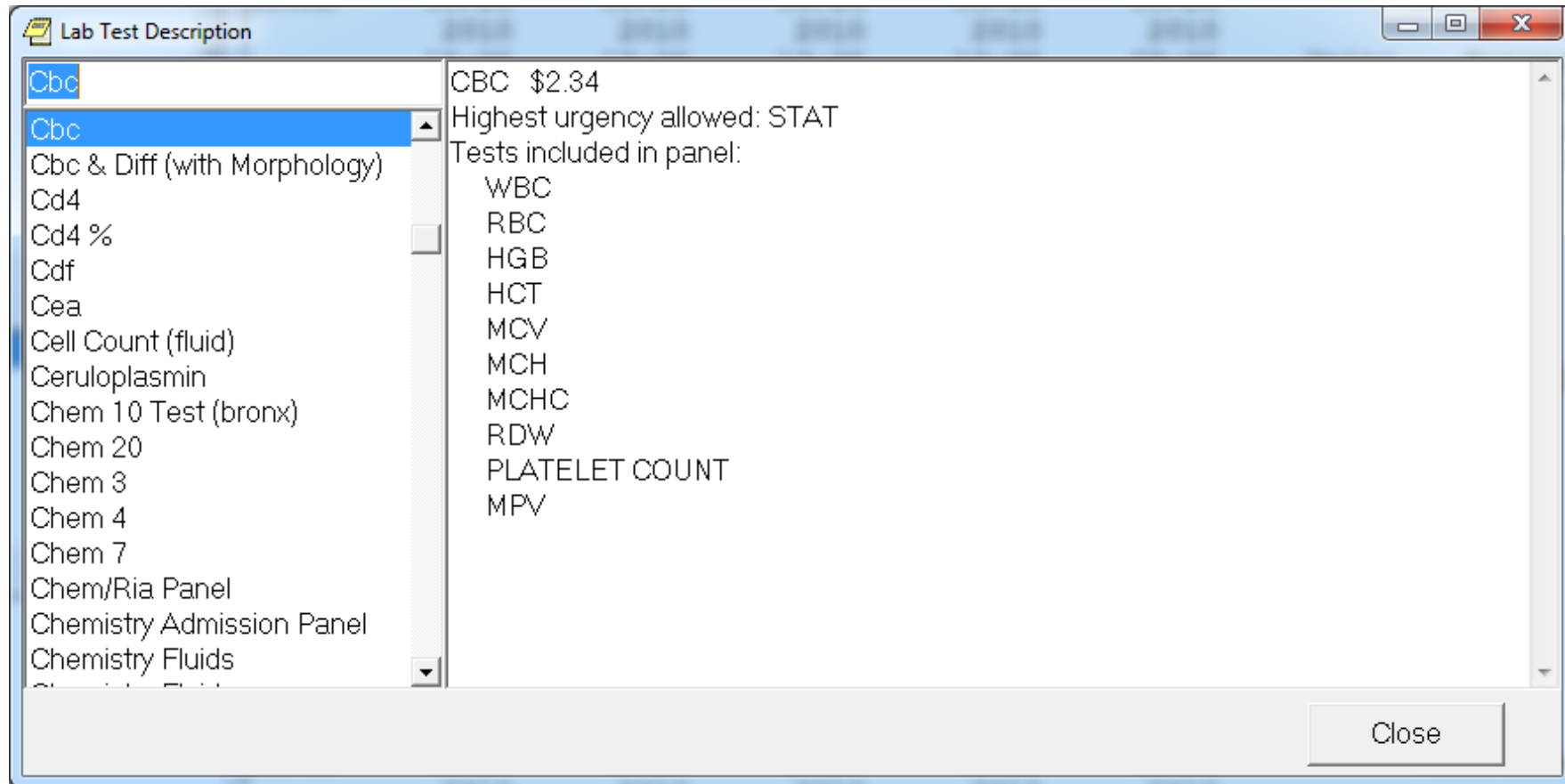
Cover Sheet Problems Meds Orders Notes Consults Surgery D/C Summ Labs Reports



More information on lab tests



Including (for some) cost



Another patient

Vista CPRS in use by: Doctor,One (BROKERSERVER)

File Edit View Tools Help

EIGHT.PATIENT Visit Not Selected Primary Care Team Unassigned Flag VistaWeb Postings
 666-00-0008 Apr 07,1935 (75) Provider: DOCTOR.ONE Remote Data CAD

Active Problems	Allergies / Adverse Reactions	Postings
Headache Hypertension Hyperlipidemia Acute Myocardial Infarction, Unspecified Site, Episode Of Care Unspecified Chronic Systolic Heart Failure Diabetes Mellitus Type II Or Unspecified	Penicillin Chocolate	Allergies Crisis Note May 21,2000 Advance Directive Completed May 16,2007 Advance Directive Oct 18,2000 Advance Directive Oct 18,2000

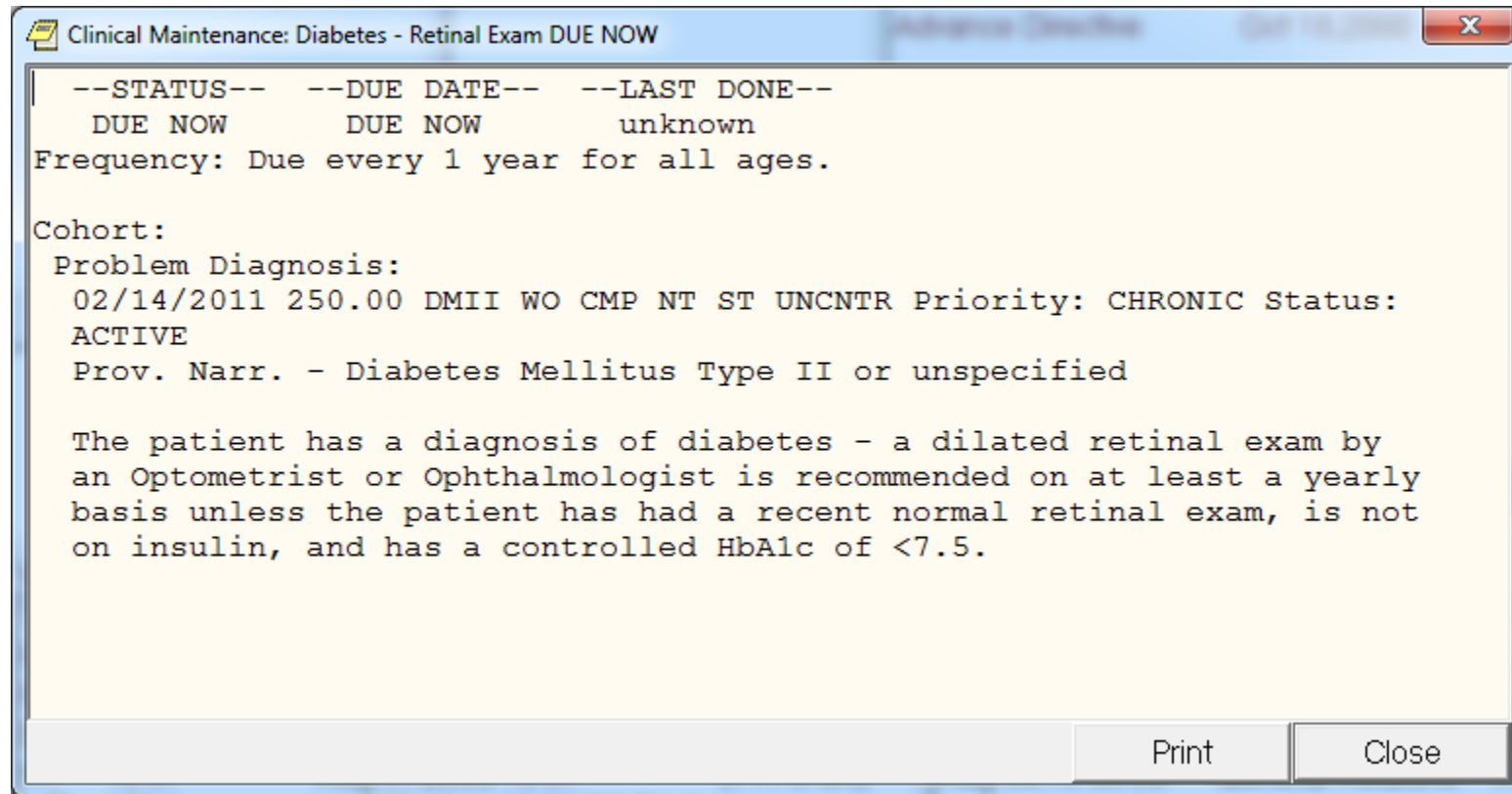
Active Medications	Clinical Reminders	Due Date
Metoprolol Tartrate 50mg Tab Active	Depression Screening	DUE NOW
Simvastatin 40mg Tab Active	PC Nutritional Screening	DUE NOW
Non-VA Aspirin 81mg Ec Tab Active	Diabetes - Urinalysis	DUE NOW
	Influenza Vaccine	DUE NOW
	Pneumococcal vaccine (Pneumovax)	DUE NOW

Recent Lab Results	Vitals	Appointments/Visits/Admissions
No Orders Found.	T 98.5 F Mar 05,2010 09:00(36.9 C) P 74 Mar 05,2010 09:00 R 22 Aug 31,2009 10:00 BP 134/81 Mar 05,2010 09:00 HT 70 in Aug 31,2009 10:01 (177.8 cm) WT 178 lb Mar 05,2010 09:00(80.7 kg) PN 1 Mar 05,2010 09:00 POX 98 Dec 01,2009 08:53 BMI 25.59 Mar 05,2010 09:00	Aug 26,10 21:19 Cardiology Action Required Aug 12,10 08:00 General Medicine Action Required Aug 11,10 08:00 General Medicine Action Required Aug 10,10 08:00 General Medicine Action Required Aug 09,10 08:00 General Medicine Action Required

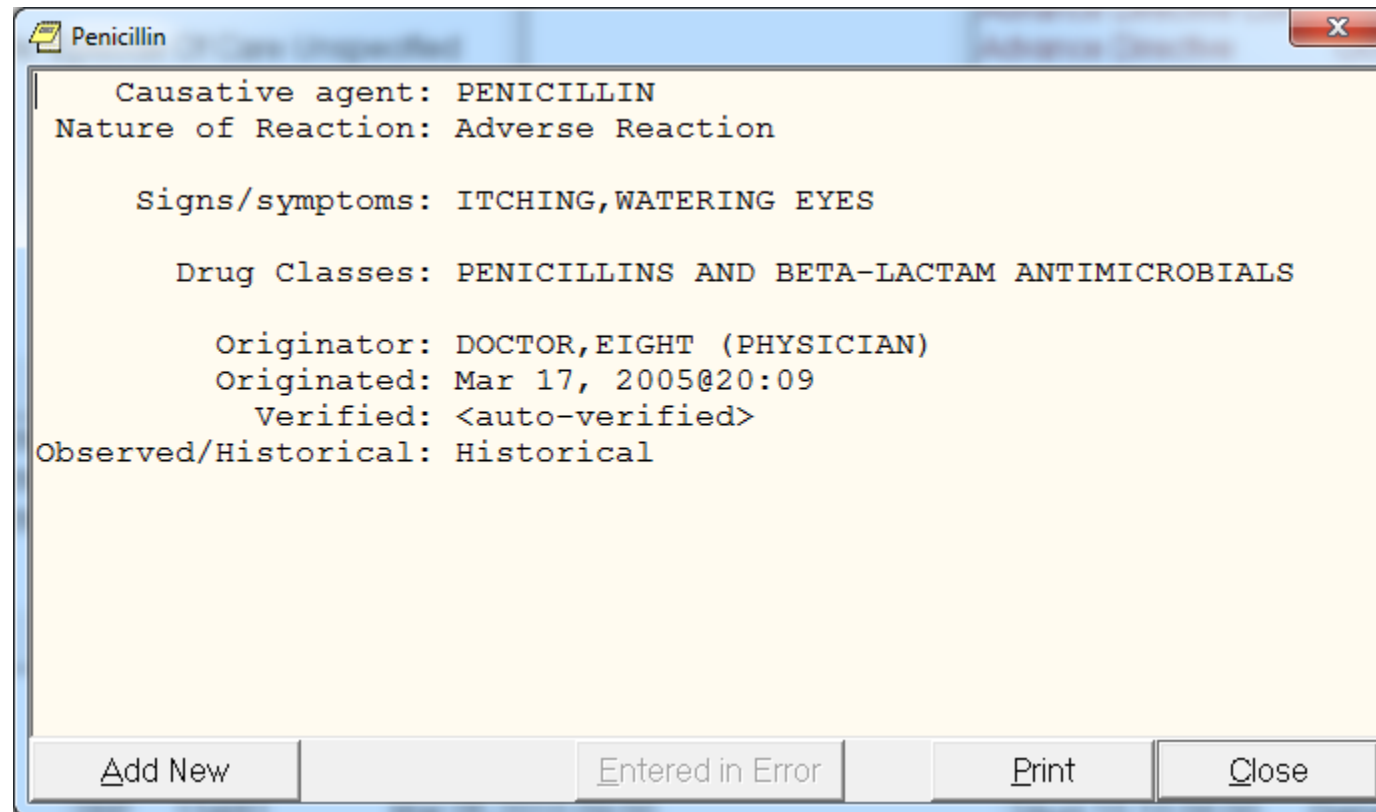
Cover Sheet Problems Meds Orders Notes Consults Surgery D/C Summ Labs Reports



Clinical decision support: reminders



Clinical decision support uses allergy information



Penicillin

Causative agent: PENICILLIN
Nature of Reaction: Adverse Reaction

Signs/symptoms: ITCHING,WATERING EYES

Drug Classes: PENICILLINS AND BETA-LACTAM ANTIMICROBIALS

Originator: DOCTOR,EIGHT (PHYSICIAN)
Originated: Mar 17, 2005@20:09
Verified: <auto-verified>
Observed/Historical: Historical

Add New Entered in Error Print Close

Let's try to prescribe a medication

Vista CPRS in use by: Doctor,One (BROKERSERVER)

File Edit View Action Tools Help

EIGHT.PATIENT Visit Not Selected Primary Care Team Unassigned

666-00-0008 Apr 07,1935 (75) Provider: DOCTOR.ONE

Flag VistaWeb Postings
Remote Data CAD

Sort by Status/Exp. Date (IMO first on Inpt)

Action	Outpatient Medications	Expires	Status	Last Filled	P
	METOPROLOL TARTRATE 50MG TAB Qty: 180 for 90 days Sig: TAKE ONE TABLET BY MOUTH TWICE A DAY	02/28/11	Active	Feb 27,10	3
	SIMVASTATIN 40MG TAB Qty: 90 for 90 days Sig: TAKE ONE TABLET BY MOUTH EVERY EVENING	02/28/11	Active	Feb 27,10	3

Action	Non-VA Medications	Start Date	Status
	Non-VA ASPIRIN 81MG EC TAB 81MG MOUTH EVERY MORNING Non-VA medication recommended by VA provider.		Active

Action	Inpatient Medications	Stop Date	Status	Location
--------	-----------------------	-----------	--------	----------

Cover Sheet Problems **Meds** Orders Notes Consults Surgery D/C Summ Labs Reports

How about some amoxicillin?

Medication Order

AMOXICILLIN CAP,ORAL Change

Dosage	Complex	Schedule	
500MG	ORAL (BY MOUTH)	Q8H	<input type="checkbox"/> PRN
250MG	ORAL (BY MOUTH)	Q8H	
500MG		Q8H*	
1000MG		QAM	
1500MG		QAMINSULIN	
2000MG		QDAY	

Comments:

Days Supply: 30

Pick Up: Clinic Mail Window

Priority: ROUTINE

AMOXICILLIN CAP,ORAL 500MG
TAKE 1 CAPSULE BY MOUTH EVERY 8 HOURS
Quantity: 90 Refills: 0

Accept Order Quit

Oops, patient is allergic

Order Checking

Remote Order Checking not available - checks done on local data only

Previous adverse reaction to: (INACTIVE) PENICILLINS: (LOCAL)

Accept Order Cancel Order

Maybe erythromycin?

Medication Order

ERYTHROCIN <ERYTHROMYCIN TAB > Change

Dosage	Complex	Schedule	<input type="checkbox"/> PRN
250MG	ORAL (BY MOUTH)	BID	<input type="checkbox"/>
250MG	ORAL (BY MOUTH)	5XD	<input type="checkbox"/>
250MG		AT ONSET	<input type="checkbox"/>
500MG		BID	<input type="checkbox"/>
500MG		BID AC	<input type="checkbox"/>
1000MG		CONTINUOUS DRIP	<input type="checkbox"/>

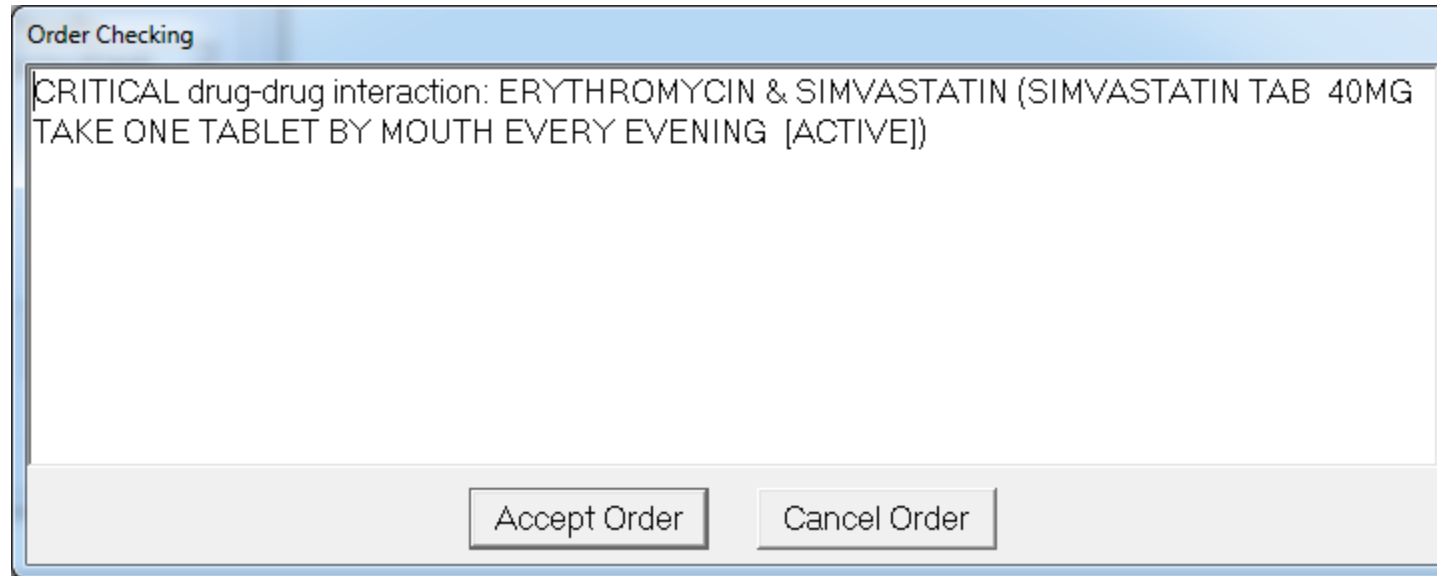
Comments:

Days Supply: 30 Pick Up: Clinic Mail Window Priority: ROUTINE

ERYTHROMYCIN TAB 250MG
TAKE ONE TABLET BY MOUTH TWICE A DAY
Quantity: 60 Refills: 0

Accept Order Quit

No, interacts with statin drugs



Another patient – drug interactions

Vista CPRS in use by: Doctor,One (BROKERSERVER)

File Edit View Action Tools Help

ZZZTWO,IMAGEPATIENT Visit Not Selected Primary Care Team Unassigned
666-06-1002 Apr 15,1968 (57) Provider: DOCTOR,ONE

Flag VistaWeb No Postings
Remote Data

Sort by Status/Exp. Date (IMO first on Inpt)

Action	Outpatient Medications	Expires	Status	Last Filled
	SILDENAFIL CITRATE 50MG TAB Qty: 10 Sig: TAKE ONE TABLET BY MOUTH AS NEEDED		Pending	
	ATORVASTATIN CALCIUM 40MG TAB Qty: 90 Sig: TAKE ONE TABLET BY MOUTH EVERY DAY		Pending	

Action	Non-VA Medications	Start Date	Status
--------	--------------------	------------	--------

Action	Inpatient Medications	Stop Date	Status	Location
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Cover Sheet Problems Meds Orders Notes Consults Surgery DIC Summ Labs Reports



Prescribing nitrates for angina

Medication Order

NITRO-BID <NITROGLYCERIN CAP.SA > Change

Dosage	Complex	Schedule	<input type="checkbox"/> PRN
2.5MG	ORAL (BY MOUTH)	BID	<input type="checkbox"/>
2.5MG	ORAL (BY MOUTH)	AT ONSET	<input type="checkbox"/>
5MG		BID	<input type="checkbox"/>
6.5MG		BID AC	<input type="checkbox"/>
9MG		CONTINUOUS DRIP	<input type="checkbox"/>
13MG		ENS	<input type="checkbox"/>

Comments:

>> Quantity Dispensed: DISP IN MULT OF 100 <<

Days Supply: 90

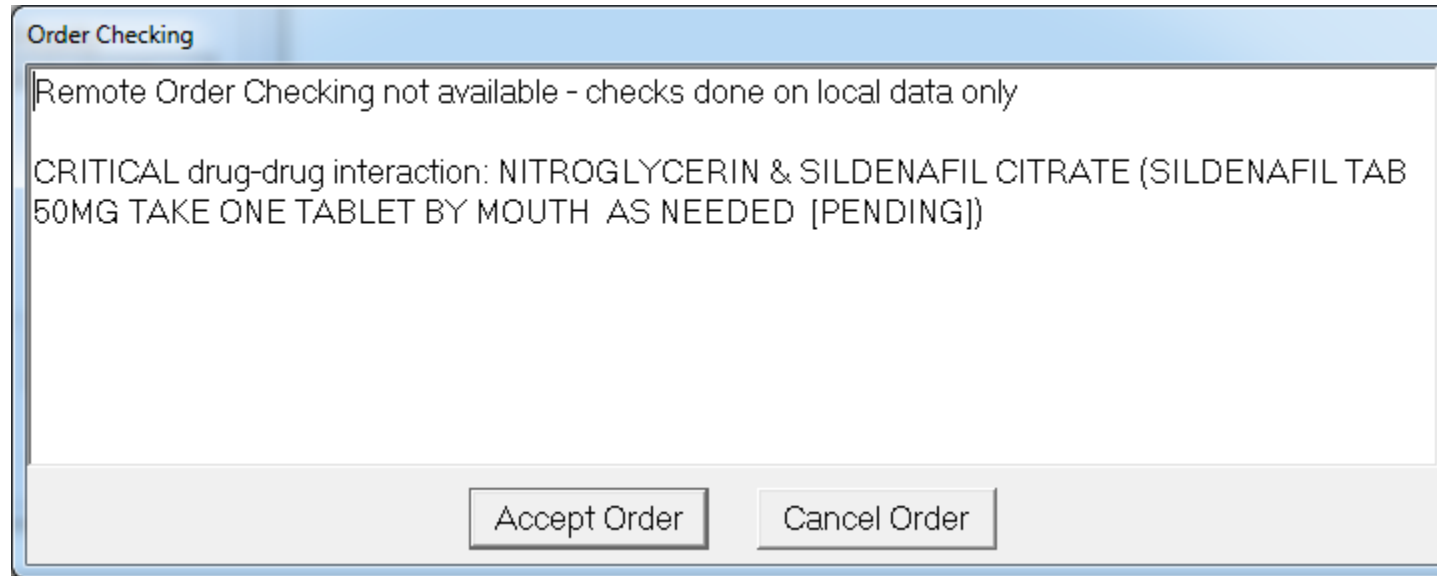
Pick Up: Clinic Mail Window

Priority: ROUTINE

NITROGLYCERIN CAP.SA 2.5MG
TAKE 1 CAPSULE BY MOUTH TWICE A DAY
Quantity: 180 Refills: 0

Accept Order Quit

Oops!



More about VistA

- Pure open-source version is also known as FOIA VistA
- There are two other streams of VistA activity
 - WorldVistA (<http://worldvista.org/>) follows a more traditional open-source pathway
 - OpenVista more commercially oriented, and some vendors have proprietary extensions from the base code (e.g., <https://www.medsphere.com/>)
- Transition to Cerner with Department of Defense is proceeding, starting in Pacific Northwest and slated to take 8-10 years
 - <https://www.ehrm.va.gov/>

Other open-source EHRs

- Most recent analysis of free and open-source EHR systems (Purkayastha, 2019)
 - Many downloads but tiny operational usage
- Only two currently have ONC certification
 - OpenEMR – <https://www.open-emr.org/>
 - WorldVista – <https://worldvista.org>
- More use of other noteworthy systems
 - Indian Health Service Resource and Patient Management System (RPMS) – derived from VistA; future unclear (HIS, 2019; Cullen, 2020)
 - <http://www.ihs.gov/rpms/>
 - OpenMRS – <https://openmrs.org/>
 - OpenEHR – <https://www.openehr.org/>
 - LibreHealth – <https://librehealth.io/>

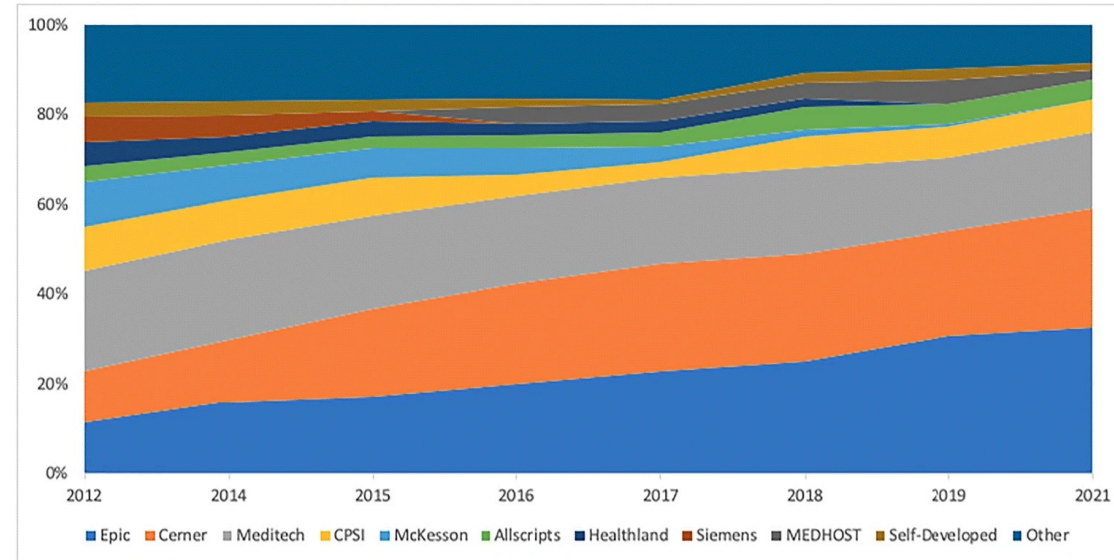
Despite appeal of open source, market belongs to commercial vendors

- Halamka (aka, Geek Doctor) noted “Era of Epic,” where integration and vendor performance trump innovation and “best of breed” (Halamka, 2013)
 - Epic (<https://www.epic.com/>) dominates high end of market, e.g., academic and other large medical centers
 - “No one ever got fired for buying Epic”
 - Epic methodology focuses on workflow
 - Product cycle creates effective demand management
- Epic is privately held, 40 years old, and run by Judy Faulker (Newman, 2019; Jennings, 2021)
 - Lynchpin of Madison, WI economy (Eisen, 2020)
- Early research-oriented “home grown” EHR systems have given way to commercial systems (Hersh, 2017)
- Worldwide comparative status of EHR adoption (Commonwealth Fund, 2020)
- Cerner acquired by DBMS vendor Oracle in 2022 (Landi, 2022)

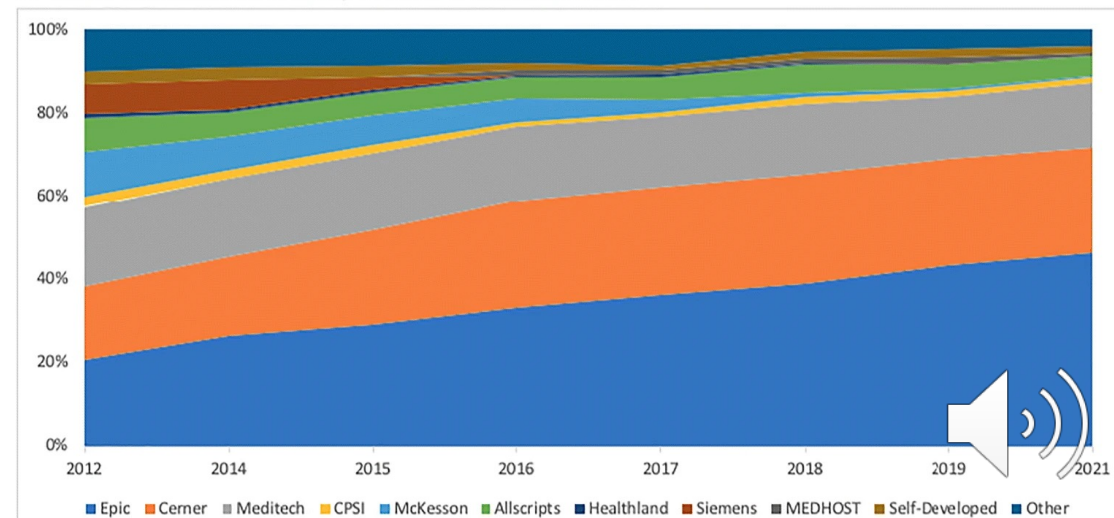
US EHR market share

- Hospital EHR market has consolidated around two vendors – Epic and Cerner – especially among large hospitals (Holmgren, 2022)
- Four vendors provided service to largest hospitals (>500) beds in 2018 (Landi, 2020)

a EHR Vendor Market Share by Number of Hospitals, 2012-2021



b EHR Vendor Market Share by Number of Beds, 2012-2021



Ambulatory EHR marketplace in US (Definitive Healthcare, 2022)

Rank	Vendor	# of Installs	% of Market Share
1.	Epic Systems Corporation	2,502	41.10%
2.	Oracle Cerner	1,413	23.21%
3.	MEDITECH	805	13.22%
4.	Evident, a CPSI Company	486	7.98%
5.	Allscripts	182	2.99%
6.	Athenahealth	123	2.02%
7.	Altera Digital Health, a Harris Company	99	1.63%
8.	Netsmart Technologies	78	1.28%
9.	eClinicalWorks	41	.67%
10.	Proprietary Software	39	.64%